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Abstracts
Head and Spine
Oral Presentations

1
DISCRIMINATION BETWEEN NORMAL AND PATHOLOGICAL BRAIN MATURATION BY MR IMAGING AT 1.0 T
P.Bairol, M.Huber, A.Mühlsteffen, Ch.Förster

Introduction: During the first two years of life, MR images at 1.0 T demonstrate characteristic changes of gray and white matter signal intensities. The purpose of this study was: 1. to quantify these changes for the sequences commonly used; 2. to provide a set of normal values and standard deviations for cerebral matter development.

Method: 120 brain examinations in infants younger than 24 months of age were evaluated. 35 of these patients were diagnosed as normal. In all cases relaxation times and proton densities for frontal and occipital white and gray matter as well as for the internal capsule and the corpus callosum were measured. For 4 different sequences the contrast-to-noise ratio between gray and white matter was calculated. Results: Relaxation times and proton densities decreased with increasing age. This tendency was more pronounced for white matter than for gray matter. Based on these data, a simple algorithm provided theoretical gray/white contrast curves as a function of age and of the various imaging parameters. In normals these calculated diagrams agreed well with the time course of the contrast measured for each patient. In some infants with congenital or perinatal defects gray/white contrast differed from the normal values. In these cases a 2-sigma-curve paralleling the mean values helped to discriminate between normal and pathological development.

Conclusion: Successive stages of maturation can be assessed exactly by MR imaging at 1.0 T.

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OPIERCULAR MALFORMATION: RADIOLOGICAL WORK-UP OF 7 CASES
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Ocular malformation is a rare brain lesion characterized by the abnormal development of the sylvian and rolandic fissures.

The diagnosis may be suggested by CT but MR offers a better demonstration of the three main features:

- verticalization of the sylvian fissure which seems prolonged by the rolandic one;
- abnormal cortical venous drainage;
- micropoligryic cortex surrounding these fissures.

One can find good correlation with the embryological data. In one case the postnatal history allows to date the time of this injury around 22 weeks of gestation.

This entity belongs to the large spectrum of neuronal migrational disorders, is different from localized pachygryia and fused schizencephaly, and can easily be identified thanks to MRI.

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A NEONATE WITH A SUPERFICIAL INTRACRANIAL ARTERIOVENOUS MALFORMATION
A. Daneman, P. Burrows

An otherwise well four week old male was found to have cardiomegaly on routine postnatal checkup. Further clinical evaluation revealed a cranial bruit but no other significant finding. Echocardiography confirmed the cardiomegaly but showed no cardiac defects. Cranial sonography at a referring institution failed to document an intracranial cause for the cranial bruit.

Clinical follow-up two weeks later again revealed cardiomegaly and the cranial bruit but cardiac failure was not present. A repeat cranial sonogram at our institution showed moderate enlargement of the superior subarachnoid space over the cerebral hemispheres (a little larger on the right than the left) and widening of the interhemispheric fissure. The superior sagittal sinus was enlarged. There were a few echogenic foci noted in the superior subarachnoid space on the right lateral to the falx. The appearance of some of these foci suggested the presence of enlarged superficial cerebral vessels.

The color Doppler study clearly showed a markedly enlarged branch of the right anterior cerebral artery, ascending along the medial surface of the right cerebral hemisphere. This communicated with a bunch of irregular vessels on the superior service of the right cerebral hemisphere and these drained into the superior sagittal sinus. These findings were confirmed on angiography.

Superficial arteriovenous malformations presenting in the neonatal period are rare. This case emphasizes the need to evaluate superficial structures diligently in the search of arteriovenous malformations and illustrates how color Doppler evaluation can facilitate the documentation of the presence of abnormal vessels with their unusual communications and directions of flow.

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THE CONUS MEDULLARIS: TIME OF ASCENDENCE
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In contrast to earlier papers in which it was presumed that the ascension of the conus medullaris throughout childhood, MR-imaging has proved that the conus medullaris of newborns is already to be found at the level of L1/2.* Therefore we examined the level of the conus medullaris in 100 premature and fullterm babies and young infants by using ultrasound (linear transducer 5 MHz).

Conclusion: In children aged between the 30th and 39th week of gestation the conus medullaris mostly lies at L1/2 and from the 40th week of gestation at the level of L1/2. Thus the ascension of the conus medullaris is completed by the 40th week of gestation.

The case of one three month old baby (53rd week of gestation) we found the tip of the conus medullaris at the level of L4. This finding had not changed when examined 2 months later (tethered cord?).

*Wilson, O.A. Prince J.R. 1989
MR Imaging Determination of the Location of the Normal Conus Medullaris Throughout Child-
hood
AJR 152: 1029-1032
This study emphasizes the better knowledge of pathology.

We have seen 5 cases with pseudocyst phenomenon in the subependymal germinal matrix. Cerebral ultrasonography showed linear areas of increased echogenicity in the region of the lenticulostriate vessels. One infant had a small area of adjacent peri-ventricular leucomalacia on one side.

The third infant was born at term and was thought clinically to have Meckel Syndrome. He was ventilated intermittently for 15 days and subsequently died. Autopsy in this infant showed (i) bilateral multifocal microscopic astrocytic reaction in the thalamus. (2) calcium encrustation of individual neurons. No vessel abnormality was identified histologically and there was no morphological evidence of congenital infection in the infant or its placenta. The findings were thought to be the result of intrauterine asphyxia. We conclude that the findings on sonography are non-specific and are due to ischemic rather than congenital infection as previously was suggested.

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Interpretation of sub-ventricular pseudo-cyst

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Sonolucent lesions are occasionally detected in the subependymal germinal matrix, at the upper external angle of lateral ventricle and anterior or at the level of the foramen of Monro. These are most commonly believed to be the sequelae of prior subependymal germinal hematoma that has undergone cystic degeneration. Central liquefaction in this area of prior hemorrhage is believed to be the most common cause of subependymal pseudocyst formation in neonates.

We examined postmortem 12 brains with subependymal germinal hemorrhage at different stages. The serial sonographic images (Acuson, 3ME) are attempted to correlate with the corresponding brain sections.

We have seen 5 cases with pseudocyst phenomenon in the subependymal germinal matrix in whom there was no evidence of central liquefaction. The echogenic wall of pseudo-cyst is not hematoma itself but the surrounding tissue. Increased periventricular echogenicity around the hematoma is due to edematous changes of the surrounding tissue or even leukomalacia. The organized subependymal hematoma itself is homogeneous anechoic.

This study emphasizes the better knowledge of pathology for interpretation of subependymal pseudocyst and its associated changes. It is necessary to remit cautiously before predicting the cystic changes of subependymal hemorrhage.

MAGNETIC RESONANCE IMAGING (MRI) OF CEREBRAL INFARCTION (CI) IN THE NEONATE

J. Haddad*, H. Christmann**, R. Casanova*, J. Messer*, D. Willard*, J.P. Walter**

Cerebral infarction (CI) or focal ischemia occurs in the neonate without specific clinical signs. With the advent of CT and US scan, the recognition of CI becomes easier. We report here imaging features of CI in five term babies suffering from CI and we compare them to US and CT scan findings in the neonatal period. A 0.5 T GMR magnet is used. T1 (450/12 msec) and T2 (2000/120 msec) are utilised. The MRI characteristics can be divided in two overlapping stages: Stage I of demyelination phase early after birth in which CI territory demonstrates an increased signal intensity lower than white matter's but higher than cerebral spinal fluids on T1 or TE. A midline shift and absence of gyral definition is also noted. US shows altered parenchymal echogenicity and CT scan hypodensity. Multiples images allows us to delimitate the CI with accuracy. In 4 cases whole territory of right middle cerebral artery (MCA) was involved whereas in the remainder only a distal branch of left MCA was concerned. Parenchymal hemorrhage was associated in 2 cases. Two weeks after: stage 2, cystic changes were well developed on MRI. Hemorrhage was still identified whereas on US and CT scan altered parenchymal echogenicity and hypodensity persisted. From these features, MRI enables us to date the occurrence of CI. In one infant prenatal occurrence was evident on MRI at 3 days old (stage 2) whereas in US and CT scan findings couldn't differ it. Furthermore, old and fresh hemorrhage were easily identified on T2 in this case. MRI seems to be more accurate in the recognition of CI in the neonatal period and may be of great interest during the evolving postnatal period from ischemia to liquefaction and ultimately cavitation (stage 2) which occurs sooner than previously.

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MR IMAGING OF INTRACRANIAL HEMORRHAGE IN ABUSED AND OTHERWISE TRAUMATIZED CHILDREN
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For biochemical and physical reasons CT is the image modality of choice in patients with acute intracranial hematomas. In subacute and chronic hemorrhages methaemoglobin shortens T1- and T2-times significantly. So MRI with its advantages superior to CT in children is very helpful in detection and characterization of intracranial hematomas especially in repeatedly abused children. Moreover MR imaging best discloses small subdural hematomas often not detectable in CT scans due to beam hardening effect, small concurrent intracerebral bleedings caused by whiplash injuries, and other concurrent small intracerebral hemorrhages.
This paper focuses on our MRI experiences in 12 patients with intracranial hematomas due to: child abuse (4), road accidents (3), sports activities (2), and spontaneously in vascular malformations (3).
We compared the results as far as reasonable and possible with ultrasonographic and CT findings. In some patients follow-up studies were done emphasizing the value of MRI as control examination.
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MAGNETIC RESONANCE IMAGING WITH GADOLINIUM-DTPA IN NEUROEPIDEMIOLOGICAL ONCOLOGY
Th. Kahn, N. Roosen, G. Fürst, U. Madder
We performed 320 contrast-enhanced MR examinations of 112 infants and children aged 6 days to 18 years with tumors of the central nervous system and the spinal canal. Using a superconductive magnet (0.5 Tesla), we acquired T1- and T2-weighted images, followed by T1-weighted images obtained immediately after i. v. injection of Gadolinium-DTPA (0.1 mmol/kg body weight). In no case side effects were encountered. 29 tumors were located in the supratentorial region, 27 in the pineal region, 97 in the posterior fossa and 19 in the spinal canal. The most common tumors were primitive neuroectodermal tumors (n=19) and ploidyct astrocytomas (n=19).
During initial diagnosis, the majority of tumors showed intensive enhancement with improved demarcation from neighbouring structures. The solid component of a cystic tumor, even when small and not visible on the original scan, could be demonstrated in all cases by means of Gadolinium-DTPA. The sensitivity of MRI for demonstrating spinal intradural extramedullary tumors was greatly improved by Gd-DTPA. During chemotherapy or radiotherapy, contrast-enhanced MRI provided reliable demonstration of the success of treatment and accurately demonstrated the size of the tumor and the presence of necrosis. Post-operatively, T2-weighted scans regularly showed areas of high signal strength at the margin of the resection; in the absence of a mass or demonstrable progression, the significance of this is uncertain. In these cases Gd-DTPA because of the function of the blood-brain barrier, greatly increased accuracy in demonstrating residual or recurrent tumors.
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MRI OF CENTRAL DIABETES INSIPIDUS: 5 CASES
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Five observations of central diabetes insipidus demonstrate the potential of MRI to explore the hypothalamo-hypophysial axis. Various etiologies were observed: abnormal signal of the posterior pituitary gland in a case of "idiopathic" diabetes insipidus, lobar prosencephaly, histiocytosis X, malignant taxatoma and cranio-pharyngioma. The hyperintense signal of the posterior lobe of the pituitary gland, normally observed in the T1-weighted SE sequences, was absent. Three out of the all cases illustrate that the diagnosis of primary or idiopathic diabetes insipidus must remain uncertain for several years until repeated investigations fail to demonstrate any signs of a neoplasm or histiocytosis X. The inocity and the gater sensitivity of MRI, compared to CT, will permit an earlier diagnosis of pathologies responsible for secondary diabetes insipidus. However, MRI is non specific and has to be correlated to the clinical and the biological data (including tumoral tracers such as B-HCG and alpha-fetoprotein). The cases of lobar prosencephaly and histiocytosis X illustrate that in addition to the hypothalamo-hypophysial axis, the whole parenchymal brain has to be explored. Gd-enhanced MRI appears useful to delineate the extension of tumoral process or of abnormal cell infiltration. MRI is the imaging modality of choice for the diagnosis and follow-up of central diabetes insipidus.
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GROWTH HORMONE DEFICIENCY (GHD) IN CHILDREN. COMPARATIVE MR AND ENDOCRINOLOGIC STUDY
M. Argyropoulou, F. Perignon, F. Brunelle, R. Brauner, R. Rappaport
The etiology of GHD is often unknown. MRI was performed on SE, T1 sagittal and coronal scans, 3 mm thick in 31 children with GHD. The PG height (PGH) was measured and compared to a control group (1). MR anatomy discriminatecl 2 groups: Group I: 19 children had a normal MR anatomy. The PGH in the 2 groups was inferior to normal values (p 0.001). Clinical and MR data were compared in the 2 groups:
GROUP I (PSIS) II
PGH (mm) 2.5 ± 0.9 3.6 ± 1.1 0.02
GH (µg/ml) 3.7 ± 2.4 6.6 ± 2.4 0.001
Multiple deficits 86% 14% 0.05
Perinatal insults 75% 25% 0.05
Facial malformation 2
Head trauma 1
GHD is associated with diminished PGH. There is a good endocrinological and MRI correlation. Abnormal MR anatomy (PSIS) is associated with a more severe clinical presentation.
(1) M. Argyropoulou, F. Perignon, F. Brunelle
Height of normal pituitary gland as a function of age evaluated by MR in children. Pediatr Radiol (submitted for publication)
Sect de Radiol Péd Hopital des Enfants Malades 149, rue de Sèvres, 75730 Paris Cedex 15 (France).
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CONTRIBUTION OF NMR TO THE DIAGNOSIS OF CEREBRAL LESIONS OF ADRENOLUBEUKODYSTROPHY.

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NMR examinations were performed in 31 males with biochemically proved adrenoleukodystrophy (ALD). 13 patients had childhood or juvenile cerebral ALD, 8 patients had adrenomyeloneuropathy (AMN) and 10 were neurologically asymptomatic boys without adrenal insufficiency.

In cerebral ALD, MRI was remarkably sensitive in demonstrating lesions in the white matter located within the auditory and visual pathways, the colliculus and the pyramidal tracts within the internal capsules and the pons. Furthermore, a two distinct temporal phase was identified by the variation in the abnormal white matter T2 signals.

MRI detected white matter lesions in 6/10 neurologically asymptomatic boys: four of these patients became neurologically symptomatic within the two following years. MRI lesions in the brain white matter therefore appear as reliable predictors of clinical ALD. 4/8 AMN patients had white matter lesions in the brain and 3/4 of these patients had moderately to severe neuropsychological deficits. This suggests that central nervous system involvement is more frequent in AMN than previously thought on the basis of clinical and CT data.

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MAPLE SYRUP URINE DISEASE, CT AND MR OF THE BRAIN.

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Maple syrup urine disease (MSUD) is a rare enzymatic defect blocking the catabolism of the branched chain amino acids. The affected child is usually normal for a few days after birth, then rapidly deteriorates with failure to thrive, trunca hypotonia, convulsions and stupor progressing to coma. Without treatment the infant often dies within the first few weeks. An early, rigid diet may prevent this course and even preserve a normal intellect.

The cranial CT and MR findings have previously only been presented in scattered case reports. We have performed totally 26 CT and 13 MR examinations in 12 patients with MSUD during different stages of the disease. As the age at diagnosis varied from 3 days to 7 months, the first time, document the natural course of the disease. CT is negative during the first few days of life, then a generalised edema appears. In addition, a more severe, localised edema is seen extending from the deep cerebellar white matter up through the cerebral peduncles and through the posterior limb of the internal capsule; these changes are best appreciated from T2 weighted MR registrations. Both the local and the generalized edema subsided during the second month of life, often leaving well defined low density scars; some loss of brain substance then also becomes obvious. The CT and MR changes are typical enough to permit early diagnosis of MSUD.

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EVOLUTION OF MRI FINDINGS IN A YOUNG CHILD WITH BRAIN CYSTICERCOSIS AFTER THERAPY WITH PRAZIQUANTEL

A Beutler, Ch. A. Haenggeli and D. Nusslé

Cysticercosis is a common parasitic disease of the nervous system in developing countries, and occurs also in industrialized nations with high rate of immigration. Therapy of neurocysticercosis with aniparasitic agents is still controversial in children, because the disease appears to be still limited in the majority of cases, and because adverse reactions after medication occur in almost all patients, due to a flare-up of inflammatory reaction.

Clinical, laboratory and MRI findings before and 3, 7, 10 and 16 months after Praziquantel therapy in a 4 1/2 year-old girl are presented. She had numerous partial and generalized seizures since the age of 12 months, after a stay in Haiti between 4 and 8 months. The diagnosis of parenchymal brain cysticercosis was made 3 1/2 years later with CT and serological analysis of blood and CSF. CT showed multiple parenchymal calcifications without focal of enhancement, MRI showed no abnormal signal in T1 weighted images. T2 imaging demonstrated several large areas of high signal intensity in the grey and white matter, surrounding hypointense foci, suggesting active inflammatory lesions. Three months after Praziquantel therapy new inflammatory areas were seen as well as small rings with high intensity around calcified foci, consistent with a clinical exacerbation and increasing serological titers. Follow up examinations showed progressive disappearance of inflammatory lesions with persisting calcified foci and serological improvement.

These MRI studies demonstrate that calcified foci can still be active, thus an increase of the inflammatory process after antiparasitic treatment, followed by complete inactivartion.

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SERIAL MR-STUDIES IN MULTIPLE SCLEROSIS IN CHILDHOOD

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The aim of the study was to assess CNS focal white matter abnormalities in childhood MS, and to correlate changes in appearance over time with clinical courses of the disease. Methods: Superconductive magnet 1.5 T. Pulse sequences: IR 1500/450/30, PSSE 450/20/4, SE 2500/30/60/2. Imaging in transverse and sagittal planes. Results: From 1/87 - 6/89 87 consecutive children (age 0-18 years) were referred to MR of the CNS. Within the age group 10-14 years 7 patients had clinically definite (n = 5) and laboratory supported definite (n = 2) multiple sclerosis (MS) (Ann. Neurol. 13: 227, 1983). Results: The average onset of MS in the present series was 12 1/12 years. The female male ratio was 5:2. The patients presented clinically with motor symptoms (4/7), visual disturbances (3/7), urinary dysfunction (2/7), gait disturbance (2/7), vertigo (2/7) and synnastigus (1/7). From all paraclinical tests MR proved to be the most useful paraclinical test for establishing the clinical diagnosis of MS. All patients had brain white matter abnormalities which fulfilled the criteria of Paty's MR classification of MS (Neurot. 38: 180, 1988). In 4/7 patients with acute clinical attack large lesions (8-21 mm in diameter) were present which demonstrated a regular fumellar structure on both T1-, proton density and T2-weighted images. On MR follow-up studies, performed in a series of 3-4 examinations, all children exhibited changing patterns of their CNS signal abnormalities. In 3/6 cases clinically silent brain lesions were detected. The lesions exhibited the best contrast to cerebral white matter on long TR/short TE spin echo sequences. Combined sagittal and transverse series, obtained with ECG-gating and flow compensating technique were proved best for repeated MR follow-up studies.

MR could possibly be used to monitor the in vivo regression of the fresh demyelinating process. Furthermore MR may be of use to contribute to more reliable epidemiologic data on prevalence and incidence of MS in childhood. MR possibly offers a tool to evaluate therapeutic response in the acute MS-plaque.

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SPECT/MR CORRELATIONS IN CHILDHOOD ONSET EPILEPSY
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The relationship of functional and structural abnormalities in 11 patients with childhood onset epilepsy was evaluated using SPECT and MRI. Eleven patients aged 2.2 to 27 years underwent SPECT (Tc-99m-HMPAO) and MRI. In 5 patients with normal MRI, SPECT detected asymmetry of cerebral blood flow. In the other six patients, both MRI and SPECT were abnormal, but the extent and distribution of the abnormalities did not correlate completely.

SPECT findings: in mesial temporal sclerosis (n=2) and temporal lobe dygenesis (n=1): perfusion asymmetry, more extensive than MRI abnormality; in infantile cerebral venous thrombosis (n=1): contralateral hypoperfusion not seen on MR; chronic hypoxic encephalopathy (n=1): non-perfusion in middle cerebral arterial distribution, not seen on MR.

In conclusion, this study demonstrates that in patients with childhood onset epilepsy; 1) SPECT detects abnormalities not shown by MRI, and 2) when both SPECT and MRI are abnormal on the same patient, SPECT appears to detect more extensive involvement, and gives more specific functional information than MRI. Therefore, both modalities should be utilized to understand better functional effects of structural lesions of the brain in patients with childhood-onset epilepsy.

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NEURAL CREST DEFECTS
J. McCredie

Reduction deformities of the limbs caused by contergan (thalidomide, distaval) can be interpreted radiologically by reference to maps of the segmental sensory nerve supply of the skeleton (sclerotome maps). Contergan was a sensory neurotoxin with a short pharmacokinetically active period, but it caused an intractable sensory peripheral neuropathy in adults.

Congenital reduction deformity is seen as the embryonic equivalent of contergan neuropathy, in which toxic damage to segments of the developing neural crest result in aplasia or hypoplasia within the fields dependant upon the injured levels. Associations of limb reduction deformities and malformations in internal organs can be attributed to toxic autonomic neuropathy related to the damaged segment of neural crest. This concept of "neural crest defects" can be expanded beyond the contergan model to provide a logical interpretation for many congenital malformations of skeletal and visceral tissues. As a group in the hierarchy of birth defects, neural crest defects are separate from, but adjacent to, the well-established neural tube defects.

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COMPARISON OF PLAIN AND GD-DTPA-ENHANCED MR IMAGING IN PEDIATRIC PATIENTS
J. Haustein P. Baierl H.P. Niendorf

40 children and adolescents (aged 1 - 16 years) were examined by MR Imaging at 1.0 T. Gd-DTPA was given intravenously at a dose of 0.1 mmol/kg body weight. In all cases TI-weighted SE sequences were used to demonstrate contrast enhancement. No adverse effects were seen. 10 patients had one or more lesions; in 20 patients contrast enhancement was seen. In 4 cases lesions were not observed by plain MR and could only be detected after GD-DTPA. In addition, contrast enhancement provided additional information about the differentiation of lesion from edema or necrosis in 13 patients. Normal brain matter did not show any changes in signal intensity. However, an age-dependent signal increase was found in the normal vertebral bone marrow in all children. Gd-DTPA should be used as a supplementary examination whenever a tumor or an infectious disease of the CNS is suspected and plain MRI is normal, or when origin and extent of a lesion cannot be adequately defined with plain MRI.

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ULTRASONIC EVALUATION OF INTRACRANIAL LESIONS IN NEONATES AND INFANTS: COMPARISON WITH COMPUTED TOMOGRAPHY.
L. Alparslan, K. Kamberoglų and O. Çolkyılmaz

The sonographic manifestations of periventricular and intraventricular hemorrhage in neonates have been well described by many investigators. In this study we examined pediatric patients with other cerebral pathologies excluding those with neonatal hemorrhage. 35 neonates and infants underwent both US and CT. The ages of the patients ranged between newborn and 12 months of age. All ultrasound examinations were performed with a real-time sector scanner using a 5-MHz transducer. No sedation was employed. The patients were scanned on Siemens Somatom 2 and GE CR 12000 scanners. The indications for examination were enlarging head size, inflammatory disease, trauma, seizures, neural canal defects and cranio-facial anomalies.

All the ultrasonic diagnosis were compared with CT findings. Overall sensitivity of US in detecting the intracranial lesions was 80 % (28/35). US showed the similar accuracy with CT in determining the abnormalities concerning about the cerebral ventricles (hydrocephalus, abnormalities of shape, ventriculitis) 100 % (22/22). US was insensitive in recognizing the brain lesions of 7 patients. These were 3 diffuse parenchymal disease, 1 lacunar infarction in 1 small cortical abscess and hematoma, 1 subarachnoid hemorrhage.

In conclusion US offers an accurate, non-ionizing diagnostic modality for early recognition of suspected hydrocephalus and their long term follow up. However CT should be the initial screening procedure in defining the diffuse parenchymal lesions, tumors and subarachnoid hemorrhage.

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GYRIFORM ENHANCEMENT ON CT BRAIN IN SEVEN INFANTS
P. Close, H. Carty

Gyriform enhancement seen on CT scan is an unusual finding unless associated with arteriovenous malformations (AVM). There are sporadic case reports in the literature of its occurrence in association with herpes simplex virus encephalitis (HSVE), purulent meningitis, following chemotherapy for leukaemia, in a child with chronic renal failure, and in a child with folic acid deficiency. We present a series of seven cases exhibiting this phenomenon, none of whom have AVMs, who have been scanned at this hospital in the first 28 years following the installation of a CT scanner. Four of the cases had congenital heart disease requiring corrective surgery or cardiac catheterisation. The other three had probable meningo-encephalitis. In all cases the gyriform enhancement followed an ischaemic insult to the child’s brain. We hypothesise that this phenomenon is an ischaemic response in the immature brain and that its occurrence is not so rare as the literature may suggest.

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PERIVENTRICULAR LEUKOMALACIA (PVL): NEUROLOGICAL OUTCOME AND MAGNETIC RESONANCE IMAGING (MRI) AT SHORT TERM.

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Neurological outcome of PVL is well established. Cerebral ultrasound (US) in the neonatal period seems to be of a prognostic value but is limited in the follow up. The purpose of this study is to assess whether MRI can be used as of US in predicting outcome and to measure the effect of PVL on brain maturation.

Nine infants whose gestational age ranged from 27 to 32 weeks and one infant at term who experienced bilateral PVL are enrolled in this study. All underwent US and MRI scan. Neonatal MRI findings allowed us to classify PVL as: parieto-occipital (PO) (9 cases) and mixed PVL (1 case) (PO + subcortical) ; R.PVL ; 2 hemorrhagic PVL (one mixed). Neurological and electrophysiological assessment was performed in all in the first year of life. MRI (GHR GE 0.5 T ; T2 2000/120 msec) was performed once or twice during the same period. All infants with PVL exhibited spastic diplegia whereas hemorrhagic PVL were associated with quadriplegia, hearing loss and blindness. MRI findings during the first year of life were as following : delay in myelination most marked in centrum semi-ovalis, lateral capsule and occipito-thalamic radiation. Reduction of white matter volume, irregularly dilated occipital horns and reduction of thickness of corpus callosum. On the contrary, white to grey matter differentiation was not affected.

From these preliminary results, we could emphasize that MRI in the neonatal period seems to constitute at short term a prognostic value especially when hemorrhagic PVL is detected. Functional abilities correlate well with MRI findings in this period. Further studies at long term are needed to confirm these data.

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PRE- AND POSTNATAL DIAGNOSIS OFENCEPHALOCELES

D. Hörmann, K. Meinel, E. Herrmann and W. Tischer

The prenatal diagnosis of encephaloceles by means of sonography is possible from about the 18. GM. The evidence of a big cele containing cerebral parts up to the 24. GM. There has nearly always the consequence of an interruption of the gravidity. Postnatally the clinical, sonographic and radiographic investigation must include progressively on size and form of the ventricles, additional malformations and alterations of the skull: - From 1983 to 1989 4 frontal and 8 occipital encephaloceles were found prenatally by sonography in three confessional hospitals. In 8 cases the gravidity was interrupted, 4 children were born due to the delayed diagnosis; 3 of them died after short time. In the same period 11 newborns with occipital encephaloceles hospitalised in the Clinic of Pediatric Surgery of the KU Leipzig - as a consequence of the improved prenatal diagnosis only one in the last three years. None of them had been recognized prenatally.

9 cases contained predominantly parts of the cerebrum with regressive alterations. Only in 3 patients a primary hydrocephalus was found, in 2 caused by Chiari-II-syndrome and additional lumbal myelomeningocele. 4 infants developed a hydrocephalus after operation. The hydrocephalus - to be expected in about 2/3 of the children - is caused either by an additional cerebral malformation or by the postoperative blockade of the jugular circulation. The cele was removed in 9 infants, in 6 the hydrocephalus was shunted. 9 of the 11 children survived up to now. - Because of the considerable mental retardation of nearly all children with encephalomyeloceles an early prenatal diagnosis is essential to have the possibility of the decision whether or not to interrupt the gravidity.

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INTRACRANIAL ABNORMALITIES IN CHILDREN WITH OPTIC NERVE HYPOPLASIA

A. G. Hollman, J. S. Stra ton and S. M. Zeki

Optic nerve hypoplasia is an uncommon congenital abnormality which may range in severity from being asymptomatic to giving rise to blindness. The condition is associated with a range of CNS malformations, most notably, absence of the septum pellucidum (septo-optic dysplasia).

We report the neuro-radiological features of a series of 20 children with optic nerve hypoplasia. The findings are related to the underlying neurological and ophthalmological status of the patient. Sixteen patients had undergone cranial CT and 10 underwent cranial ultrasound examinations. For the whole group the following features were identified: absent septum pellucidum (60%), hydrocephalus (45%), porencephaly (30%), absent corpus callosum (15%), cerebellar atrophy (5%), and supravascular epicardial cyst (not previously reported) (5%). In 5 cases the examination was normal (1 CT and 4 US).

From the neurological standpoint, the majority (17 cases) had manifest pathology (eg. cerebral palsy) but 7 patients were blind without additional manifest neurological disturbance. These patients were found to have dilated suprasellar and chiasmatic cisterns, septo-optic dysplasia, and mild hydrocephalus with porencephalic cysts. Sixteen patients underwent detailed ophthalmological and endocrine assessment (1 had died and 3 failed to attend for follow-up). Eight patients had severe bilateral visual dysfunction with nystagmus, but the remainders demonstrated less severe visual defects. These patients all demonstrated neurological disturbance and/or hypothyreotism. Anticipation was present in all cases and was more severe in cases with severe brain disorders. Patients with bilateral clinically manifest optic nerve hypoplasia merit neurological assessment and imaging, and warrant investigation for endocrine dysfunction.

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ULTRASONOGRAPHY OF EYES (I): ANATOMY, CONGENITAL ABNORMALITIES AND TRAUMA

I. Pastor, C. Prieto, P. Cortes and M.L. Hoyo

A) By studying the eyes in the form of echography one can observe its interior without any preparation (anesthesia), or radiation, seeing the normal anatomy: anterior chamber, lens, vitreous humour, retina, optic nerve, rectus muscles and retro-ocular fat.

B) The congenital abnormalities correspond to the following echography:

1) Congenital microphthalmia, small but proportioned ocular globe
2) Congenital cataract, hyperechogenic lens
3) Persistent primary vitreous, hyperechogenic band from papilla to the lens, caused by mesodermal remains
4) Persistent hyaloid artery, similar to above, with pulse
5) Coloboma, lack of fusion of the sphenoid gap, with small ocular balloon, with retro-ocular cystic mass
6) Coats disease, is a retinal angioma with retinal detachment and subretinal haemorrhage

C) The traumas and foreign bodies are relatively frequent in children, existing:

1) Vitreous haemorrhage and membranes, oedema and linear bands in vitreous without anchored points, trouble
2) Vitreous with air, by inclusion and lead pellets, hyperechogenic area with posterior shadowing artefacts, with mobility.

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ULTRASONOGRAPHY OF EYES (II): VITREOUS RETINAL DISEASES AND TUMORS

I. Pastor, C. Prieto, J. Gutierrez and L. Pablo

D) Vitreous retinal disease:

1) Retinal detachment and its treatment, linear hyperechogenic band with anchoring stiches in the papilla area; in the stitched area we can see hyperechogenic nodules in the ora serrata
2) Coroid detachment, bands from the ora serrata with anchoring at the sides of the papilla
3) Edema of the papilla, is the protrusion and increase in size of the papilla

E) Masses. Retro-circular, all can produce exophthalmos

1) Cellulitis, retro-circular fat is infiltrated by diffusion of low echogenicity, which could affect the muscles and the optic nerve
2) Dermoid cyst, a round mass with a good delineation with irregular echogenicity depending on its contents
3) Angioma, mass of mixed echogenicity with small anechoic areas inside
4) Neurofibroma, well defined mass near the papilla
5) Rhabdomyosarcoma, badly defined mass with rapid development near the muscles and of variable echogenicity
6) Glioma, a well delimited mass of mixed echogenicity in the optic nerve
7) Neuroblastoma, with good delineation in the mass of mixed echogenicity
8) Histiocytosis, with increased retinal muscles
9) Ota of the lacrimal duct, with well delimited cystic mass, middle ocular balloon

Intra-circular, not causing exophthalmos

1) Retinoblastoma, simple or multiple hyperechogenic mass with calcium inside, associated to the detachment of the retina; hereditary and bilateral (66%)
2) Angioma, subretinal mass with detachment and haemorrhage of the retina, in Sturge Weber disease.

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VESTIBULAR AQUEDUCT DILATATION: A STILL UNDERESTIMATED CAUSE OF CONGENITAL DEAFNESS

N. Sellier*, C. Maudeauony**, M. Gandar**

Isolated vestibular aqueduct dilatation is a rare cause of fluctuant hearing loss and vertigo. We report 16 cases of such anomaly.

The diagnosis is based upon computed tomography an axial view; the normal aqueduct has a shape of an inverted "J".

In one case, MRI discloses the presence of lymphatic fluid in an enlarged vestibular aqueduct and endolymphatic sac.

According to the different segments of the vestibular aqueduct on CT, one can differentiate several types of aqueduct dilatation:

- dilatation of the long limb of the "J" often unilateral (3 cases)
- dilatation of the short and long limbs of the "J" (5 cases),
- dilatation of the two limbs of the "J" with posterior petrous bulging corresponding to a large endolymphatic sac (8 cases).

These two last types are most often bilateral and the value of MRI must be pointed out.

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MRI-FINDINGS WITH GADOLINIUM-DTPA ENHANCEMENT IN CHILDREN WITH STURGE-WEBER-SYNDROME

J. Sperner, I. Schmauser, R. Bittner, C. Bassir, D. Scheffer, H.J. Kaufmann and R. Felix

Involvement of intracranial vessels is responsible for epilepsy, paralytic and dementia in the Sturge-Weber syndrome. Neurological symptoms and outcome depend on the extent and distribution of leptomeningeal angiomatosis, which can be visualized for the first time by MRI using Gadolinium-DTPA enhancement (Gd-DTPA). This report is based on the study of four children, aged 7 to 19 months, who presented with cutaneous, neurologic and ocular symptoms at the time of MRI examination.

With T2-weighted images, angiomatous alterations of the skull, atypically located and congested intracerebral veins as well as changes secondary to the leptomeningeal angiomatosis (brain atrophy, accelerated myelination) are demonstrated. Gd-DTPA enhanced T1-weighted images exhibit clearly the regional distribution of angiomatosis in the skull, meninges and in brain parenchyma. Prior to possible recognition of calcifications by CT, MRI is the method of choice to discover intracranial involvement. Enhancement with Gd-DTPA improves the diagnostic value of MRI before neurological symptoms appear. Follow-up studies with Gd-DTPA enhanced MRI demonstrate also thrombotic changes of leptomeningeal angiomatosis as well as subsequent cerebral impairment, whereas the CT is more sensitive for incident calcifications in this disease.

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CT DEMONSTRATION OF DIFFUSE INFARCTION IN UNEXPLAINED CHILDHOOD ENCEPHALOPATHY
J. S. Straiton, A. S. Hollman, R. M. Teasdale and J. B. P. Stepheanson

Diffuse low attenuation in both hemispheres with sparing of central structures on CT has been labelled the "Pattern Reversal" sign, cortical gray matter showing apparent reduced attenuation in comparison with white matter. Most reported examples are cases of non-accidental injury in infancy, the reversal sign being accompanied by other stigmata of trauma. In cases where there is no history or evidence of trauma, the significance of this sign is less clear, although the prognosis is uniformly bad.

In 3.5 years, 6 examples of pattern reversal and a further 6 with more widespread low attenuation have been identified in patients aged between 5 weeks and 2 years referred for CT. Patients had been previously well, with illness rapidly progressing to coma. A history of trauma was forthcoming in only one instance, with respiratory distress or hypotension a feature common to all cases. EEG when performed showed extensive abnormality with low amplitude or featureless recordings in extreme cases.

It is concluded that the reversal sign is a non-specific manifestation of a severe ischaemic insult to the brain, with co-existing systemic disease in many cases. Careful scrutiny for evidence of trauma is justified where details of the preceding history are vague. Although the prognosis is uniformly bad, it is difficult to distinguish lissencephaly from immature brain, however, we believe that there is a characteristic appearance of the periventricular white matter, and since this reflects pathogenesis of the disease, is pathognomonic.

9 children with lissencephaly, ranging in age from 3 mos to 9 yrs were evaluated using CT or MRI. CT was performed on 6 cases; 5 of 6 had non-enhanced and 3 of 6 had enhanced examinations. 3 were evaluated with MRI using both T1 and T2 weighted sequences.

Ventricular enlargement was presented in all cases. There was triangular or rectangular shaped enlargement of the sylvian fissures in all cases. All showed a smooth brain surface with some pachygyria noted in 5 cases. In all instances the grey matter to white matter ratio was increased, the white matter was angularly distributed around the ventricles, was hypodense on non-enhanced CT and hyperintense on T2 weighted MRI, and did not interdigitate with the grey matter at the level of the centrum semiovale. In addition, a hypodense T1 hyperintense subcortical band was noted in all 9 patients.

From our experience and review of the literature, we believe that the angular appearance of the white matter on CT and MRI is diagnostic, and permits differentiation of normal immature brain from those with lissencephaly.

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THE ANGULAR WHITE MATTER SIGN: CHARACTERISTIC OF LISSENCEPHALY
K. B. Towbin and K. Hacker

Lissencephaly is a migrational anomaly, presumably due to arrest of prenatal migration between the 11th & 13th week of gestation. It has been recently associated with chromosomal deletion and may be genetically inherited. At times it is difficult to distinguish lissencephaly from immature brain, however, we believe that there is a characteristic appearance of the periventricular white matter, and since this reflects pathogenesis of the disease, is pathognomonic.

9 children with lissencephaly, ranging in age from 3 mos to 9 yrs were evaluated using CT or MRI. CT was performed on 6 cases; 5 of 6 had non-enhanced and 3 of 6 had enhanced examinations. 3 were evaluated with MRI using both T1 and T2 weighted sequences.

Ventricular enlargement was presented in all cases. There was triangular or rectangular shaped enlargement of the sylvian fissures in all cases. All showed a smooth brain surface with some pachygyria noted in 5 cases. In all instances the grey matter to white matter ratio was increased, the white matter was angularly distributed around the ventricles, was hypodense on non-enhanced CT and hyperintense on T2 weighted MRI, and did not interdigitate with the grey matter at the level of the centrum semiovale. In addition, a hypodense T1 hyperintense subcortical band was noted in all 9 patients.

From our experience and review of the literature, we believe that the angular appearance of the white matter on CT and MRI is diagnostic, and permits differentiation of normal immature brain from those with lissencephaly.

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DEFICIENCY, NORMALIZING AFTER BONE MARROW TRANSPLANTATION

Skeletal System

Oral Presentations

35.

CONTRAST CHARACTERISTICS OF PEDIATRIC BONE MARROW ON GRADIENT RECALLED ECHO IMAGING

G.H. Sebag 1-2, S.G. Moore 2

Gradient Recalled Echo (GRE) imaging is becoming increasingly used in pediatric musculoskeletal imaging since this technique allows fast MR imaging with the advantage of a 3D acquisition. However, because of the lack of 180° refocusing pulse, GRE is not dependent on T2 but on T2* which is the effective transverse relaxation time. To evaluate the impact of this T2* dependence on bone marrow contrast, 17 normal extremities (6F, 6M, 5M-25 years) and 10 patients (5F, 5M, 3-25 years) with Neoplastic, neoplastic, vascular and osteopenic lesions (n=14) were examined on a 1.5 T magnet. Spin echo (TE 600/30 and T2 2000/20,80) and GRE images (TR 60, flip-angle 30°, TE = 10, 12, 16, 20, 24, 30, 40 msec) were compared. The study shows that marrow in contact with trabecular bone exhibits a shortened T2* relaxation time and resultant signal loss in healthy subjects. This is due to local field gradients resulting in inhomogeneous susceptibility where the mineralized matrix interfaces with marrow. This T2* effect is increased in those region with a greater amount of trabecular bone (epiphysis) as compared to those region with less or no trabecular bone (diaphysis) and by increasing TE. Knowledge of the effect of trabecular bone on GRE is important in the analysis of MR studies for three reasons: Low signal intensity on GRE may represent fatty marrow with a high content of trabecular bone, and should not be interpreted only as red marrow. Secondly, the detection of epiphysial lesions is improved by decreasing TE and pixel-size. Finally, GRE may have a potential role in the evaluation of osteopenia.

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36.

SKELETAL FINDINGS IN AN INFANT WITH ADENOSINE DEAMINASE DEFICIENCY, NORMALIZING AFTER BONE MARROW TRANSPLANTATION

H.G. Oppermann, W. Siefert, W. Friedel(*) and J. Schaub

Severe combined immunodeficiency (SCID) with absent or reduced activity of adenosine deaminase (ADA-) in red blood cells and other tissues is now a well-established clinical entity within the defects of the immune system. We report on two affected out of three children from a healthy father and sister. Diagnosis of SCID ADA- was confirmed by gel electrophoresis of lysed erythrocytes showing no enzymatic activity while her parents and sister were heterozygotes. The second female child is by now three years old and healthy. The third infant presented as a ten week old girl with failure to thrive and BCG-lymphadenitis. Her white blood count was below 2000/ul with lymphocyte count below 150/ul. Chest X-ray revealed absence of thymus as well as splayed and cupped costochondral junctions. Further radiologic abnormalities included thick growth arrest lines, a broad pelvis with squared-off ilia, horizontal and long acetabular roofs, and spicule formation. Similar alterations could be detected in the first child by post-mortem reevaluation of his radiographs. In the patient, diagnosis of SCID ADA- was confirmed by gel electrophoresis of lysed erythrocytes showing no enzymatic activity while her parents and sister were heterozygotes. Without prior conditioning the patient was grafted with unmanipulated bone marrow from her HLA-identical sister. Post transplant course was uneventful except of severe generalized BCG-infection which was successfully treated by tuberculostatic drugs. Eight months post transplantation radiographs showed regular pelvic structure and impressive normalization of costochondral junctions. Thus the developing immune system as well as the developing skeletal system show a requirement for ADA activity and impaired functions in both systems are restored by bone marrow transplantation.

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37.

RARE PRIMARY BONE TUMOURS OF THE CRANIAL VAULT AND THE BASE OF THE SKULL IN CHILDREN - REPORT OF 24 CASES

Kozlowski K, Campbell J, McAlister W, Havel J, Taccone A.

Primary tumours of the cranial vault and base of the skull with exception of Kaposiform Granuloma and Epidermoid/Dermoid tumours are rare in childhood.

Twenty four cases with such rare lesions are reported. These include 4 children with Haemangiomata, 3 Osteoma, 1 Osteochondroma, 2 Osteoblastoma, 2 Progonoma, 3 post radiation Osteosarcoma, 1 Ewing Sarcoma, 4 Chordoma and 4 not well classified, most likely fibrous benign lesions.

The differential diagnosis of the cranial vault and base of skull tumours and tumorous lesions is discussed. The difficulties of both the X-ray and pathological diagnoses are stressed. The value of CT and MR imaging in delineating the exact location of the tumour and its relationship to adjacent structures is illustrated by some representative cases.

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38.

BONE MARROW METASTASES IN NEUROBLASTOMA: MRT IN CORRELATION TO BONE MARROW CYTOTOLOGY AND MIBG-SCINTIGRAPHY

G. Bane-Soehn, W. Gross-Pengels, S. Widemann, A. Linden

Thirteen MRT-investigations of the knee region of nine children with neuroblastoma stage IV/III were performed in order to demonstrate bone marrow metastases. The MRT-findings were correlated with bone marrow cytology, immunofluorescence and MIBG-scintigraphy. MRT showed a high sensitivity in demonstrating bone marrow abnormalities. Bone marrow aspiration and MIBG-scintigraphy will still be needed to make a specific diagnosis. Evidence of bone marrow infiltration only by MRT does not exclude bone marrow metastases.

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SONOGRAPHIC EVALUATION OF ACETABULAR MORPHOMETRY IN CHINESE INFANTS — AN ANSWER TO THE RELATIVELY LOW INCIDENCE OF CONGENITAL HIP DISLOCATION IN THE CHINESE Y.L. Chan, J.C.Y. Cheng and C. Metreweli

Congenital hip dislocation is the result of interaction of multiple factors: acetabular morphometry, soft tissue elasticity and extrinsic mechanical factors. The importance of the racial influence is reflected in the varying incidence of congenital hip dislocation in different races. The incidence is relatively low in Chinese infants. To explore the possibility of intrinsic differences in the anatomic or the developmental pattern of the acetabulum, an ultrasound study of 240 normal Hong Kong Chinese infants aged 2 days to 7 months with equal sex distribution was done using Graf’s technique. Ultrasound imaging with 7.5 MHz or 5 MHz linear transducers by a standard coronal approach with the babies in the decubitus position was used.

The alpha and beta angles were measured as after Graf. 1050 hip examinations were performed. The findings were compared with figures obtained in Western population.

A difference was noted in the values of the acetabular morphometric parameters. The trend of acetabular development was similar.

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THE BONY PELVIS AS DIAGNOSTIC INDICATOR: A) THE SCHNECKENBECKEN-DYSPLASIA (SSD), B) THE TRISOMY 8 MOSAICISM (T8M), C) THE SMALL PATELLA SYNDROME (SPS), D) A NEW SYNDROME SIMILAR TO SPS, BUT WITH IMMUNODEFICIENCY AND HYPOPLASTIC KIDNEYS

A) The pathognomonic configuration of the iliac wing in the SSD, a AR lethal type of neonatal short limbed platyspondylic dwarfism resembles the silhouette of a snail sticking its neck off the shell medially. The radiographic and histologic findings observed in a family with 3 affected siblings are demonstrated.
B) The “typical iliac horns” (IH) of 3 cases with T8M were examined by CT: They are caused by an excessively large spine iliacus anterior superior, which may be folded in medially or may point caudally or laterally, thus producing quite different appearances in the ap-view. A second “horn” may be observed, due to a bony protuberance sticking out dorso-laterally from the iliac crest.
C) The AR SPS (Scott and Taor) may show a striking hypoplasia of the ischium together with hypoplastic or absent patellae. Such a case, and
D) a similar one, but together with polydactyly, immunodeficiency and complex renal dysfunction, a new syndrome, are presented.

SEARCHING FOR SYNDROMES IN PEDIATRIC RADIOLOGY (DEMONSTRATED BY THE EXAMPLE OF WEILL-MARCHESANI-SYNDROME)

J. Buhr

By the example of Weill-Marchesani-Syndrome which goes on with abnormalities in eyes (small spherical lens, ectopia lentis in half of cases, myopia with or without glaucoma, blindness in one third), in limbs (brachydactyly with broad metacarpals and phalanges, with or without late ossification of epiphyses), in growth (small stature), in craniofacial dysmorphia (broad skull, small shallow orbits, mild maxillary hypoplasia with narrow palate) and in teeth (malformed and malaligned) the importance of a subtle assessment in native radiological diagnosis is emphasized.

Beside a lot of syndromes in case of which the diagnosis can be made by one look on the film there are not few which demand the physician to act — as the German philosopher Friedrich Nietzsche said — "with the subtlety of a policeman and advocate".
NEW CLINICO-RADIOGRAPHIC OBSERVATIONS IN A NEONATAL SYNDROME WITH PROFOUNDLY ADVANCED BONE AGE

G. Eich, T. Costa, M.J. Phillips and A. Daneman, (Departments of Radiology, Genetics and Pathology from the Hospital for Sick Children, Toronto, Canada.)

This paper presents previously unreported clinical and radiographic observations in 3 neonates who had profoundly advanced bone age. The two M and one F were born at term. Polyhydramnios had been present in 2. Family history, available biochemical and chromosomal studies were unremarkable.

Major Clinical Findings:
1.Long extremities with big hands and feet
2.Craniofacial abnormalities with large fontanelles, prominent eyes, downsloping palpebral fissures, hypertelorism, small nose, microretrognathia and dysplastic auricles.
3.Urogenital anomalies.
4.Hypotonia, feeding problems, developmental delay. Death occurred at 26 hours, 3 months and 3 years.

Radiographic Findings: Identical in all 3: the most striking features are at the craniofacial junction and the hands:
1.Marked flattening of the occiput with downward projection of the occipital rim posterior to the foramen magnum and incongruity of the skull base and CI with narrowing of the spinal canal. Small mandible with obtuse angle, wide sutures and fontanelles, hypertelorism.
2.The hands are large with a bone age of 2 to 3 years at birth and widened proximal and middle phalanges.
3.Sharp angles of vertebral bodies with mild anterior wedging and decreased AP diameter. Anterior scalloping on follow-up examination in one patient. Premature ossification of coccyx with three to four centers.
4.Steep iliac angles, somewhat triangular chest, excessive curvature of clavicles, mild diaphyseal stenosis of the long bones.

Marshal and Smith (1971) described a syndrome with similar clinical features and typical x-ray findings of the hand. In our three infants the presence of auricular findings and the distinctive skeletal radiographic features mainly of the craniofacial and spinal region raise the question whether our patients represent a new syndrome, which would have to be considered a bone dysplasia.

NEUROFIBROMATOSIS AND HYPEROSTOSIS OF LONG BONES

J.C. Hoeffel, B. Scherpereel, M.A. Galley and C. Schmitt

A 16 years old girl was admitted because of painful swelling of the tibias. There was no history of infection nor of trauma. X-Rays showed appositional new bone on the antero-lateral aspects of both tibial diaphyses at the level of the interosseous membrane and also on the left fibula.

Radionuclide bone imaging showed a mild cortical uptake. Biopsy was negative. At physical examination there was some cafe-au-lait spots and molluscum on the thorax. Two years later a huge bilateral acoustic neuroma developed rapidly. Surgery was performed but the girl died post-operatively.

We believe this hyperostosis of long duration may be associated with neurofibromatosis. Up to now only subperiosteal hematoma has been described in association with neurofibromatosis.

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MINOR TIBIAL DUPLICATION: ANOTHER CAUSE OF PRENATAL BOWING. REPORT OF FOUR CASES

C. Adamsbaum*, G. Kalifa*, R. Seringe**, J. C. Bounet**

Four infants presented with posterior and medial unilateral concavity of the tibia. The fibula was normal but a homolateral great toe duplication was seen as well as a hand malformation.

Plain films and C.T. showed no evidence of tibia pseudarthrosis but disclosed a true tibial duplication with distinct corticals. We do think that this abnormality represents a true entity. The embryology and surgical treatment will be discussed. Other causes of such tibia bowing can be ruled out, such as congenital pseudarthrosis (with or without neurofibromatosis) or some skeletal dysplasias.

The main problem of these children is a marked leg discrepancy. No visceral malformation has been noted in association.

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Retrospectively, all files of patients with cystic bone lesions were analyzed resulting in 50 patients with JBC and documented follow-up since 1980. Characteristic radiographic patterns for JBC were found in 79%. Accuracy of radiography compared to pathology was 85%. Most patients had combined instillation of steroids, spongiosis, and pathologic fractures. Overall success of treatment was 70% with 20% of relapses. The average number of required steroid instillations was 4.2. The chosen modality of treatment had no influence on the results nor did a pathological fracture or the number of instillations improve the outcome.

The radiologic follow-up of typical cases is illustrated, criteria for relapse and definite healing are discussed.

Because of the limited accuracy of radiography, the first instillation of steroids should be used to gain material for pathology.

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CONGENITAL LYMPHANGITIC ELEPHANTIASIS
R. Dominguez, L. Robinson

A case report is presented of a boy with localized congenital hypertrophy of his lower extremity.

Conventional radiographs revealed osteolytic lesions of the long bones in the affected extremity as an expression of the rare lymphangiomatosis of bone. An MRI multiplanar supplemental study revealed the extent, nature, and limits of the subcutaneous lymphangiomatosis and was very helpful in planning the surgical resection.

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I-123-/I-131-MIBG IN DIAGNOSIS AND FOLLOW-UP OF NEUROBLASTOMA
A. Hach, H. Bihl, P. Gutjahr, B. Kimmig, G. Hahn

Neuroblastoma is the most common extracranial solid tumor of childhood, in most cases showing specific enrichment of meta-iodo-benzylguanidine (MIBG). The aim of our study was to determine the reliability of MIBG in primary tumor diagnosis and evaluation of metastatic and recurrent disease.

From 1982 to now, we performed 137 MIBG-scintigraphies in 97 children, either with iodine-123 (n=71) or iodine-131 (n=66). Indications for scintigraphy were the differential diagnosis of abdominal masses (n=11), staging of neuroblastomas before and after surgery (n=68), monitoring disease status after chemotherapy (n=51), or the evaluation of clinical symptoms (n=7).

79 patients had neuroblastomas, 56 of them suffering from stage III or IV disease. Specificity in primary tumor diagnosis was 98%, sensitivity = 91%. For bone marrow involvement and recurrent disease, sensitivity was 75% each. It decreases in cases of very large tumors or weak bone marrow involvement.

In 30 cases, an additional bone scintigraphy was performed. 22 children had bone lesions with corresponding findings of both examinations in 20 cases. MIBG scintigraphies and bone marrow biopsies after chemotherapy showed correlating results. 43 MIBG scans were true negative, 11 scans showed false negative results, 6 of them being performed under chemotherapy.

We conclude that MIBG scintigraphy is a sensitive and highly specific method in routine monitoring of neuroblastoma.

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VERTEBRAL EWING SARCOMA - MISTAKES IN DIAGNOSIS
V. Jovanovic, Z. Vuskasinovic, B. Tanaskovic

One hundred cases of Ewing sarcoma was classified in ‘Banjica’ register of bone tumors. Among them, 11 were located on several parts of vertebral column. There were six males and five females. Mean age was 13.9 years (ranged from 7 to 22).

Some of them were misdiagnosed at the beginning of the treatment and, consequently, they were treated as having osteomyelitis of vertebrae, tuberculosis of the spine, juvenile discus etc. This caused prolonged period between initial complaints and proper treatment (7.3 months) compared with average period for this group of tumors.

Authors present initial radiograms which caused mistakes in diagnosis.

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USE OF DYNAMIC HIP SONOGRAPHY IN THE TREATMENT OF CONGENITAL HIP DISLOCATION
H.T. Harcke, L.E. Grissom, M.E. Boulden, and J.R. Bowen

The Pavlik harness and similar devices are used to treat infants with congenital hip abnormality. Radiographs are of limited use because they can fail to detect posterior dislocations that occur when the hips are positioned in flexion and abduction.

The dynamic, real-time method of sonography permits the hip to be evaluated, not only at rest, but while the hip is moved thru the range allowed by the harness. Position and stability is assessed in transverse and coronal planes. The technique has been used in over 500 examinations performed on infants wearing a Pavlik harness.

Sonography is useful for checking position. Clinically undetected posterior dislocations have been identified. The harness can be adjusted with the assistance of ultrasound in order to obtain the most beneficial position. With dislocations detected within four weeks of birth, placement in the harness can result in gradual reduction over time. Serial sonograms are critical in deciding if the dislocated hips are reducing and if treatment should be discontinued.

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NEW UNCLASSIFIED BONE DYSPLASIAS WITH DISTINCTIVE RADIOGRAPHIC FEATURES
Kozlowski K.

Three cases of unclassified bone dysplasia with distinctive radiographic features are presented.

CASE I. Boy 5 year-old with sacral hypoplasia, bifid distal femora and mild generalised bone changes.

CASE II. Girl 3 year-old with mesomelic shortening of the upper extremities, unusual deformity of the femora and minor generalised bone changes.

CASE III. Girl 17 year-old with acroosteolysis, clavicular hypoplasia and cervical ribs.

No similar cases have been reported to the best of our knowledge in the literature.

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ACROOSTEOLYSIS SECONDARY TO BENIGN PHEOCHROMOCYTOMA
F. Marcon, J.C. Hoeffel, A.M. Worms, M.A. Galloy and M. Schmitt

A boy 11 years of age suffer from hypertension and acrocyanosis with puffy and cyanotic hands. The distal metaphyses of several phalanges look irregular and tapered. At surgery bilateral benign adrenal pheochromocytoma is removed. Hypertension regressed and follow up of the bones of the hands shows disappearance of the acroosteolysis of the phalanges.

Metaphyseal bone changes associated with benign pheochromocytoma are very rare. Usually the knees, ankles, elbows and wrists are involved. Osteolysis of the phalanges have not been reported up to now.

The bone lesions can be explained by microcirculatory changes. Adrenaline cause hypovolemia and hemoconcentration with tendency toward hemoconcentration responsible for aggregation of red blood cells and formation of microthrombi resulting in stasis.

Since the vascularity is greater in the growing bone, bone changes take place more rapidly in the child.

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SONOGRAPHIC DIAGNOSIS OF OSGOOD-SCHLATTER DISEASE: A COMPARATIVE STUDY BETWEEN SONOGRAPHIC AND CONVENTIONAL X-RAY TECHNIQUES.
M. Meradji, S.G.F. Robben

High resolution sonography was performed in 30 children (21 boys and 9 girls) with Osgood-Schlatter disease. In 27 cases the knee was altered unilaterally and in the remaining 3 cases bilaterally (33 knees). Comparative x-ray films were taken routinely in all patients of this group.

Soft tissue swelling in front of the tuberosity as a characteristic feature of altered knee was seen and measured in all 33 knees (30 cases), while radiologically the swelling was visible in 31 knees. Avulsion of tibial tuberosity, as may be seen in the second stage of this disease, was sonographically and radiologically recognized in 17 of 33 altered knees. In addition sonography showed avulsion in one knee, that was missed by radiography. In two other cases (two knees) the fragmentation was clearly seen on ultrasound, but not on the radiographs.

Fragmentation of tuberosity usually appears late stages of Osgood-Schlatter disease. This sign was seen both sonographically and radiographically in 21 of 33 knees. In two knees sonography detected fragmentation, missed by x-rays.

The results of this comparative study show the superiority of sonography in the diagnosis of Osgood-Schlatter disease especially in early stages, not only for the recognition of soft tissue swelling but also to detect avulsion of the tibial tuberosity and changes of the ossification centre and can be used for the evaluation of Osgood-Schlatter disease.

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DIFFERENTIAL DIAGNOSIS OF NEUROMUSCULAR DISEASES BY MYOSONOGRAPHY (VIDEODEMONSTRATION)
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Clinical myology and genetics are often facing the problem of early detecting carriers of x-linked recessive muscular dystrophies. The differential diagnosis of patients with neuromuscular diseases (ND) is an unsolved problem in many cases, but a precise diagnosis is required for every genetic counselling. To solve these problems myosonography as introduced by Dr. Heckmatt was used.

A total number of 874 persons was investigated: healthy controls 218, patients with known or suspected ND 351, screening of carriers 305. Myosonography was able to detect abnormalities before the onset of clinical symptoms.

The following muscular diseases can be differentiated by ultrasound: Duchenne, Becker and Emery-Dreifuss-dystrophy, Facioscapulohumeral and Limb Girdle dystrophy, Congenital and Fukuyama dystrophy as well as Welander and Myotonic dystrophy, finally spinal atrophies.

In screening of carriers myosonography had a sensitivity of 92%, a specificity of 95%, and a positive predictive value of 92,5%. In neuropathies, however, this method seems not to be promising.

Myosonography is recommended as easiest way to detect carriers and to differentiate dystrophies. Additionally, patients at risk for malignant hyperthermia can be identified preoperatively by ultrasound.
SIBS WITH A DISORDER RESEMBLING BLount DISEASE
H. Schmidt, S. Mundlos, R. Schumacher, J.W. Spranger

Blount disease (tibia vara, osteochondrosis deformans tibiae) is a local disturbance of growth of the medial aspect of the proximal end of tibia, affecting the metaphysis, epiphyseal cartilage and epiphysis. Histological changes are principally localized to epiphyseal cartilage. No findings suggest the occurrence of avascular necrosis of bone. The irregularity of the metaphysis and medial part of epiphysis is a consequence of irregular advance of ossification. The entity was classified into the infantile and adolescent type (Blount, 1937). The radiographic abnormalities of the infantile type can be divided into 6 stages depending on the maturity of the skeleton and the degree of growth disturbance (Langenskiöld, 1952, 1964).

3 Turkish sibs presented at the age of 7 (Q), 26 (O) and 43 (~) months with bowing of legs. An elder brother and further members of the family were healthy. Their parents are first cousins. Diet had always been adequate and the bowing was not preceded by any localized or systemic illness. Radiographic investigation showed physiologic bowing of tibia in the 7 month old girl, Stage I Blount disease in the 26 month old boy and Stage II Blount disease in the 45 month old girl.

The reported cases provide evidence for autosomal recessive inheritance. Blount disease has been reported to be an autosomal dominant (Mckusick, 18870) and recessive (Mckusick, 25920) disorder. This observation points to genetic heterogeneity, i.e. the existence of two genetically different, but radiologically indistinguishable disorders. Germinal mosaicism is less likely, multifactorial inheritance has been suggested by Bathfield and Brightman, 1978.

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COINCIDENCE OF RIB ANOMALIES AND MALIGANCY IN CHILDHOOD
R. Schumacher, A. Mai, P. Gutjahr

Few authors report a coincidence of minor congenital anomalies and embryonic tumors of infancy. Well known are those combined with chromosomal anomalies (hemihypertrophy, aniridia, 13p-syndrome, trisomy-21...). The incidence of rib anomalies in children without malignancies, congenital heart disease or spinal dysraphism was 3.5% (250 children). We reviewed thorax X-rays of 1000 children with malignancies for any kind of rib anomaly. We found 242 rib anomalies in 218 patients (21.9%); a significant (p<0.001) accumulation considering an incidence of 5.5% rib anomalies in a "healthy" population. All kinds of malignancies showed a high incidence of cervical ribs: neuroblastoma 35.2%, cerebral tumors 20.4%, Wilms' tumor 20.3% and leukemia 25.7%. The increased incidence of these mesenchymal "defects" in malignancies of infancy and childhood may be another clue for an altered morphogenesis in tumor origin. On the other hand in neuroblastoma the rib anomaly may be another expression of neurocraniopathy as proposed for the association of congenital heart disease and neuroblastoma*.

*Bellah, R, Andrea, AD, Darilis, R, Fellows, KE (1989) The association of congenital neuroblastoma and congenital heart disease. Pediatr. Rad.19:119-121

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GORHAM'S DISEASE IN CHILDHOOD
(Paper report and review of the literature)
M. Thiesse, P. Kammerlen, E. Bouffet, C. Bailly, M. Favrot, P. Jonas, T. Philip, M. Brunat-Mentigny

Lyphangiomatosis of bone is an uncommon disease. It appears as a massive primarily avascular osteolysis affecting both the cortex and spongiosa rapidly progressive, extending to the adjacent bones with no respect for joint boundaries. A painless soft swelling is usually present and the vital prognosis depends on the chest involvement.

We report one case of an 11 year-old girl with pleural involvement which lead to death within 4 months after the appearance of a cutaneous lymphangiomata. The difficulties of the diagnosis on histopathological samples and the variability of the clinical progression give a preeminent place to the radiological identification of these disease. The radiological appearance is the key to the separation of this entity from cystic lymphangiomata or ordinary hemangiomata of bones.

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EXAMINATIONS OF BONE DEFECTS CAUSING NON-ACUTE JOINT COMPLAINTS WITH CONVENTIONAL X-RAY AND MRI
K. Urbanek, K. Bitvai, Z. Harkányi, Prof. L. Szlávi

Conventional radiography and MRI were used in twenty children (age range 4 - 15 years) to determine the cause of joint pain. 13 boys, 7 girls were examined.

MRI studies were performed with a 1.5T system (Siemens, Magnetom). SE, T1 and T2 weighted images were obtained through each lesion in a variety of planes. In these cases conventional X-ray revealed intracapsular or extracapsular focal lesions.

MRI imaging proved to be accurate in estimating the size and localisation of the lesions, soft tissue and bone marrow involvement. Different types of lesions were detected (osteoid osteoma, chronic osteomyelitis, eosinophilic granuloma etc.).

MRI provided helpful information in planning the surgical intervention.

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CEPHALO-SKELETAL DYSPLASIA (Taybi-Linder syndrome): report of a new case with unusual natural history.

G.F. Vichi, P.L. Duvina, F. Bettini, T. Bougleux, M.L. Giovannucci Uzielli

Cephalo-skeletal dysplasia (CSD) is a very rare syndrome, characterized by generalized, severe enchondral, delayed growth development, and brain dysplasia. The clinical spectrum includes: low weight birth dwarfism, microcephalia, unusual facies with bulging eyes, flat nasal bridge, high-arched and narrow palate, spade-like hands and feet, mental retardation. The prognosis for life is fatal in early infancy. Radiological patterns include severe microcrania, small anterior fontanel, incompletely closed sutures, more or less expressed platyspondyly, variable shortness of long bones, cup-shaped ends of short tubular bones of hands, feet and ribs, squared iliac bones, narrow ischiatic notches, horizontal acetabular roof (quasi-zero acetabular angle), flattened ilia, incomplete or absent ossification of pubic bones, slight widening and irregularity of metaphyses of long bones. We describe a new patient, still alive at 12 months age, we studied from several points of view (clinical, radiological, cytogenetic and genetic), showing all the major aspects of CSD syndrome.

We emphasize the complex skeletal anomalies and the severe brain dysplasia revealed by MRI, consisting in corpus callosum and frontal lobes agenesis, temporal lobes dysgenesia, lateral ventricles dilatation. The imaging of other organs excluded major abnormalities. Karyotype was normal in propositus and in parents.

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DIFFERENCES OF RADIOLOGICAL MANIFESTATIONS OF EWING SARCOMA DUE TO TOPOGRAPHICAL DISTRIBUTION

Z. Vukasinovic, V. Jovanovic, B. Tanaskovic

In "Banjica" register of bone tumors there were 100 cases of histologically verified Ewing sarcoma. In analysis of these cases authors found great differences in radiological signs of tumors of long tubular bones comparing them with the tumors of the other localization (15% on vertebrae, 8% on sacroiliac joint etc.).

Authors present classical radiogram, arteriography, scintigraphy and computerized tomography of some illustrative cases.

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Upper Airways and Chest
Oral Presentations

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CT EVALUATION OF NASAL ABNORMALITIES IN CHILDREN
C.J. Becker, R.B. Towbin and T.L. Slovis

The purpose of this paper is to examine a spectrum of nasal pathology and assess its evaluation by CT.

51 cases of nasal abnormality were reviewed, consisting of 23 females and 27 males. The age group was 1 day to 17.5 years, with a mean of 5 years. Sedation was utilized frequently in obtaining the scans.

16 children had congenital structural abnormalities, including 6 choanal stenoses (1 multiple craniofacial anomaly), 9 choanal stenoses (including 2 Pfeiffer's syndrome, 1 Croneza's, and 1 Apert's), and 1 clafth palate with nasal involvement. Benign masses were found in 23 with 4 dermoids, 5 polyps (1 with cystic fibrosis and polyps), 1 papilloma, 2 lipomas, 4 encephaloceles, 1 nasal glioma, 1 keloid, 1 foreign body granuloma, 1 foreign body, 1 benign fibrous mixed lesion, 1 lymphangioma, and 1 case of hypertrophied adenoids. Three lacrimal duct abnormalities were seen as well as 6 patients with vascular abnormalities (2 hemangiomas and 1 hemangioloendothelioma, and 3 angiofibromas). Fibrous dysplasia was present in 1 case.

There were 3 malignant masses including 1 each of nasal glomus, 2 lipomas, 4 encephaloceles, 1 nasal glioma, 1 foreign body, 1 benign fibrous mixed lesion, 1 lymphangioma, and 1 case of hypertrophied adenoids. Three lacrimal duct abnormalities were seen as well as 6 patients with vascular abnormalities (2 hemangiomas and 1 hemangioloendothelioma, and 3 angiofibromas). Fibrous dysplasia was present in 1 case.

CT was able to delineate the extent of the abnormality and could frequently suggest the diagnosis or limit differential considerations. CT is an excellent means of accurately imagining a wide variety of nasal abnormalities in children.

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LARYNGEAL ULTRASONOGRAPHIC STUDY IN INFANTS AND CHILDREN: PATHOLOGICAL FINDINGS.
C. Garel* ; M. Hassa* ; M. Elmaleh* ; I. Legrand* ; P. Narcy**

Normal patterns of laryngeal sonography (LS) in children have already been described during the last ESPR meeting in Dublin (Reference 64, to be published in Pediatric Radiology). We now report the findings in 22 children with endoscopically and/or surgically proved laryngeal pathology who underwent LS. This is not a double-blind study. Our series included 4 vocal cords palettes, 8 acquired subglottic stenosis, 7 space-occupying lesions (cystic laryngoma (1), sub-glottic hemangiomasses (4), heterotopic salivary tissue (1), neoprophimatosus - related mass (1)), 2 congenital sub-glottic stenosis related to an anatomic abnormality of the anterior arch of the cricoid and 1 laryngeal diastema.

The sonographic and endoscopic findings have been well correlated in 19 children. The missed cases included: a laryngeal diastema in which the posterior criocoid slit could not be imaged because it was hidden by the cesophagotic shadow of the subglottic air, one out of the 4 subglottic hemangiomasses because of a subglottic study (restless child) and one out of the 4 laryngeal palettes, which was probably ascribed to the fact that the infant had been examined during deep sleep, that led to too small glottic movements.

We conclude that LS yields an overall good accuracy as a complementary way of investigating laryngeal pathology during childhood. LS is quite useful for studying dynamic abnormalities (provided that glottic movements can be obtained), in the work-up of space-occupying lesions and acquired and congenital laryngeal stenoses. At times, some kind of sedation may be necessary. LS will not be contributive in postero-midline defects (laryngeal diastemes).

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RADIOGRAPHIC CHANGES AFTER SURFACTANT THERAPY IN PREMATURE NEONATES WITH SEVERE RDS
W. Weigel, C.Harms, E.Herting, Ch.P.Speer

23 premature neonates with severe respiratory distress were studied following the application of 200 mg/kg/b.w. "Curosurf" into the bronchial system according to the rules of the Collaborative European Multicenter Study Group. Curosurf is a natural porcine preparation of phospholipids and 5 apoproteins. The clinical data derived from the study, finished in 1988, demonstrate within minutes signs of improvement of the status and biochemical parameters of the newborns. The radiographic changes needed four (in 4 patients) to 24 hours to improve from grade 3 to 4 of the hyaline membrane disease pattern, in 12 patients to grade 1 and in 11 patients to grade 2. In one patient grade 3 persisted till the 6th day, he needed ductus ligation. Only one patient had interstitial enphyma and another a small pneumothorax without drainage. 6 patients needed up to 4 doses of surfactant. More than 24 hours after treatment 7 newborns had grade 2 HMD pattern, 4 of them needed a ductus ligation. No adverse effects of the treatment were observed. None of the treated patients died of RDS problems during the first week. While 25 % of the matched controls from the year before died of respiratory insufficiency. Controls had a longer period till their lungs cleared, 4 had tension pneumothorax, nine needed pneumothorax drainage, one resolved without aspiration. 4 controls developed lobar atelectasis. No difference between the treated and the control group in complication rates as intracranial hemorrhage, retinopathy, bronchopulmonary dysplasia and frequency of significant ductus arteriosus and patent ductus arteriosus. Surfactant treatment is an evolution even in pediatric radiography.

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ARDS IN CHILDREN: ABOUT 8 CASES
L. Raussin*, J. Khamis*, M. Speah**, J.M Bertrand*, C. Piette*, E Baudoin*

The adult respiratory distress syndrome is relatively rare in children.

The authors reviewed 8 cases (6 recoveries, 2 deceased) and they tried to define the part of the X-ray examination in the diagnosis and the follow up of such a syndrome.

A critical event occurred before hospitalisation in 6 cases and a chronic respiratory disease was revealed in 5 cases.

Increased alveolar permeability was confirmed by normal half-clearance time of aerosol from the lungs (T1/2 was 17 - 20.0 min. (mean 8.6; SD, 4.5 min.). A normal half-clearance time of aerosol from the lungs allows early aetiological diagnosis.

Satisfactory biopsy specimens were obtained in all patients. Diagnoses included fibrosing alveolitis (4/6), desquamative interstitial pneumonitis (1/6), chronic interstitial pneumonitis (1/6). Combined CT scanning and percutaneous lung biopsy allows early aetiologic diagnosis.

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RADIOLOGIC SEQUELAS OF STAGE IV BRONCHIOLAPULMONARY DYSPLASIA IN TEENAGERS AND YOUNG ADULTS
B.R. Parker, W.H. Northway Jr, S. Carlisle, I. Eichler, R.L. Popp, T. Tye, P.T. Pittick, B.W. Brown, J. Halpern, R.B. Moss

Twenty-six survivors of Stage IV BPD treated in our Intensive Care Nursery between 1964 and 1973 were studied at ages 14-25 for late outcome and sequelae. Control groups consisted of 26 age-matched ex-prematures and 53 healthy age-matched non-smoking volunteers. All subjects were assessed by history, physical examination, chest radiography, EKG, doppler echocardiography, blood gas studies, and pulmonary function studies. Chest radiographs were scored normal (0), mild (1), or moderate/severe (2) for eight variables in a blinded fashion. Eight (31%) ex-BPD subjects had a total score of 4 or greater while no control subject had a score that high (P<.001).

Radiographic abnormalities included mild hyperexpansion, blebs, interstitial thickening, perihilar cuffling, and plural thickening. The sensitivity of the chest radiographic score was high (1.0), but the specificity was low (30%). Twenty (76%) of the ex-BPD group had pulmonary dysfunction. Tests of airway obstruction, when compared with normal controls, were significantly diminished (P<.01 - P<.001). Fixed airway obstruction was found in 6 ex-BPD subjects (24%) while 14 (54%) had reactive airway disease. EKG and echocardiographic changes were rare. We conclude that young adult survivors of Stage IV BPD may have significant functional sequelae with relatively minor radiographic abnormalities.

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DIAGNOSIS OF CHRONIC INTERSTITIAL LUNG DISEASE BY COMBINED CT SCANNING AND PERCUTANEOUS LUNG BIOPSY.
H. Carty, D.P. Haef, and D. van Velzen

Chronic interstitial lung disease is uncommon in childhood and presents diagnostic difficulties. Clinical and chest x-ray abnormalities are non-specific and aetiological diagnosis is dependent on open lung biopsy that is invasive and usually reserved for severe progressive disease. Between Oct 1988 and Nov 1988, 6 infants, mean age 10 mths (Range 1 to 36 mths) presented with chronic respiratory distress, failure to thrive and basal crackles. Chest X-rays showed diffuse infiltrates. CT scanning of the chest showed extensive pulmonary infiltrates with cysts (3/6). Percutaneous lung biopsy was performed under general anaesthetic using either an aspiration needle or Radiplast biopsy gun. Complications included a small pneumothorax (4/6) and pulmonary haemorrhage (1/6). None requiring treatment or causing clinical deterioration.

Satisfactory biopsy specimens were obtained in all patients. Diagnoses included fibrosing alveolitis (4/6), desquamative interstitial pneumonitis (1/6), chronic interstitial pneumonitis (1/6). Combined CT scanning and percutaneous lung biopsy is less invasive than open lung biopsy and allows early aetiologic diagnosis.

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99mTc-DTPA AEROSOL LUNG CLEARANCE IN THE EARLY DETECTION OF INTERSTITIAL PNEUMONITIS IN BONE MARROW TRANSPLANT PATIENTS
H. Van der Wall, L.P.C. Murray, S. Russell and M. Vowels

Following a study in 48 patients with AIDS, which confirmed that altered alveolar membrane permeability associated with opportunistic pulmonary infection could be identified by measurement of 99mTc-DTPA aerosol clearance, the role of the investigation was assessed in children undergoing bone marrow transplantation. Eighteen patients (9 male, 9 female) were studied, the ages ranging from 5 to 15 years (mean 9.2 years). Baseline clearances, obtained in 13, provided values similar to non-smoking adults except in 2 in whom, by exclusion of alternative aetiologies, markedly shortened values appeared to reflect pre-conditioning chemotherapy. In the others, the normal half-clearance time of aerosol from the lungs (T1/2) was 32.0 - 90.0 min. (mean, 46.9; SD, 16.5 min.). Abnormal values were demonstrated in a further 9 patients, 4 of whom initially had normal results, on 11 separate clinical occasions. The range of abnormal T1/2 was 1.7 - 20.0 min. (mean, 8.6; SD, 4.5 min.). A definitive pathological diagnosis was established in 7 chronic graft versus host disease (GVHD); 2; GVHD and cytomegalovirus (CMV); 2; CMV; 1; chronic interstitial pneumonitis (IP); 1; adenovirus; 1. CMV was implicated in 2 children by its growth in stool and urine while, in 2 others, clinical improvement resulted from empiric therapy for pneumocystis carinii pneumonia (PCP). An abnormal chest X-ray was only associated with a shortened T1/2 in 4/13 (31%).

It is concluded that measurement of pulmonary aerosol clearance provides a cheap but sensitive method for the investigation of suspected IP. Being simple, rapid and reliable it permits the more specific investigations to be directed sooner than the previously standard screening tests and thus expedite the initiation of therapy. It has also shown that the response to such therapy by serial studies can be monitored.

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Invasive pulmonary aspergillosis (IPA) is a potentially lethal complication of prolonged neutropenia occurring most commonly in patients with leukemia or aplastic anemia. Early diagnosis is important for prompt therapy, but may prove difficult. CT augmented by high resolution and contrast enhancement techniques can be helpful in identifying early lesions, monitoring evolution and response to treatment and characterizing unusual complicating features.

In the last four years we have seen 10 patients with IPA at The Children’s Hospital of Philadelphia. The most recent cases coincided with new hospital construction, a recognized risk factor. The group of patients comprised 6 boys and 4 girls. Six children had acute leukemia, 3 aplastic anemia and 1 disseminated neuroblastoma. Five patients have died, several from aspergillosis; two had lobectomies.

Typical CT findings included multiple round parenchymal nodules (occasionally with surrounding “halo sign” early in the course), larger confluent mass-like infiltrates and peripheral pleural based nodules/infiltrates resembling infarcts. No adenopathy or pleural effusions occurred. Later on some of the lesions cavitated or developed an air crescent. CT clearly depicted several unusual complications, including involvement of left mainstem bronchi resulting in lobar narrowing leading to unilateral pulmonary overinflation and air leak (this patient later died of a bronchoaortic fistula), mycotic aneurysms of left pulmonary artery, fungal thrombosis of a pulmonary artery and phrenic nerve palsy.

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ULTRASOUND EXAMINATIONS ON STAGE III AND IV DENGUE HEMORRHAGIC FEVER: A COMPARATIVE STUDY WITH CHEST X-RAY FINDINGS
H.S. Pramuljo, L.A. Tamaela, B.Budiyatmoko, K.Firman, H.W.T. Karyomanggolo and S.R. Harun

Dengue hemorrhagic fever (DHF) is a severe disease in children, sometimes leading to death. To decrease the mortality rate, an early diagnosis is needed. One of the diagnostic criteria is pleural effusion detected on chest X-ray(CXR). CXR and US examinations were performed on stage III and IV DHF clinically proven cases. The aim of this study is: 1. To compare CXR and US findings in detecting pleural effusion. 2. To report other findings found on US examination.

128 CXR-US examinations were performed on 50 cases. In 256 pleural spaces were 103 pleural effusions detected on both examinations, 82 negative findings on both examinations, 65 were positive on US but negative on CXR and 6 were negative on US but positive on CXR. Ascites was also found in 33 cases, thickening of the gallbladder wall in 11 and an abnormal liver parenchyma in 1.

Conclusion: US examination might be superior to CXR for early detection of DHF pleural effusion. Other US findings were ascites as well as liver and gallbladder abnormalities in a few cases.

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MRI IN THE EVALUATION OF CONGENITAL HEART DISEASE IN NEWBORN.
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In congenital heart disease of neonates (CHD), Doppler echocardiography (DSE) is diagnostic in about 80% of cases. When DSE is insufficient invasive procedures like cardiac catheterization and angiography are mandatory. The aim of this study was to determine clinical benefits of MRI in a pediatric low aged population.

Patients: 54 newborns (NB) (age ranging from 3 to 24 months). 9 with congenital heart disease and 45 with various CHD were studied. Surgical follow-up was possible in 10 patients.

1 “Switches”, 2 Senning procedure, 4 Blalock-Taussig, 1 coarctation. Imaging technique: Images were obtained with a 0.5 T GE-GE imager using pulse echo sequences with a 5 mm slice thickness in transverse and for small axes sagittal or coronal planes. Selection was achieved with internal hydrates (30-40 ml/kg) + feeding (15 ml) before scanning. Total scanning times did not exceed 80 min (2 to 4 min per run).

Post-operatively: MRI was sufficient in 11 patients (double aortic arch, aberrant right subclavian artery, hypoplasia of left pulmonary veins, ventricular septum defects...). MRI complemented DSE in all patients.

Conclusion: DSE is insufficient in 11 patients (double aortic arch, aberrant right subclavian artery, hypoplasia of left pulmonary veins, ventricular septum defects...). MRI complemented DSE in all patients. MRI has the potential to replace angiography which is therefore no longer always mandatory.

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DYNAMIC CT SCANNING
B.J. Cremin

Dynamic CT scanning is the acquisition in rapid sequential CT scans following a bolus injection of contrast media. It may be performed as a static scan over a preselected region of interest or as a moving dynamic scan over 8-10 incremental slices. This we find the most useful for chest and abdominal pathology. The pathology had been initially surveyed by ultrasound and routine CT and all cases were performed under basal or hyper chloral hydrate sedation without general anaesthetic. Illustrative cases in thorax and abdomen in children aged 3 months to 7 years will be presented. An upper limb vessel should be used as a lower limb injection produces artefacts in the vena cava. In the chest it can replace arteriography for mediastinal and vascular problems. In the abdomen it is most useful for liver and retroperitoneal problems.

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350 sonographic examinations were performed in 350 children aged 1 month to 7 years under different conditions (fasting, milk feeding and in 30 cases after orange juice). In order to evaluate its predictive value concerning esophagitis, US took in account:

- hiatal function,
- hiatal and pyloric morphology.

These parameters were compared to pHmetry in 225 cases and to endoscopy in 80 cases.

Results: we considered as normal: 0 reflux (19% cases), physiological: 1-3 refluxes per 10 min (52%), mild dysfunction: 3-6 refluxes per 10 min (15%), severe dysfunction over 6 refluxes per 10 min (14%).

The later cases were considered as severe because they included all the esophagitis. In case of esophagitis dysfunction was permanent with numerous episodes also during fasting time.

However, esophagitis represents only 40% of this population and function alone is not specific. In esophagitis, morphological changes were also predominant:

- short intra abdominal esophagus losing 30% of its normal value, esophageal length being age related, growing from 10 mm in the newborn to 35 mm at 3-4 years,
- hypertrophic pyloric muscle conditioning outlet obstruction and gastric stasis (3-4 mm in babies, 2 mm in the elder children).

In the other 60% cases with severe dysfunction morphological changes were dissociated or less important.

Sonography appears as highly sensitive in characterizing the severity of gastroesophageal reflux and screening the infants at risk.

Sonography is also useful in evaluating efficacy of treatment; medical treatment, on the contrary of surgical intervention, bringing progressive pyloric improvement.

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**GAStRO ESOPHAGEAL REFLux : Sonographic study**

H. Gomes - Radio A.M.H. - 51100 REIMS - FRANCE

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**BAllON DILATATION OF ESOPHAGEAL STRictures IN CHILDREN GUIDED BY ESOPHAGOSCOPY**

Stöver, B., Posse1t, H., Heller, K.

The results of children with esophageal strictures in whom the bougienage with rigid Rehbein bougies was replaced by balloon dilatation were retrospectively studied. In a total of 13 patients aged 3 months to 13 years, 40 dilatations were performed. 6 children had localized esophageal strictures following esophageal atresia repair, 2 suffered from congenital stenosis, in 3 the stricture was acquired, the remaining 2 developed schelasis. Esophagoscropy as well as fluoroscopy was employed for guidance.

In 11 children clinical i.e. symptomatic improvement after balloon dilatation was evident, radiographically confirmed in 8. Seven patients required only one dilatation, 6 required repeat dilatations but no surgical intervention. Two failures occurred, one in a child with diffuse, unresectable stricture, due to child abuse, the second in a boy suffering from complicated esophageal atresia repair. The study shows, that esophagoscopic guided balloon dilatation of localized and diffuse esophageal strictures is an effective and safe procedure.

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**GAStRO ESOPHAGEAL REFLux: COMPARATIVE STUDY BETWEEN SONOGRAPHY AND PHMETRY**

H. Gomes

225 simultaneous US and pHmetric examinations were performed in children aged 1 month to 7 years. 80 concomitant endoscopies were available. We considered pHmetric score as pathological over 5% total acidity time.

On US, after milk feeding, we considered as normal: 0 reflux, physiological: 1-3 refluxes per 10 mm, mild dysfunction: 3-6 refluxes per 10 mm and severe dysfunction: 6 refluxes or more. The later cases were considered as severe because they included all the esophagitis.

Results:

In 25 cases technical problems made pHmetry useless.

pHmetry was normal in 100 cases (45%). US correlation was good in 93 cases and normality confirmed endoscopically in 19. However in 7 cases US showed severe dysfunction. One case had endoscopically proven esophagitis the baby was exclusively milk fed.

pHmetry was pathological in 100 cases (45%), US showed:

- in 25 severe dysfunction, endoscopy was pathological showing hiatus hernia gaping cardio and in 11 cases ulcerative esophagitis. But pHmetric score was not specific and similar values were found,
- in 18 mild US dysfunctions with 9 normal or subnormal endoscopies, in these cases pathological score was due to a small number of prolonged events. Two are particularly disturbing: acid food which increases the number and length of acid refluxes,
- reflux during sleep which lengthens dramatically esophageal clearance, in reducing depletions.

In our experience reflux is only damaging if constantly repeated and related to severe hiatal dysfunction. US is a good alternative to appreciate hiatal function and gives furthermore insuable morphological data.

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THE VALUE OF MR IMAGING IN PEDIATRIC AIRWAY OBSTRUCTION
Th. Vogl, C. Wilimzig, U. Hofmann, D. Hofmann, J. Lissner

Pediatric airway obstruction due to vascular anomalies can be related to a disease producing respiratory distress. Up to now, several diagnostic modalities have been used in the evaluation of tracheal stenosis. It has been shown that MR imaging has substantial capability for demonstrating the anatomical structures and has the added advantages of not requiring intravascular contrast medium nor x-ray exposure. Bronchoscopy allows the evaluation of the lumen of the trachea, and the degree and location of collapse, however it may be difficult to determine the etiology of the tracheal narrowing.

Forty patients ranging in age from six weeks to five years ten months were examined with MR imaging after bronchoscopy. The MR imaging diagnoses were subsequently compared for accuracy with the diagnoses determined by direct surgical observations or by the combination of other examinations and clinical findings. Diagnosis included aortic arch anomalies, innominate artery compression, pulmonary artery compression and tracheomalacia.

MR imaging was performed with a 1.0T MAGNETOM (Siemens) using ECG-gated single-echo sequences. In seventeen patients the tracheal narrowing by the innominate artery was demonstrated as a focal compression of the trachea. Sagittal plane by demonstrating the entire thoracic trachea revealed best the site and extent of the tracheal narrowing. Nine patients had aortic arch anomalies. Some of them had a right descending thoracic aorta and a markedly dilated arch compressing the trachea at the level of carina. Eight patients were diagnosed by bronchoscopy to have distal tracheal or bronchial compression.

MR imaging appears to be an imaging modality, appropriate for demonstrating tracheal stenosis. For evaluation of the cause of airway obstruction, MR imaging is an ideal method depicting detailed anatomic structure without employing ionizing radiation or intravenous contrast medium.

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Poster Presentations

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BRONCHIAL MUCOCELE AND REGIONAL HYPERINFLATION OF THE LUNG
D. Bakalova, M. Vraskovska, P. Čurčiev

Bronchial atresia is a congenital malformation in which a bronchus is atretic and is separated from the rest of distal bronchial tree. This condition is characterized by nearly pathognomonic radiologic features. This is a retrospective study of 5 cases of bronchial atresia. The age of the patients was 1 - 15 years and all of the children had persistent clinical symptoms like cough, dyspnea and infection. There were three types of diagnostic criteria: radiographic, endoscopic and/or bronchographic and anatomic.

On conventional radiographic examinations, this complete syndrome was observed in all 5 cases. A thoracic CT scan was performed in all 5 cases. It permitted identification of the bronchoceles more precisely than conventional chest X-Ray.

Endoscopy and bronchoscopy was performed in all 5 cases. The endoscopic examination was normal. The bronchographic examination revealed in all cases displacement of adjacent bronchus. Anatomic macroscopic and microscopic observations were found in 2 children: dilated distal bronchial branches ramifying in emphysema.

CT is a method of choice in identification of this syndrome.

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ARTERIAL SWITCH OPERATION FOR TRANSPOSITION OF THE GREAT ARTERIES: MRI OF LATE COMPLICATIONS.
F.J.A. Beek, J. Punt, W.A.M. de Ronde, E.J. Meijboom, L.C. Meiners, P.P.G. Kramer

Seventy eight children with TGA, corrected with an arterial switch operation, were examined with Doppler US and MRI. A late complication of the arterial switch operation is stenosis of the RVOT, PT or MPA. It is often possible to assess a flow gradient with Doppler US, but imaging with US is insufficient due to intervening lung and scar tissue. Cardioangiography is too invasive to be used as a screening imaging examination for pulmonary stenosis.

Twenty patient were operated in 2 stages, first pulmonary artery banding, followed by a switch of the great arteries. Fifty-eight patients had an immediate arterial switch operation. Doppler US showed a stenosis of the RVOT, pulmonary trunc or main pulmonary artery in 24 patients. MR imaging in transversal, angulated sagittal and coronal planes provided anatomical information of a mild to severe stenosis in 28 patients.

In patients with a two-stage operation, MRI demonstrated exaggerated sinusoid trabeculation with dilatation of the RV and RA in 18, probably a result of hypertrophy due to the delay till the second operation. This aspect of RV anatomy was not noticed on US and has as yet not been reported in the literature.

MR images are shown of postoperative anatomical relationships of the great arteries, of right ventricle abnormalities and of pulmonary stenoses.

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THE VALUE OF SONOGRAPHY FOR THE DIAGNOSIS OF PLEURAL DISORDERS IN CHILDREN
Z. Borot, A. Balcar-Boroli, A. Kurylak

The general use of sonography can, as for many other organs, contribute significantly to the elucidation and differentiation of many pleural processes. Although sonography has limitations due to its imaging principle it is very effective for differentiation liquid-filled cavities from solitary masses. This capability is especially useful in children. Preceding radiography, however, is compulsory.

The authors present some patients from their own experiences which illustrate this problem.

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THE ULTRASONIC DIAGNOSIS OF THE MAXILLARY SINUSES OF CHILDREN
H. Handel and M. Breitschuh

Ultrasonic diagnosis (A- and B-mode) is a noninvasive alternative without radiation exposure to the radiographic examination of the maxillary sinuses of children.

Given the adequate prerequisites (high resolution device, trained examiner) diagnostic mistakes can be reduced to a minimum. By means of 500 examinations we can show that sonography becomes the first and frequently the only necessary diagnostic imaging procedure for diagnosing the maxillary sinuses in paediatric patients.

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A CLINICAL-HISTOLOGICAL CLASSIFICATION OF VASCULAR LESIONS IN CHILDREN: CORRELATION WITH COMPUTED TOMOGRAPHY, MAGNETIC RESONANCE IMAGING, AND ANGIOGRAPHY
P.E. Burrows, P.S. Babyn, S.J. Blaser, S.H. Chuang, H.G. Thomson and J.C. Posnick

Computed tomographic (CT) and magnetic resonance (MR) examinations of 22 children with confirmed vascular lesions were reviewed retrospectively to determine the respective imaging characteristics in 6 clinical-histological lesion categories: Lymphangioma (2 patients), combined lymphatic and haemovascular malformations (6 patients), venous or capillary-venous malformations (3 patients), arteriovenous malformations (5 patients), haemangiomas in the proliferating phase (3 patients) and involuted haemangiomas (3 patients). CT and MR scans were evaluated for tissue extent, margins, attenuation or signal characteristics, enhancement pattern, and the presence of increased fat, calcifications or vessels.

In each patient, an attempt was made to diagnose specifically the lesion type from each examination. The contrast between the lesion and normal tissue was seen best on T2-weighted MR images, but there was no difference in the tissue extent predicted by CT compared with MRI. Reviewers correctly diagnosed the type of lesion with certainty by CT in 16 patients and by MR in 11 patients. In arteriovenous malformations MR demonstrated the high flow vessels better than CT, but CT showed bone changes better. In vascular lesions containing predominantly lymphatic tissue, contrast-enhanced CT demonstrated the haemovascular components better than MR. Although imaging characteristics were inhomogeneous within the categories, some specific features were identified: "cystic stranding" and rim enhancement for lymphangiomas, large calcifications for venous and capillary-venous malformations, and diffuse fibro-fatty tissue with "capsules" for involuted haemangiomas. In summary, contrast-enhanced CT appears to be more informative than MR in predicting the different types of vascular lesions in children.

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CORRELATION OF BLOOD CULTURE AND RADIOLOGICAL FINDINGS IN LOWER RESPIRATORY TRACT INFECTIONS OF THE NEWBORN
D.A. NZEH AND S. RIMMER

Analysis of plain chest radiographic findings in 20 neonates with positive blood cultures were carried out. Organisms isolated were staphylococcus, streptococcus, listeria, candida, pseudomonas, escherichia and cedecea species. The frequency of radiological abnormalities was determined namely: consolidation, granular opacities, ground glass appearance, interstitial opacities, emphysema and air bronchogram. 4 cases (20%) had normal chest radiographs. On the whole the findings did not conform to a particular pattern for any individual pathogen.

Department of Radiology, St. Mary's Hospital For Women & Children, Manchester M13 0X5, United Kingdom.
IMAGING THYROID CARCINOMA IN A CHILD

V.E. Tavibre, I. Forster, R. Binswanger and U. V. Willi

An 8 year old girl presented with right cervical adenopathy that had been progressive during 3 months and followed by diffuse thyroid enlargement. Ultrasonography (US) showed a heterogenous thyroid gland consisting of diffusely hyperechoic solid nodules and similar lymphnodes (LN). Laboratory data revealed Hashimoto's thyroiditis. Scintigraphy demonstrated absence of isotope uptake in the right thyroid lobe. On standard chest radiography, there was evidence of mild upper mediastinal enlargement with some compression of the trachea, but of normal lungs and no calcifications. Right thyroidectomy, resection of the isthmus and biopsy of the left thyroid lobe were performed; the diagnosis of papillary adenocarcinoma with metastatic adenopathy was made by histology, also confirming Hashimoto's thyroiditis of the left lobe. Two weeks after surgery, a subocipital computerized tomography showed some solid tissue at the site of thyroidectomy and no LN. At 4 weeks, US demonstrated a right cervical lesion, suspicious of a thyroidectomy site and nonspecific inflammation of the remaining left thyroid lobe. All of these were confirmed histologically after a second operation.

This pictorial assay summarizes the complex nature and diagnosis of a rare pathological entity in pediatrics. It also allows to demonstrate the value of the different imaging modalities used in the work-up and monitoring of a malignant thyroid process.

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Efficacy of Chest Radiography in Children with Fibrocystic Disease

Z. Zivkovic, Z. Kovacevic

Children with fibrocystic disease suffer from numerous respiratory infections. That is a reason for prospective evaluation of clinical and radiological findings, so it could be possible to make graduation of chronic respiratory insufficiency (CRI). Radiological examination was evaluated in 17 patients over 12 months period. There were 10 male and 7 female patients. The mean age was 4,2, range from 1 year to 14 years. Clinical signs in all cases were steady cough, viscous mucus, pneumonia infiltrate in the lung, found by physical examination. Study of all obtained and acceptable radiographs attempts to classify the degree of interval change.

We found hyperinflation in all the cases, nonspecific linear shadows in most cases, atelectasis in six patients, empyema in two children. This study showed that there were polymorphic changes of radiographs, but, abnormalities detected before a severe pathophysiological damaging is present, may prevent considerable CRI and also mortality.

Zavod za zdr. zastitu dece i omladine, Ivana Milutinovica 9/14, YU-11000 Belgrade
GENITO-URINARY TRACT ORAL PRESENTATIONS

90 ENDOVAGINAL SONOGRAPHY IN A CHILDREN'S HOSPITAL: IS IT WORTHWHILE? R.D. Bellah, H.K. Rosenberg

We report our experience with endovaginal sonography (EVS) in a group of non-pregnant adolescent females referred for peltic sonography over the past year. We assessed the efficacy of EVS as compared to transabdominal sonography (TAS). 31 scans with EVS were performed in 26 post-menarcheal females (median age 16 yrs) referred for possible PID (13), pelvic pain (8), mass (1), menstrual irregularities (1), or questionable abnormal ovaries (1). 29 exams included both TAS and EVS; in 2, only EVS was done. We compared both techniques and assessed whether EVS could provide better image quality, better anatomic detail and offer additional diagnostic information. In 10%, findings which were clearly normal by TAS were shown to be abnormal by EVS. However, EVS demonstrated better image quality in 76% and better anatomic detail in 97%. In none was TAS better than EVS in quality or detail. EVS provided additional useful information in 66%: this allowed greater diagnostic confidence in 35% with possible PID by better demonstration of fluid in endometrial canal, hydrosalphinx, or tubo-ovarian abscesses, and better characterization of free pelvic fluid. EVS improved diagnostic accuracy in cases of uterine duplication and ovarian torsion. The average scan time for EVS was 12 minutes. Our experience indicates that EVS is a relatively easy, rapid imaging technique that is better-tolerated by most patients. Although field-of-view is limited as compared to TAS, EVS provides exquisite detail, helps to elucidate unclear findings on TAS, and helps to improve diagnostic accuracy. EVS is also especially helpful in obese patients and in those unable to maintain a full bladder. EVS should be considered a useful and worthwhile adjunct to TAS.

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91 HYPERECHOIC RENAL MEDULLARY PYRAMIDS IN INFANTS AND CHILDREN J.L. Strife, PK Rand, CF Strife, J McDaniel

Purpose: To determine the incidence and clinical significance of increased sonographic echogenicity of the renal medullary pyramids in infants and children.

Materials & Methods: The ultrasonography and clinical courses of 46 children initially diagnosed as having hyperchoic renal medullary pyramids was reviewed.

Results: Patients with hyperchoic renal medullary pyramids included 30 males and 16 females whose ages ranged from 1 day to 18 years. The clinical diagnoses included 7 preterm infants on chronic furosemide therapy, 5 children with Bartter's syndrome, 3 with hyperparathyroidism, 6 with renal tubular acidosis, 7 with transient renal insufficiency, 2 with sickle cell hemoglobinopathy, 10 with isolated abnormalities and 6 with multifactorial problems. In the majority of patients, the increased echogenicity of the medullary pyramids was due to nephrocalcinosis. However, an important subgroup included infants who demonstrated prominent medullary echogenicity which, on follow-up examination, returned to normal. In this group, the hyperchoic medullary pyramids is thought to relate to transient renal insufficiency and has been labeled "Tamm-Horsfall" tubular obstruction.

Conclusion: In 89% of patients, the finding of a hyperchoic renal medullary pyramid was associated with a specific pathological condition. The majority of patients have hypercalcemia which causes deposition of calcium in the renal tubules result in increased sonographic echogenicity of the renal medullary pyramids. A systematic approach, including the sonographic appearance, measurement of serum calcium, creatinine and electrolytes, and urine calcium excretion usually allows a specific etiologic diagnosis.

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ULTRASOUND FINDINGS IN GLOMERULOCYSTIC DISEASE ASSOCIATED WITH IN UTERO EXPOSURE TO INDOMETHACIN
H.K. Rosenberg, I. Rostaino, B.S. Kaplan, P. Kaplan, G. Witzleben
Indomethacin is used as a tocolytic agent and in the treatment of preeclampsia. We report the case of a female infant, the 2nd of twin girls born at 36 weeks gestation, exposed to indomethacin for 13 weeks in utero (beginning at 20 weeks gestation), because of polyhydramnios affecting both fetuses. Oligohydramnios was detected in both fetuses at 30 weeks, resolved in twin A after indomethacin was stopped, but persisted in twin B. On day 3, twin B developed gross hematuria, systolic hypertension and bilateral flank masses. Urine output was normal. On day 3, BUN was 10 mg/dl and serum creatinine was 3.4 mg/dl. Renal sonography (US) days: bilateral renomegaly with bright increased parenchymal echogenicity bilaterally and virtually no corticomedullary differentiation, findings typical for infantile polycystic kidney disease. Pericystic kidney biopsy on day 9 revealed numerous immature glomeruli, many of which had dilated Bowman’s spaces. There was mild interstitial fibrosis but no evidence of inflammation. Tubules were slightly dilated and there were a few dilated cystic structures lined by flattened epithelium. Renal US at 2 months showed normal size kidneys with persistent, but less bright increased cortical echogenicity. At 6.5 months, US revealed bilateral small kidneys with overall increased parenchymal echogenicity and complete loss of visualization of the corticomedullary junctions. By the end of the first year of life, the serum creatinine levels remained stable at 1.2 to 1.5 mg/dl. We speculate that in utero exposure to indomethacin may lead to an arrest in nephrogenesis and suggest that the diagnosis of glomerulocystic disease be considered when US findings mimic those of infantile polycystic kidney disease in this clinical setting.

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RADIOLOGICAL AND FUNCTIONAL CORRELATIONS IN PYELONEPHRITIC SCARRING.
Ingrid Wikstad, Tommy Linnd, Jonas Karlén and Anna Aperia. Departments of Pediatric Radiology and Pediatrics, Karolinska Institute, St Göran’s Hospital, Stockholm, Sweden.
Kidney size and renal function were investigated in 61 children (9.7 +/- 4.3 years of age, range 1.7-17.9 years) with unilateral or bilateral renal scars. Most patients had a history of vesico-ureteral reflux but not of obstruction. The correlation between radiology and renal function was evaluated in 29 patients, in which the functional and morphological study had been performed within six months. The renal area was estimated by planimetry. The renal scars were graded according to Smellie and the reflux according to Parkulainen. Clearance of inulin, GFR effective renal plasma flow, C/PAH, filtration fraction, FF and the urinary excretion of albumin were determined under water diuresis. Albumin was analyzed by radioimmunoassay. In 54/61 patients one or both kidneys had a renal size below -2SD. Decreased GFR (<90ml/min/1.73m², range 20.7-89.4) was found in 45% of the patients indicating that some patients with one small kidney have compensatory hypertrophy on the contralateral side. Increased albumin excretion (>20ug/min/100ml GFR) was common (44%), also in patients with normal GFR’s. The degree of albuminuria was related to the size of the smallest kidney to the grade of the scars and to the dilatation of the reflux. The microalbumin excretion was inversely correlated with the GFR. Strong correlation were found between kidney area and GFR as well as C/PAH. Microalbuminuria appears inversely correlated with GFR but is also commonest found at normal GFR in patients with one small scarred kidney and/or large reflux.

Total Scan Diminished Reflux
Uptake
P-fimbriae +ve 39 4 15 15
P-fimbriae -ve 67 8 17 15

Upper renal tract abnormality is not associated with the P-fimbriae status of E.coli but reflux is common with P-fimbriae +ve E.coli than with P-fimbriae -ve.

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RELATIONSHIP OF VESICOURETERAL REFLUX, P-FIMBRIATED E. COLI AND ACUTE PYELONEPHRITIS IN CHILDREN.
H. Majd, H.G. Rushton, B. Jantausch and B.L. Wiedermann
Acute pyelonephritis in children is commonly assumed to be associated with reflux. Recent reports have suggested that pyelonephritis in the absence of reflux is common and it has been attributed to the presence of P-fimbriae in certain strains of E. coli. We studied 94 patients (pts) hospitalized with febrile UTI to determine the relationship between reflux, P-fimbriae, and acute pyelonephritis and to evaluate the diagnostic reliability of commonly used clinical and laboratory parameters. Based on previous experimental study, we used 99mTc-DMSA renal scan as the standard of reference for diagnosing acute pyelonephritis. Pyelonephritis was documented in 61 (65%) pts. Reflux was demonstrated in 32% of the total group and only 39% of pts with pyelonephritis. Of the 70 E. coli urinary isolates, 70% were P-fimbriated including 65% of isolates from pts with scan documented pyelonephritis and 75% of isolates from pts with normal DMSA scans. Although a trend was noted, there was no significant difference in the incidence of P-fimbriated E. coli in pts with positive DMSA scan and reflux (50%) compared with those who had positive scans without reflux (72%) \(P=0.15\). Statistical analysis of clinical and laboratory parameters commonly used in the diagnosis of pyelonephritis revealed that these variables did not adequately predict the presence or absence of parenchymal involvement. These data show that: (1) acute pyelonephritis in the absence of demonstrable reflux is common; (2) febrile UTI in children is commonly associated with P-fimbriated E. coli both in the presence or absence of reflux; (3) the presence of P-fimbriae alone does not fully explain the pathophysiologic of pyelonephritis in the absence of reflux; and (4) diagnosis of acute pyelonephritis in children with febrile UTI based on the clinical and laboratory parameters is unreliable.

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EVALUATION OF ANTENATAL MEGACYSTIS. REPORT OF 10 CASES.
M.P. QUERE, J.Y. COHEN, Y. HELOURY, C. GUYOT.

Several questions have to be addressed when antenatal sonography shows megacystis: evolution within time, term of pregnancy, association with malformations mainly urogenital anomalies, necessity for fetal karyotype, fetal status. Diagnosis is different in boys and girls. We report 10 cases of megacystis discovered antenatally, associated with urinary tract abnormalities. Beside classical etiologies, for boys: posterior urethral valves, Prune-Belly syndrome. In both sex: mega-ureter - megacystis syndrome. We report other less frequent etiologies, mostly obstructive malformations. Precise diagnosis was often made postnatally: congenital polyp of posterior urethra, anterior urethral hypoplasia, diverticulum urethral ...

PERCUTANEOUS NEPHROSTOMY IN NEONATES, INFANTS AND CHILDREN: 57 PATIENTS.
E. THOMAS, S. NEUENSCHWANDER, J. Ph. MONTAGNE

Over a 5 years period, 81 percutaneous nephrostomies (PCN) were placed in 57 patients (45 males, 13 females). Ages ranged from one day to fourteen and a half years (mean 2 years 11 months; 36 patients being less than 18 months old). No sedation nor general anesthesia were needed, except in one case. 10 patients had bilateral PCN. Drainage duration ranged from 2 days to 7 months (mean 22 days). 5 major complications were encountered: pyelo-colonic fistula, retro-renal hematoma, perforation of the ureter, peritoneal abscess, peritoneal reaction. Indications for PCN were the same as in adults: pyonephrosis (10 cases), post operative obstruction (12 cases); or specific to pediatrics: evaluation of the functional value of an obstructed kidney (23 cases), malignant ureteral obstruction (6 cases), posterior urethral valves (6 cases).

The authors stress the safety and usefulness of PCN in the pediatric age group.

Conclusions of the presentation:

The authors present their experience with 81 percutaneous nephrostomies (PCN) placed in 57 patients (45 males, 13 females) over a 5 year period. The ages ranged from one day to fourteen and a half years, with 36 patients being less than 18 months old. No sedation or general anesthesia was needed, except in one case. Ten patients had bilateral PCN. The drainage duration ranged from 2 days to 7 months (mean 22 days). Five major complications were encountered: pyelo-colonic fistula, retro-renal hematoma, perforation of the ureter, peritoneal abscess, and peritoneal reaction.

The indications for PCN were the same as in adults, including pyonephrosis (10 cases), postoperative obstruction (12 cases), and specific to pediatrics: evaluation of the functional value of an obstructed kidney (23 cases), malignant ureteral obstruction (6 cases), and posterior urethral valves (6 cases). The authors stress the safety and usefulness of PCN in the pediatric age group.

Antenatal diagnosis of renal pelvic dilatation - is postnatal conservative management justified?
Gordon I, Dhillon HK, Ransley PG, Duffy P, Dillon MJ, Barrett TM.

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One hundred and twelve children with an antenatal diagnosis of PUJ dilatation were referred up till 1987. 77 children had one normal kidney with contra lateral PUJ dilatation, 73 underwent Tc 99m DTPA scans. Three kidneys had nephrostomy drainage, 1 kidney showed less than 10% function and was subjected to nephrectomy, the other 2 kidneys improved function and underwent pyeloplasty. There were 16 kidneys with moderate function (group A) and 54 with good function (group B). Group B 1 (good function plus poor diuretic response) and group B 3 (good function plus good diuretic response) were treated conservatively.

Group  No. Scans Differential Function Lasix
A 16 40 43 50 6 47 53
B 1 15 44 20 33 33 13 15 86
Post 15 29 46 33 13 6 86 14
B 2 15 16 31 18 50 18 32 69
B 3 23 36 52 26 21 80 19

All figures quoted are in percent. NA = Not available.

Long term follow up has demonstrated that conservative management for PUJ dilatation with good functioning kidney may be justified.
Urodynamics in the Imaging Evaluation of Pediatric UTI

John de Campo

This study was carried out to evaluate whether urodynamic results, in addition to conventional imaging results, change the method of treatment in pediatric patients with UTI.

The records of 51 patients who had recurrent UTIs and had both a conventional imaging work-up (VCUG, US, EU) as well as a urodynamic evaluation were reviewed. The clinical course as well as the therapeutic interventions were followed over a mean of three years.

There was no statistically significant correlation between the prevalence of VUR and any of the urodynamic parameters of vesico-urethral dysfunction. Forty-one of 51 patients had alterations in their urodynamic information. Of these, 50.1% were infection free for the subsequent 3 years.

Urodynamics should thus be contemplated in children with:

1) recurrent UTI after appropriate imaging and therapy regardless of the anatomic findings or imaging results, or
2) persistent symptoms of dysfunctional voiding or vesico-urethral dysfunction.

Is a preliminary film necessary before the micturating cystourethrogram?

Many technical factors have contributed to significant dose reductions during micturating cystourethrograms (MCUs) in children. However, a preliminary film is still performed in many centres.

The aim of this study was to determine the value of the preliminary film in children undergoing MCU, and to determine if the film could be eliminated.

The coded computer reports of 869 children undergoing MCUs in a 12 month period were retrospectively reviewed for abnormalities of the lumbar spine, hips or for calculus. In addition all other coded computer reports of the lumbar spine, hips, abdomen and intravenous pyelograms on these patients were reviewed to determine if any calculus, congenital dislocation of the hips (CDV) or spinal anomalies (apart from meningomyelocele) were ever detected.

Vesico-ureteral reflux was present in 185 patients (21%). 4 patients had renal calculi (0.5%), and in 3 of these the diagnosis was evident on preceding ultrasound and in one on preceding IVP.

Skeletal anomalies (other than known meningomyelocele) were present in 4 patients. Clinically obvious abnormalities were present in patients with sacral teratoma and sacral lipoma. Spinal anomalies were present in one patient with tracheo-oesophageal fistula, and one patient with tethered cord had a cutaneous angioma and sacral pit evident clinically.

No patients (other than those with known meningomyelocele) had congenitally dislocated hips diagnosed.

If the preliminary film had not been performed in 869 patients, no renal calculi, and no CDV would have been missed. One patient with tethered cord may have been missed. The low incidence of plain film anomalies indicates that a plain film is only justified when there is clinically obvious vesical anomaly or unexplained urodynamic disturbance.

A larger study involving a 48 month period is in progress.

Functional Evaluation by Modified VCU-Technique in Congenital Neuropathic Bladder

R. Potter, K.A. Hamgegg, E. Soranto, F. Ebner, E. Urav

The therapeutic goals in children with myelodyplasia and associated congenital neuropathic bladder are preservation of renal function, avoidance of urinary tract infection and achievement of appliance - free and social continence. During recent years intermittent catheterisation and/or standardized specific pharmacological treatment have gained increasing importance to achieve the above mentioned goals. To put such treatment on an objective basis it is essential to know the precise nature of the underlying bladder dysfunction namely the behavior of the detrusor muscles and the bladder base. Until recently patients were commonly undertaken urodynamic or combined urodynamic and radiological studies. The goal of the present prospective study was to prove the value of a slightly modified and standardised technique of Voiding Cystourethrography (VCU) for functional evaluation of the lower urinary tract in comparison to urodynamic techniques. The study consisted of 75 patients (47 girls and 28 boys) from 6 weeks to 17 years (mean age 5.3 years) with myelodyplasia and congenital neuropathic bladder. The results showed good correlation, the Bowkens-chi-square-test showed no significant difference between both methods (p = 0.98).

The modified VCU-technique has proven its diagnostic validity already for the diagnosis of unstable bladder (1). The slightly modified VCU-technique enables the radiologist to distinguish between three types of neurogenic bladders in children with myelodyplasia with high reliability, concerning detrusor- and bladderneck dysfunction. The high positive correlation with urodynamic examinations allows the statement, that the classification of the underlying type of neurogenic bladder disturbance can be done, even if no or limited urodynamic examinations are available.

(1) Potter, R. et al: Unstable bladder in children: Functional evaluation by modified voiding cystourethrography. Radiology 1986: 161: 811-813
Departments of Radiology and Paediatrics, Peterborough District Hospital, Peterborough, PE3 6DA, England.

UTI. For ~ negative indirect VCS (vithout termination to evaluate reflux in urinary tract VbS an VC6J were compared in104 patients v~th relevant literature.

We believe this to be the first report of ultrasono-

diagnostic management for the evaluation of reflux surgery the check-up of the reflux is fundamental. In the cases of con-

servatively treated refluxes and after antireflux surgery the check-up of the reflux is carried out only sonographically. VCU is only indicated in cases of sonographically detected refluxes higher than VUR grad III with regard to surgical therapy.

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Detection of nonpalpable testes by MRI.

C. Kaniklides, F. Pech, T. Löhnerzhölz, A. Stenberg. Ultrasound, computed tomography, radionuclide scanning, laparoscopy, testicular arteriography and venography have all been used with varying success to locate undescended testes. Instead we have used magnetic resonans (MR) imaging in ten patients (4-12 years old). Eight of our patients had unilateral and two bilateral cryptorchism. All of the patients underwent imaging in both axial and coronal plane with short as well as long TR/TE sequences using a 0,5 T Siemens Magnetom and either body or head coil. Surgical and histological findings were correlated with the MR findings. In eight cases there was complete agreement between MR and surgical findings. In one of these both MR and surgery failed to demonstrate a testis. The undescended testes were found either in the lower abdomen (two cases) or intracanicular (five cases). In two patients MR imaging suggested atrophic testicular tissue but at operation a lymphatic or epididymal-testicular tissue was found. The undescended testis was most confidently identified in the axial plane as a round or ovoid structure, with optimal testis-fat contrast on T1 weighted images. The inguinal canal was best identified on T1 weighted images in the coronal plane. In our opinion MR imaging is a promising modality to localize a testis.

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Voiding cystosonography (VCS) as an true alternative to radiologic voiding cystourethrography (VOU).

V. Hofmann and S. Jange

VCS an VOU were compared in 104 patients with urinary tract infections and vesico-ureteric reflux (VUR). In 57 cases (64 %) the findings were coincident, in 37 cases (36 %) they were different. Under the different findings the VCS demonstrated in 33 cases VUR with higher grades than by VOU. Only in 4 cases the situation was opposite. The sensitivity of VCS is higher than VOU. For this reason VCS is the screening method and the first examina-

tion to evaluate reflux in urinary tract infections (UTI). The consequence is a new diagnostic management for the evaluation of UTI. For a negative indirect VCS (without catheterization) is no longer necessary a VOU, there are no operative consequences. All the refluxes with operative indication can be detected by sonography. In the cases of con-

servatively treated refluxes and after anti-reflux surgery the check-up of the reflux is carried out only sonographically. VCU is only indicated in cases of sonographically detected refluxes higher than VUR grad III with regard to surgical therapy.

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RENAL TUBULAR ACIDOSIS PRESENTING WITH NEONATAL RENAL MEDULLARY CALCIFICATION.

A.E.W. Dux and S.J. Tuck

Neonatal renal medullary calcification is rare and is usually associated with drug therapy. It is also associated with Tam Horsfall proteinuria. We describe the ultrasonographic appearances of neonatal renal medullary calcification in a pair of identical (monozygotic) twins who had Distal Renal Tubular Acidosis (DRTA) diagnosed at the age of two weeks. The parents were non consanguineous Asians. The father subsequently developed renal colic secondary to a calculus. Screening of the remain-

ing family revealed no other affected individuals.

We believe this to be the first report of ultrasono-

diagnostic demonstration of renal medullary calcification in association with DRTA during the neonatal period and present the cases together with a brief review of the relevant literature.

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Abstracts. 27th Congress of the European Society of Paediatric Radiology

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DMSA SCANS IN ACUTE URINARY TRACT INFECTIONS
J.R. MacKenzie, D.N. Tappin, A.V. Murphy, T.J. Beattie

A prospective study was set up in 1985 to monitor children presenting with a first bacteriologically proven symptomatic E. Coli infection. To date 156 children (52 boys, 104 girls) have entered the study. Investigations included an early 99m Tc DMSA scan, an ultrasound examination, a plain x-ray of the abdomen and either an MCU or 99 Tc DTPA indirect voiding cystogram.

A follow-up DMSA scan was performed 3–6 months later. 48 children showed an area of diminished uptake on the initial DMSA scan and 19 showed cortical scarring. 9 of these children had both abnormalities. Diminished uptake was significantly associated with pyrexia, systemic upset, length of symptoms, elevated WBC and loin pain in the older child. We believe that this finding localises the site of infection in the renal parenchyma.

37 children had reflux and 18 of these had a normal DMSA scan. Only 8 of the children with scarring and 11 of the children with diminished uptake had demonstrable reflux. The assessment of reflux by conventional techniques is not a sensitive method of detecting the "at risk kidney". An early 99 Tc DMSA scan will identify such kidneys and should be performed in all cases of acute UTI.

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UNUSUAL CAUSES OF URETERIC OBSTRUCTION
J.R. MacKenzie, R. Weddings, A. Amy

Ureteric obstruction is a fairly common problem in children and usually occurs at the pelvi-ureteric or vesico-ureteric junction. The diagnosis is usually suspected ultrasonically and confirmed by a 99m Tc DTPA scan with Brunsende. An IVU may be helpful prior to surgery.

In the last 4 years, 4 children have presented with unusual obstructions occurring between the pelvi-ureteric and vesico ureteric junctions. Ureteric hold-up was demonstrated by the DTPA scan and IVU’s and retrograde pyelograms were needed to make a more precise diagnosis.

Two children (a 31 year old boy and a 13 year old boy) presenting with urinary tract infection were found to have a retro-caval ureter. A 9 year old boy with a long history of recurrent abdominal pain had a benign ureteric polyp situated below the pelvi-ureteric junction and a 13 year old girl with recurrent infection had a mid ureteric structure with changes of chronic inflammation.

The investigations and the surgical findings will be demonstrated and a brief review of the literature will be given.

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URETHRAL ABNORMALITIES IN THE MALE INFANT
C. Martín, C. Durán, C. Escofet, S. Rigol and J. Lucaya

Several cases of either unusual urethral anomalies or common urethral disorders with atypical radiological features are presented.

Renal ultrasonography may be deceivingly normal when examining neonates with hydronephrosis in the first two days of life. The case of a neonate with bilateral ureterohydronephrosis secondary to posterior urethral valves, and a borderline renal ultrasound, is presented.

Urethral polyps are exceedingly rare in infancy. A patient with bilateral hydronephrosis diagnosed in utero was found to have an obstructive urethral polyp.

Rectourethral fistulae are common in patients with imperforate anus. Occasionally such fistulae may enlarge and compress adjacent structures. A case of lithiasis in a huge urethral diverticulum secondary to a rectourethral fistula is shown.

Other unusual urethral lesions such as anterior diverticula and complete urethral duplication are also illustrated and discussed.

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A COMPARISON OF TWO TECHNIQUES IN PEDIATRICS VESICO-URETERAL REFLUX (VUR) STUDIES
B. Nägele-Wöhrle, Drosn. W., Schumacher R., Hahn K.

The clearance measurement and the indirect reflux test using 99m-Tc-MAG3 (Mercapto-acetyl-triglycine) in 89 patients with 164 kidneys was compared to micturating cystourethrography (MCU) performed suprapubic puncture of the bladder. By rapid excretion of MAG3 from the kidney, the low radiation exposure associated with technetium and the fast availability, this substance today can be regarded as equivalent to iodine-hippuran. The renal clearance for each kidney, was calculated by the method of Oberhausen. The indirect reflux test was carried out without interim emptying of the bladder when the patients reported the urge to urinate after abundant fluid intake. The VUR was tested first by applying manual pressure to the bladder region after that under voiding. The VUR was indicated by a rise of activity within the kidneys. Radiisotope as well x-ray examinations showed 114 identical negative and 13 identical positive results. We found 29 positive radionuklde examination and on the other hand 25 positive MCU examination. The indirect VUR test performed in this way is more sensitive for higher graded reflux than MCU. 99m-Tc-MAG3 gives the function and the flow study combined with the indirect VUR.

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MR IMAGING OF UNDESCENDED TESTES

M. Reither, E. Imeschweiler, R. Lindner

We performed Magnetic Resonance Imaging (MRI) in 21 patients, 13 with no abnormalities, 7 with clinically undescended testes, and 1 with hemihypertrophy. The results were compared with ultrasonographic, clinical, surgical, and histologic findings. In all patients the undescended testes were unilateral and could be correctly identified on MR images. There was no intraabdominal testis.

The purpose of MRI in undescended testes is twofold: 1) localization and 2) tissue characterization. For 1) we recommend both $T_1$- and $T_2$- weighted sequences in transverse and coronal sections. For 2) $T_2$- weighted sequences in coronal and/or transverse sections are suitable. In atrophic testes there is a lack of any signal intensity, whereas intermediate or even high signal intensities suggest different degrees of vitality.

In summary MRI imaging promises to become an important diagnostic tool in the detection and characterization of undescended testes. MRI is useful to help plan a surgical approach in cryptorchid patients. It seems reasonable to foresee a time when it might obviate the necessity of surgical exploration in selected patients.

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THE ULTRA-SOUND PICTURE OF NEPHRITIS CAUSED BY FUNGAL SEPSIS

S. Várady, G. Rudas

Our patient was a one month newborn male falling to thrive, with a palpable left-sided mass. An ultra-sound scan found an increased density and enlargement in the upper pole of the left kidney. Intravenous urography detected a deformed and compressed cavity system. The two findings confirmed tumor suspicion. Great quantity of fungus was found in urine sediment, culture and haemoculture respectively. An anti-acidotic therapy was introduced. In a month the ultrasound picture of the kidney gradually normalized.

What makes the case interesting is that the comparatively rare fungal-sepsis led to pronounced changes in the kidney, which the ultrasound and IVU considered to be a tumor.

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IMPORTANCE OF RESIDUAL URINE VOLUME MEASUREMENT

J. Weisenbach, M. Keresztes, A. Mayer, A. Molnár und V. Jászai

Residual urine volume of patients having obstructive uropathy was measured by ultrasonic sound before and after operation.

In the first group of our patients studied were involved children having reflux vesicoureterales.

Patients who were operated on using the technique of Politano-Leadbetter and those by whom teflon was injected into the vesicoureteral junctions are separately discussed.

The second group consists of patients having pyloureteral stenosis.

The ultrasound investigations were performed by Hitachi CUB 420 scanner.

In exact evaluation of the operation results is the residual urine volume measurement of great importance.

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DYNAMIC CHANGE OF RENAL SIZE(CRS) DURING EXCRETION UROGRAPHY(EU) DUE TO CONTRAST-ENHANCED DIURESIS

U. V. Willi, M. H. Smet

Due to forced diuresis, tubular expansion during EU leads to early and transient renal enlargement in normals. Depending on the state of hydration, its degree varies and may even be zero. However, absent CRS may be due to abnormal renal parenchymal reaction on the basis of functional disturbance (e.g. reflux) or of renal damage (e.g. reflux nephropathy). Both conditions may also delay the usual CRS and make it appear paradox. Obstructive uropathy may severely increase the renal size by expansion of the collecting system. Inaccuracy of measurement (m) of renal length can be minimized by standardisation of the method.

MATERIAL AND METHOD: EU's from 300 children were retrospectively evaluated for renal length on the 3 and 15 min and occasional later post-injection films. Regular hyperosmolar intravenous contrast material was used ("Telebrix 50": 380 mgI/ml); 136 EU's were eliminated from the study because of: 1) poor definition of renal contours, 2) inconsistent renal position due to respiration or body movement, 3) unknown technical data (outside studies). From the remaining 102 EU's, 630 measurements were obtained twice (2 observers). One mm difference in m was tolerated as "identical" result. Indications for EU were reflux in 102(63%), obstruction in 38(23.5%), and other conditions in 22(13.5%). In a few, pathology was mixed. RESULTS: In 127 instances (18.5% of all m's), disagreement between the observers was 2 mm (86%), or 3-7 mm (16%) due to inaccuracy or mistake; all these m's were corrected.

n (%) Reflux Nephrophy - Obstruct- Complex Others/ Normals

"Normal" CRS 47(68.1) 22(32.3) 17(35.4) 2(16.6) 76(63.9)
"Abnormal" CRS 12(17.4) 11(26.2) 2(4.2) 23(19.3)

CONCLUSION: The dynamic behavior of renal size during EU may be a clue in diagnosing urinary tract abnormality, especially in doubtful obstructive uropathy.

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Abdomen

Oral Presentations

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BILIARY COMPLICATIONS AFTER LIVER TRANSPLANTATION IN CHILDREN - ROLE OF IMAGING MODALITIES

D. Pariente, M. H. Bihet, S. Tammam, J. Y. Roux, O. Bernard, D. Deviere, P. Gautheir, D. Houssin, P. Claumont

Among a series of 115 children with liver transplantation (LT) explored between 1986 and 1989, 20 biliary complications (BC) were observed. The age range was 1 to 15 y., with 14 children younger than 3 1/2 y. The main indication for LT was biliary atresia in 10 cases and bile duct reconstructions was accomplished by choledochocledochostomy in only 6 cases. Biological findings were often non specific with frequent fever and cytolyis and absence of jaundice. Bile duct dilatation (15) often obscured by sludge (6) and bile collection (5) were depicted with routine doppler US. Cholangiograms were obtained by PTC in 14, by indwelling drain in 3 and peroperatively in 2.

BC were associated with hepatic artery (HA) thrombosis in 8 and with HA stenosis in 1, and thus were secondary to biliary tract ischemia. In the other cases etiology was anastomosis kink in 4, stenosis in 5, bile sludge in 1 and cystic duct remnant mucocele in 1. In 8 cases percutaneous biliary drainage was placed, allowing treatment of cholangitis. Transhepatic dilatation of stenosis was performed in 2 and surgery in 18.

We would like to emphasize the role of US in the screening of these BC, and in the guidance of PTC, especially in case of reduced-sized graft.

Repeted surgical procedures can be delayed by percutaneous placement of biliary drainage and avoided in a few cases by transhepatic dilatation of stenosis.

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ECOGENIC DILATED BILE DUCTS IN CHILDREN

G. Enriquez, J. Lucaya, E. Allende and P. Garcia

On ultrasound examination, nine patients were found to have multiple, rounded or tubular, echogenic structures with a variable degree of acoustic shadowing in the liver parenchyma. In some cases, these findings resembled those of widespread hepatic calcifications. Classic echographic features of biliary tract dilatation had been observed on previous ultrasound studies in two of our patients. Pathological correlation, CT studies and/or Percutaneous Transhepatic Cholangiography showed the echogenic liver structures to correspond in all nine cases to dilated bile ducts filled with cellular debris, inspissated bile and, occasionally, with milk of calcium. Five patients had undergone hepatic portoenterostomy for biliary atresia; two had received a liver transplant; of the remaining two patients, one had cystic fibrosis and the other a familial immunodeficiency syndrome.

All nine patients had presented clinical signs and/or symptoms suggestive of cholangitis. We speculate that the finding of dilated echogenic bile ducts should suggest the existence of cholangitis complicating an underlying biliary abnormality.

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GALLBLADDER ANOMALIES IN ACUTELY ILL AND VENTILATED NEWBORNS: SONOGRAPHIC DEMONSTRATION

E.F. Avni, F. Rypens, B. Cohen, D. Vermaylen

The authors wish to report the changes in the sonographic appearance of the gallbladder in 6 newborns, all acutely ill or/and ventilated. The gallbladder content appeared diffusely echogenic in a premature with disseminated intravascular coagulopathy on its second day of life (ruling out sludge). This type of content must probably represent hemobilia. It disappeared rapidly.

In the 5 others, a marked thickening (>7 mm) of the gallbladder wall occurred, making the lumen hardly visible.

One of these babies presented with acute heart failure and the thickening was noticed before other clinical signs. It corresponds to edema in the perivascular aerolar tissue; it is similar but more pronounced than the one described in hypoalbuminemia.

In the 4 last cases, septicemia or infection was clinically suspected. The sonographic appearance of the gallbladder was highly suggestive of inflammatory changes (with two suspicions of perforation). Although none were operated upon, these changes probably correspond to acalculous cholecystitis. Prematurity, ventilation, parenteral nutrition and necroizing enterocolitis as noted in all 4 were favouring conditions.

The evolution in three out of 4 cases was abnormal leading to lithiasis in 2 and to scleroatrophic gallbladder in two.

In conclusion, gallbladder involvement is not infrequent in acutely ill or ventilated newborns. The anomalies may be an indirect sign of a systemic disease sometimes unrecognized. The gallbladder itself may be the target of the disease especially infection. In such cases US is mandatory to monitor short and long term complications. It also helps, along with the clinical data, to differentiate between the various diagnosis.

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FORMATION OF A GALLSTONE: ULTRASONOGRAPHIC STUDY

I. Pastor, C. Prieto and P. Cortes

In 87 neonates of low weight (<1.500 g), we can detect the changes that happen in the gallbladder. All the children receive total parenteral alimentation during a long period of time, and just a minority form gallstones (those children having a septic process during their growth), but not all the children with parenteral alimentation form gallstones.

The evolution of the gallstones takes the following steps:

1) Swelling of the gallbladder wall
2) Sludge
3) Sludge hyperchoecogenic
4) Little gallstones
5) Gallstones grouped together
6) Gallstones with posterior shadowing.

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PORTAL THROMBOSIS IN NEONATES: US DIAGNOSIS, COLOR DOPPLER AND TREATMENT.
J.P.Pracros, C.H.Morin de Fine, V.Tran-Minh, P.Bourgeois, P.Defferne.
-Portal hypertension is sometimes of unknown origin in children. Umbilical infection (patent or not) in neonates may be the cause.
-6 neonates with sepsis, abdominal swelling or dirty umbilicus and who were proved to have umbilical infection (Staph.A: 4, Strept.B: 1, Enterobacter: 1) had abdominal US (coupled with color doppler in 3 cases). Two of them had had umbilical vein catheter previously.
-US allowed detection of umbilical vein edema and left portal vein obstruction in every case. Right portal vein obstruction was also present in two patients. Portal trunk was free. Others abnormalities were also detected by US: umbilical vein abscess (1), left psoas abscess (2), hip arthritis (2). Portal trunk thrombosis with cavernoma and portal hypertension occurred in two patients. They had no or inadequate heparin therapy. Evolution was favorable in the 4 other patients with adapted heparinotherapy and associated urokinase in the 2 neonates with right and left portal veins obstruction.
-Abdominal US and color doppler are indicated in neonates with suspicion of umbilical infection. Heparin and sometimes urokinase may be required if partial portal obstruction is present, to avoid cavernoma and portal hypertension.
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A PROSPECTIVE STUDY OF ULTRASONOGRAPHY IN THE DIAGNOSIS OF APPENDICITIS
H. Hahn, D. Färber, H. Gloning, F. Höpner, E. Miller, I. Spitzer
The diagnosis of appendicitis is difficult. From Jan - Dec 1989 we studied prospectively the diagnostic accuracy of abdominal sonography in 59 children, thought to have appendicitis and had a surgery. The age range was 2 - 15 y.
Ultrasonography was performed with a high-resolution linear-array transducer (7,5 MHz). In some cases it was necessary to compress the abdomen to displace air filled bowel.
The sonographic results were compared with histology. The sensitivity of ultrasonography was 87 % for all (85 % for appendicitis perforata or appendiceal mass), the specificity was 75 %, the positive predictive value was 97,9 % The rate of unnecessary surgery was only 6,8 %.
We conclude that ultrasonography is a useful aid in the diagnosis of appendicitis.
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IOTROLAN-STUDY OF THE G.I. TRACT IN NEWBORNS AND BABIES
C. Basir, H.J. Kaufmann
The purpose of this study was to determine the acceptance and the tolerance of a new isotonic, non-ionic substance - Iotrolan (Iovist® 300) in newborns and babies and the quality of the obtained studies.
From May 1988 to December 1989 we have performed 82 studies on 76 patients.
Results:
1. This is by far the presently best accepted oral contrast agent for the age group under study. Accepted and swallowed due to its sweet taste even by infants who could not be fed on the wards.
2. No untoward effects could be recognized. No loose bowels were reported.
3. In all patients studied the required diagnostic information could be given.
This new contrast agent offers the following advantages:
1. Since it is isosmolar it can be used without dilution.
2. Due to its taste its acceptance is excellent and no additive is required.
3. Due to its 6 Iodine atoms/molecule better images with very high density are obtained.
4. If it reaches trachea, pleura or peritoneum no ill effect has so far been recognized.
5. Distal small bowel and the large bowel are well visualized due to a lack of dilution. No water or electrolytes are drawn into the lumen.
6. Contrary to barium it presents no problem to the surgeon if after a contrast study the operative procedure requires opening of a part of the G.I.-tract.
7. All these properties result in a far greater readiness of neonatologists, pediatricians and pediatric surgeons to have G.I.-studies performed on very small, very young and very sick newborns and babies.
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PRENATAL DIAGNOSIS OF SACROCOCCYGEAL TERATOMA: EXPERIENCE FROM 12 CASES AND REVIEW OF LITERATURE
G.Puschink-Maurer, D.Filliatrault, L.Garrel, A.Grignon, J. Boisvert
Until now 33 antenatally diagnosed cases of sacrococcygeal Teratoma have been reported, but no more than 6 cases per series. In this study the authors experience with 12 fetal teratomas, diagnosed during the years 1980 - 1988, is reviewed and compared with literature.
Ultrasonic detection of sacrococcygeal teratoma was possible as early as 17 weeks gestational age. No errors were made in interpreting the lesion correctly. One small, intrapelvic, cystic lesion was missed prenatally at 19 weeks gestational age, when no follow up examination was possible. Several tumor features were consistent with previous literature reports: female preponderance, predominant external location, alpha-fetoprotein elevation and polyhydramnios, which, based on our results, might reflect leakage of alpha-fetoprotein containing cyst fluid into the amniotic cavity. In contrast to literature 7 of the 12 tumors in our series were predominantly cystic. None of the tumors showed malignancy, even when elevated alpha-fetoprotein levels, tumor necrosis or immaturity was present. Whereas in literature 20 out of 33 patients died because of abortion or severe pre- and perinatal complications, in our series only 2 children were aborted. All other children with tumor resection after birth are in good health and without tumor recurrence at follow up from 1 month to 7 years after operation. This excellent outcome was due to the presence of expert obstetric and pediatric care and should be considered when counselling the parents.
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Abstracts. 27th Congress of the European Society of Paediatric Radiology
ULTRASOUND IN THE DIAGNOSIS AND FOLLOW-UP OF STAGE 4S NEUROBLASTOMA
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Neuroblastomas (NBL) 4S describes a separate group of patients with neuroblastomas who have localised primary tumour and dissemination limited to liver, skin and/or bone marrow.

We have observed that ultrasound demonstrates a characteristic abnormality of the liver, and that these abnormal appearances persist for some time irrespective of treatment. In order to assess the value of ultrasound in the diagnosis and follow up of patients with NBL 4S we have retrospectively studied 10 patients who presented to this hospital between 1982 and 1989. The diagnosis was made clinically and radiologically and confirmed by raised levels of urinary catecholamine metabolites.

Nine patients had ultrasound examinations at presentation. In seven patients the diagnosis of NBL 4S was correctly diagnosed because the liver was grossly enlarged with heterogeneously increased echogenicity. In one patient the liver was enlarged with a normal echo pattern, and in another the liver appeared normal. Eight patients had adrenal tumours. Four patients were treated surgically and had adrenal tumours removed. Six patients required treatment with chemotherapy and/or radiotherapy. Follow-up ultrasound examinations were obtained in all patients at varying periods from two months to 3 years after presentation.

In all patients ultrasound demonstrated some shrinkage of the liver, but in these cases with an initial abnormal echo pattern, these abnormalities persisted despite clinical and biochemical resolution of disease.

We found liver ultrasound a useful and reliable method for diagnosing NBL 4S. However, we would question its value in follow up of disease.

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ACCUacy OF BARIUM ENEMA IN HIRSCHSPRUNG’S DISEASE OF THE COLON, WITH SPECIAL REFERENCE TO FINDINGS IN YOUNG INFANTS
S. Laurin* and L.-T. Larsson**

The barium enema is diagnostic in typical cases of aganglionosis of the colon (Hirschsprung’s disease, HD). However, its diagnostic value, especially in young infants, has been questioned.

We studied 92 children aged one day to six years with a modified barium enema technique. All had constipation and/or clinical suspicion of HD. The technique (anography) includes slow injection of contrast medium, frequent early filming in the lateral projection and no preparation of the bowel. Conventional diagnostic criteria for HD were applied. Late films (24 to 48 hours) were not included.

HD was correctly diagnosed in 15 of the 92 patients in 64 a correct diagnosis of idiopathic constipation was made. There was no instance of a false negative diagnosis, but in 13 cases a false positive diagnosis of HD was made. A confident diagnosis of HD could be made before 2 weeks of age in 11 of the children, usually within the first days of life. The false positive diagnoses were usually made in older children. Two children had a long aganglionic segment, but none had total colonic aganglionosis.

Before colostomy or corrective surgery the final step in the diagnosis of HD is (rectal) biopsy. Thus it is important to use a radiologic technique that is sensitive and will pick up all cases, especially in infants, whereas specificity is of less importance.

Using the anography technique to diagnose or exclude Hirschsprung’s disease, high accuracy was obtained (86%), with a sensitivity of 100% and a specificity of 83%.

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The Coexistence of Nephrolithiasis and Cholelithiasis in Children
Blickman JG, Herrin JF, Cleveland RH, Jaramillo, DJ

The purpose of this report is to alert physicians to the possibility of cholelithiasis and nephrolithiasis occurring concomitantly after furosemide therapy in the neonatal intensive care unit, with different outcomes.

Four cases are reported in whom renal and gallbladder stones developed after diuretic therapy documented on ultrasound. Nephrolithiasis disappeared as has been described after cessation of furosemide therapy or change to thiazide therapy. The cholelithiasis, however, remained and one of the four patients required cholecystectomy for gallstones containing calcium oxalate.

Conventional causes for cholelithiasis include hyperalimentation and chronic hemolytic states. If these are not present, hypercalcinosis induced by furosemide therapy may be the cause of these gallstones. Careful diuretic therapy may allow prophylaxis with ultrasound monitoring.

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ADRENAL CORtICAL TUMOURS REVISITED
A Boothroyd, C Dicks-Mireaux, M Malone*

Adrenal cortical tumours are uncommon during childhood. Recent pathological literature suggests that childhood tumours require different criteria to adult tumours and that tumour size is the only predictor of malignancy in childhood. 6 children with adrenal cortical tumours presented between 1987 and 1989. All were investigated radiologically using ultrasound and CT. They subsequently underwent surgery and the tumours were examined histologically.

The 6 children, 4 female and 2 male, age range 3 months to 13 years presented with Cushing’s syndrome and/or virilisation. Associated features were hemihypertrophy (8 cases) and non-adrenal tumours (1 case).

In all children the tumours were identified on both ultrasound and CT. They were found to be accurately staged at operation.

The tumours were pathologically graded as benign, less than 150g (4 cases), intermediate, 150-500g (1 case) and malignant, greater than 500g (1 case).

Ultrasound was found to be as accurate as CT and is therefore useful for screening at-risk children and for follow-up.

The imaging size correlated well with the tumour weight and therefore histology.

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Poster Presentations
AGGRESSIVE NEUROBLASTOMA WITH INITIAL PULMONARY METASTASES AND KIDNEY INVOLVEMENT
SIMULATING WILMS TUMOR

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The authors report a case of a retroperitoneal neuroblastoma with unusual appearance. A 3-year-old female was referred to our hospital for a huge abdominal mass. Ultrasonography and CT-scan showed this mass involving the right kidney and encasing the renal vascular pedicle. The inferior vena cava was thrombosed and a thrombus was lying into the right heart ventricule during the diastole. Hepatic metastases and several pulmonary nodules were found at the initial stage.

Serum catecholamine level was strongly elevated and the diagnosis of neuroblastoma was made in spite of these radiological patterns simulating Wilms tumor. The disease progressed quickly and, in spite of chemotherapy, the patient died two months later.

Retroperitoneal neuroblastoma may occasionally spread to the kidney but the right heart thrombosis and initial pulmonary metastases are exceptional. That gives evidence of a very aggressive tumor as histologic findings are of high grade of malignancy.

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MULTIPLE INTRAHEPATIC STONES IN CYSTIC FIBROSIS; A CASE REPORT

J.C. Décarie, L. Garel and F. Lacaille

Gallstones and microgallbladder are frequently seen in patients with cystic fibrosis, however involvement of the intrahepatic bile ducts by multiple stones has been rarely described in Mucoviscidosis (two case reports1,2 and one personal communication3).

We describe the case of a 9 year old girl with cystic fibrosis that presented with severe cholestatic involvement of the intrahepatic bile ducts, in association with gallstones. A similar involvement was seen, almost simultaneously in a 22 year old man that had been treated since his childhood for cystic fibrosis in our hospital, emphasizing the real possibility of intrahepatic stones in cystic fibrosis.

Surprisingly, our 2 patients were only mildly symptomatic, without significant cholestasis, despite the fact that their bile ducts were completely filled by stones. Surgery therefore was not contemplated.

1. Helv Paediat Acta (1980) 35: 277-84 (in German).
2. J. Pediatr. Gastroenterol. Nutr. (1986) Jan 2 (1): 35-40 (in English).
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IRON OVERLOAD IN THALASSEMIA MAJOR: MR QUALITATIVE AND QUANTITATIVE STUDY AT 1.5 T

P. Ferruzzi, A. Castriota-Scanderberg, A. Butturini, F. de C.Hiera, A. Rossi

Iron overload secondary to ineffective erythropoiesis and blood-transfusion therapy bring about many complications in thalassemic patients. Therefore iron storage study is very important in the modulation of the iron-chelation therapy. We report an high-field MR study about 13 thalassemic subjects (aged 10 to 22 years) undergoing blood transfusion and iron chelation-therapy from 1982. Of these patients were splenectomized. The serum ferritin (SF) levels ranged from 1200 to 16000 ng/ml with significant changes on follow-up essays. Axial images of liver, spleen, pancreas, bone (iliac crest) and heart were obtained using T1 (TR 500 TE 30) and T2 (TR 1500 TE 100) SE sequences. Qualitative analysis was performed at different anatomic sites in order to point out the morpho-structural changes (hepatochromatosis, splenic focal lesions, congestive cardiopathy with dilation of left cavitation, bone changes) in relation to the disease. Quantitative measurements of SE signal intensity were determined using operator-defined ROI within the different anatomic sites at both repetition times. Statistical analysis was performed using linear regression equations and Student test. The results obtained demonstrate: an inhomogeneous distribution of iron storages in the body, not determinable on the basis of clinical data or with SF levels; a linear negative correlation between the decrease of hepatic SE signal intensity and SF levels; no significant correlation between SF and SE signal intensities of other anatomic districts - the capability of MRI to perform an accurate morphological evaluation.

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GASTRIC EMPTYING OF DIABETIC CHILDREN MEASURED BY ULTRASONOGRAPHY

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Gastroparesis is part of the spectrum of gastrointestinal complications present in diabetes mellitus. Diabetic gastric stasis may be asymptomatic. The cross section of the gastric antrum, corresponding to the sagittal plane passing through the anterior mesenteric artery, presents an elliptical shape, so its area was calculated in all children. A standard meal including 125 ml of water and 20 g of wheat flakes was eaten. Measurements were taken before the start of the meal and subsequently at regular 10 min. intervals. The two groups of children (30 diabetic patients and 30 normal children) were homogenous for age (10 - 15 years). Changes in the cross-sectional area of the gastric antrum after the meal in relation to time were evaluated as the ratio between the area at a fixed time (10, 20, 30, 40 min.) and basal value. Diabetic patients were good compensated. There were no statistical differences in all times and so were no signs of gastric paresis.

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INDIRECT RADIONUCLIDE CYSTOGRAPHY: A SENSITIVE TECHNIQUE FOR THE DETECTION OF VESICOURETERIC REFUX

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The detection or exclusion of vesicoureteric reflux (VUR) has classically been with the micturating cystourethrogram (MCUG). Indirect radionuclide cystography (IRC) will detect renal reflux but fails to provide the same detailed anatoniocal information as the MCUG. This study has allowed comparison between IRC and MCUG in 68 children aged 2-14 years.

Number of Renal Units compared

| IRC   | MCUG | TOTAL |
|-------|------|-------|
| N     | 40   | 14    | 54   |
| C     | 9    | 86    | 95   |
| U     |      |       |      |
| G     |      |       |      |

TOTAL 49 100 149

+ = Reflux seen - = No reflux

Renal reflux was detected by IRC in 32% of renal units, while VUR was seen in 36% on MCUG. Taking the MCUG as the gold standard, the IRC has a sensitivity of 74.1% and a specificity of 90.5%. Measurement of the urine voided will provide full bladder volume, bladder residue and renal reflux in cc. Maximum urine flow rate was also calculated in ml/sec. The markedly reduced radiation burden, avoidance of bladder catheterisation, quantification of bladder dynamics and renal reflux as well as the ability to constantly monitor the urinary tract during the entire procedure should ensure that the indirect radionuclide cystography is the examination of choice in follow-up studies in VUR in all toilet trained children.

MORPHOLOGY AND ENDOCRINE FUNCTION OF PANCREAS IN THALASSEMIA MAJOR: PRELIMINARY STUDY USING ULTRASONOGRAPHY

Chrs.Hadjigeorgi, M. Skiakaki, S. Lafoyanidi, K. Aristidou, St. Kosmastriou, V. Ladis

In our department we have examined the pancreas of 120 thalassemic children using the following noninvasive methods: upper abdominal echotomography for morphological study and oral glucose tolerance test for endocrine function. The children have been divided into 3 groups of 30 children each as to the age. Group A: from 1 to 4 years with serum ferritin levels (SFL) > 1500 ng/ml. Group B: from 5 to 8 years with SFL 1500 ng/ml. Group C: from 9 to 12 years with SFL 1500 ng/ml and Group D: from 13 to 16 years with SFL > 2000 ng/ml.

Our results were:

D*: diabetic

|IRC | Echo*** | N** | N* |
|----|----------|-----|----|
|**  | 18       | 18  |    |
|****| 2+        | 25  | 24 |
|****| 12+       | 8+  | 9+ |
|****| 3+        | 3+  |    |
|****| 2+        | 14+ |    |

The examination has allowed comparison between IRC and endocrine function. The results showed a significant correlation between hyperechogenicity and endocrine function. We believe these preliminary data remain to be established with further investigation.

ABDOMINAL WALL MUSCLES INVOLVEMENT IN CHILDREN WITH ACUTE PAIN OCCURRING WITH SCHONLEIN-HENOC PURPURA

M. Hasson ; I. Legrand ; C. Garel

Three children suffering from Schonlein-Henoch purpura (SHP) and who underwent abdomen ultrasound studies for the work-up of acute abdominal pain, showed thickening and swelling of some of their abdominal wall muscles. In every case, these changes were closely correlated to the location of the pain. Moreover, in one patient in whom pain occurred successively at different sites of the abdomen, the changes of the muscles were noticed to exactly follow the migration of the pain. None of these patients had findings nor evolution consistent with an intra-abdominal complication. Each patient recovered uneventfully from their abdominal pain. From these findings, we conclude that:

1. Abdominal pain in patients with SHP may sometimes be related to a specific and peculiar transitory involvement of their abdominal wall muscles, a finding which, to the best of our knowledge, has not been hitherto emphasized in the clinical or radiological literature.
2. When examining a patient with ultrasound in this setting, it seems worthwhile to look for abdominal wall changes with high-frequency transducers (7.5 MHz or 10 MHz) so as to elucidate a possible explanation of the acute abdominal pain.

INFANTILE HEPATIC HEMANGIOENDOTHELIOMA IN A 3 YEARS OLD GIRL

S. Hanquinet, C. Christophe, A. Ferster, Ph. Goyens and N. Perlmutter

Laetitia is a 2-years-10 months old girl admitted to our hospital because of abdominal distension due to liver enlargement. Biological data are normal. Abdominal US shows a large heterogeneous solid hepatic mass without calcification, less echoic than normal hepatic parenchyma. A color and pulsed doppler study reveals an arterial and a venous vascularisation in the mass; however no dilatation of the subhepatic veins or of the hepatic artery is seen. CT reveals a large hypodense mass in the liver and a heterogeneous enhancement after bolus injection of contrast. The hepatic tumor is evaluated by RM and has a decreased signal on T1-weighted image and high intensity signal on T2. weighted image.

Angiography features consist of stretched hepatic arteries and diffuse focal accumulation of contrast without arteriovenous shunting. Radiographic findings are not characteristic for a specific vascular tumor. The diagnosis of hemangioendothelioma is made by biopsy. Due to fast impairment of liver function, a hepatic transplantation is performed. Pathologic examination of the mass shows typical features of an infantile capillary hemangioendothelioma without malignant degeneration.
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NEONATAL ABDOMINAL CYSTIC MASSES: SPONTANEOUS REGRESSION DEMONSTRATED WITH ULTRASOUND
E. Kim, T. Verebésy

With the increased use of sonography prenatal and postnatal detection of neonatal cystic masses has extended, and asymptomatic cystic masses are being discovered. 16 patients with abdominal cystic masses were admitted to the I. Department of Paediatrics, the patients' age ranged from 6 days to 3 months. There were 10 females and 6 males. The diagnosis was multicystic dysplastic kidney in 10 cases, ovarian cyst in 5 cases, enteric duplication in 1 case. The cysts were followed by ultrasound examination in 8 patients with multicystic kidney. In 2 patients who had earlier several large cysts - by the age of 1 year and 18 months, respectively - only one small cyst in each could be observed. Two patients with ovarian cysts were followed by ultrasound examinations and the cysts disappeared within 1 year of discovery.

Our experience and review of the literature suggest that conservative management with sonographic reevaluation is an acceptable alternative to surgical therapy in uncomplicated cases.

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METASTATIC NEUROBLASTOMA: CASE REPORTS OF FOUR PATIENTS TREATED WITH 131 I-META-IODOBENZYL-GUANIDINE (MIBG)
P. Knesewitsch, C.-M. Kirsch, K. Tatsch

Because of its highly selective uptake in chromaffine cells 131I-MIBG allows a specific approach to diagnosis and therapy of tumors of the APUD-System (pheochromozytoma, neuroblastoma, carcinoid tumors, medullary thyroid carcinoma).

Neuroblastoma is the most common, extracranial, solid malignant tumor in childhood. At the time of diagnosis 60 % of the neuroblastosomas show disseminated metastases. Prognosis of neuroblastomas is rather poor, the two year survival rate is reported between 10-20 %. We present our own experience in as yet four patients treated with 131I-MIBG. Nine MIBG-therapies were carried out. The longest course of disease is 11 years, the longest follow up after MIBG therapy is 38 months. The therapies were performed by infusing the patients with 3700 MBq 131I-MIBG, separated in two equal fractions given with an interval of 24 hours. In two patients (20 yrs female, four therapies; 4 yrs male, two therapies) a clinical improvement as well as an objective reduction of metastases was achieved. Two patients died three month after MIBG therapy (3 yrs male, 1 therapy; 3 yrs male, two therapies). Despite marked improvement of the symptoms no objective influence of the MIBG therapy on the course of disease could be noticed in these two patients. So far our results with 131I-MIBG therapy show that MIBG therapy alone or in combination with chemotherapy can lead to a significant and longer reduction of metastases (size and number) in individual cases. In all cases we noticed at least a rapid and marked improvement of the clinical symptoms.

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RARE TYPES OF FOREGUT DUPLICATION CYSTS
B. Lombay, E. Borbas, A. Kiss, K. Borsodi

The primitive foregut is the precursor of both the respiratory and the alimentary tract. Duplications of the foregut may have contact with any segments of the alimentary tract. The lining epithelium may be either gastro-intestinal or respiratory and sometimes both types are found within the same cyst. We present three cases of rare types which caused difficulties in the correct diagnosis.

Case 1. Prenatal and postnatal follow up US scans showed in the retroperitoneum an increasing hypoechoic mass separated from the right kidney. The boy was operated on at three months of age and an "enterocyst" was found which was lined with gastric mucosa by histology.

Case 2. Two-year-old boy was admitted with recurrent obstructive bronchiitis. Chest films showed a round soft tissue shadow behind the heart. It was thought to have infectious origin. CT scan was performed two years later which revealed a mass in the posterior mediastinum. At surgery an enterogenic cyst associated with extralobar pulmonary sequestration was found. Histology: parechymal cyst lining with fetal epithelium.

Case 3. 9-year-old boy was admitted with "abdominal trauma". US revealed a left sided hydronephrotic kidney and a cystic like mass in the retroperitoneal region. At surgery UP obstruction but no retroperitoneal cyst was found. Repeated US scans kept showing an increasing cyst. At reoperation four years later, a cyst was found in the stomach wall lined with bronchogenic epithelium by histology.

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CONGENITAL SEGMENTAL ABSENCE OF INTESTINAL MUSCULATURE PRESENTING WITH DUODENAL NARROWING AND PARTIAL SMALL BOWEL OBSTRUCTION
M. Wagid, A.-I. Tailleyrand, E. Shapiro

Congenital absence of the intestinal musculature is a rare condition presenting primarily as bowel obstruction or spontaneous bowel perforation in the young infant. One previously reported patient, a fourteen month old child, was found to have partial small bowel obstruction associated with a narrowed segment in the small bowel. Our patient, a thirty-two month old child, was admitted to the hospital for evaluation of chronic bowel obstruction. A barium meal study demonstrated a narrowed segment at the juncture of the third and fourth portions of the duodenum plus high-grade partial obstruction of the small bowel. These findings were confirmed at surgery. Histologic examination revealed congenital absence of the intestinal muscularis propria of varying degree in the small bowel; the narrowed segment in the distal duodenum was produced by exaggerated infolding of redundant intestinal mucosa. Our report is the first one describing a contrast examination in this entity as well as the oldest child reported with this condition. The finding of high-grade partial obstruction of the small bowel in a young patient in association with a narrowed segment in the distal duodenum, the jejunum, or the ileum and hypoactive peristalsis should suggest the diagnosis.

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INTRAMURAL ESOPHAGEAL PSEUDODIVERTICULOSIS IN A CHILD.
A. Martijn, J.K.M. van Loon and C.M.A. Bijleveld

Abstracts. 27th Congress of the European Society of Paediatric Radiology

Only 11 pediatric cases of intramural esophageal pseudodiverticulosis (IEP) have been reported since 1960. We present a 12th. case and discuss the pathogenesis. A white girl with severe neonatal brain damage had progressive feeding difficulties since birth. At the age of 1 year a barium swallow revealed only disturbed peristalsis of the esophagus. At the age of 10 years an esophagram showed abnormal peristalsis with ulcerations in the distal esophagus in the presence of an axial hiatal hernia. Massive reflux was present and biopsy showed non-specific chronic esophagitis. Fundoplication was performed. One year later an esophagram showed only disturbed peristalsis. At the age of 12 the feeding difficulties worsened and a barium swallow revealed abnormal motility and a stenosis at the upper half of the esophagus with multiple pseudodiverticula. Biopsy showed no abnormalities. The stenosis was treated with repeated dilatations. Including our case, 7 males and 5 females with IEP have now been described with a mean age of 8 years (8 month-15 years) at the time of detection of the IEP. Six patients had feeding difficulties from early infancy and 4 since a period of 3 month up to 2 years. Stenosis was present in the upper 2/3 of the esophagus in 8 and in the lower 1/3 in 2 patients. In 2 a stenosis was not present. In only 4 cases there was severe reflux. Six patients had motility disorders and in 2 this was not present. Biopsy revealed no abnormalities in 4 cases and aspecific inflammation in 2.

Although in adults IEP is thought to be caused either by inflammation and stasis in the excretory ducts or as a sequela of chronic reflux esophagitis, we think the most important aetiological factor for IEP in children is the abnormal motility of the esophagus.

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PRE-SACRAL CSITIC LESIONS SIMULATING TERATOMA
J. Masel

2 unusual lesions with cystic components arising in the presacral region in small children are presented: a 2 year old boy with constipation and a mass in the left buttock and a 16 month old girl with a fluctuant buttock and perineal mass. The first was a yolk sac carcinoma with major cystic components and the other an infected tail-gut cyst in association with a 7q- syndrome. The pathological and radiological features distinguishing these conditions from presacral teratoma are presented.

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DUODENAL ATRESIA WITH BIFID COMMON BILE DUCT.
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The authors report 1 case of duodenal atresia with bifid common bile duct.

By 25 weeks gestation, a fetal sonogram revealed a duodenal obstruction with moderate hydramnios. A genetic amniocentesis was performed and did not reveal any chromosomic abnormality.

At birth, this baby-boy weighing 2850 g was noted to have bile stained gastric aspirate and the 6-hour upright abdominal plain film showed the classic "double bubble" sign.

Then, this baby-boy was referred to our institution. Surprisingly, the meconium was normal and the 16-hour abdominal plain film showed a large amount of bowel gas. Gas within the gallbladder was also noticed.

An upper GI tract study was performed showing a complete obstruction at second portion of duodenum.

At surgery, a per-operative cholangiography showed a T-shaped common bile duct, one branch to the proximal duodenum, other branch to the distal duodenum. This child was discharged in good condition 5 days after duodenoduodenostomy.

Duodenal atresia with bifid common bile duct is exceptional. Less than 10 cases have been found in the pediatric literature.

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ACUTE PRESENTATION OF PELOISIS HEPATIS = US FINDINGS IN 2 PEDIATRIC CASES
D. Pariente, E. Jacquemin, P. Schmit, S. Tammam, D. Devictor, J. Vahyier, P. Chaumont

Peliosis hepatitis (PH) is a rare change of the liver characterized by multiple cysts blood-filled spaces in the liver. It has been previously reported in adults with chronic illness or long-term anabolic steroid therapy, and only a few cases have been described in children.

In the last 2 years, we have encountered 2 cases of acute and diffuse presentation of PH in a 2 and 5 yrs girls. In both cases no previous history was recorded, and there was sudden appearance of high fever, cytopenia and liver insufficiency. Ultrasonographic findings were identical in both cases showing multiple small hypoechogenic areas progressively involving the whole liver and increasing intrahepatic fluid. The first child died a few hours later during surgery after a dramatic worsening of hemodynamic status and distension of the liver. In the second case the diagnosis was suggested on the US examination, was confirmed by a surgical biopsy, and the child slowly improved under intensive care and massive antibiotic therapy.

Pathogenesis remains obscure, however it has to be noted that in both cases, as in one case reported in the literature, these liver changes were associated with E. Coli pylorophile.

In conclusion we would like to point out this new echographic pattern of liver disease which in a special clinical and biological setting may be suggestive of peliosis hepatitis.

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SONOGRAPHY, THE FIRST STEP IN THE DIAGNOSIS OF GASTROESOPHAGEAL REFLUX (GER)?

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In 72 children (aged 3 weeks to 36 weeks, mean 72 days pp) we used sonography to support the diagnostic process of GER. Sonography was done in all children, 30 of them underwent ph-metry of the esophagus to evaluate the sonographic findings. Some children, who showed unclear findings were additionally examined by manometric or radiological means (6 patients).

We defined 2 main groups of children according to the sonographic findings. Group I (14 controlled pat.) showed no or minimal, "physiological" GER. Group 2 (16 controlled pat.) moderate or severe GER. Using this sonographic distinction we found, comparing ultrasound features to the other established methods (especially pH-Metry in 30 pat.), a sensitivity for the detection of GER in 100%, a specificity of 87.5%.

In spite of the small number of controlled patients we propose sonography as a first step in diagnosis of GER as sonography does not molesed the babies and seems to bring sufficient diagnostic hints.

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PRACTICAL SONOGRAPHIC EVALUATION OF SPLEEN SIZE IN INFANTS AND CHILDREN

R.K. Rosenberg, R.J. Markowitz, H. Kolberg, C. Park, A.M. Bubard, R.D. Bellab

Currently available methods for assessing spleen size are either subjective, radiation-dependent, time-consuming and/or complicated to perform; we established a set of guidelines for spleen size at different ages using a simple reproducible ultrasound method. 155 patients, NB to 19 years, were examined by routine abdominal US because of abdominal and/or pelvic problems unrelated to the spleen. Patients were included only if they had no history of hepatic/splenic disease, trauma, hematologic, GI or oncologic problems. US of the liver and kidneys was sufficient diagnosis as sonography does not molesed the babies and seems to bring sufficient diagnostic hints.

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PERCUTANEOUS GUIDED BIOPSIES OF NEUROBLASTOMA (CONTRIBUTION TO THE PROGNOSTICAL EVALUATION)

P. Thiesse*, P. Kaemmerlen*, E. Bouffet*, V. Combaret*, B. Fontanier*, O. Wang**, T. Philip*, M. Favrot*, P. Jonas*

International criteria for diagnosis of neuroblastoma require "an unequivocal pathological diagnosis made from tumor tissues by standard methods or bone marrow containing unequivocal tumor cells and increased urinary catecholamines metabolites" (J. Clin. Oncol. 6: 1874-1881, 1988). Surgical biopsy is then mandatory if bone marrow is clear and also useful if bone marrow is moderately involved, to determine N-Myc amplification level. However the risk of haemorrhage is important during surgery before induction therapy in neuroblastoma. So as to escape this surgical risk, in a prospective study of 11 consecutive suspected cases of neuroblastoma, we performed ultrasound guided percutaneous fine needle (22 G) biopsies of the tumor. These punctures were carried out during a few minutes' anesthesia (atropine sulfate 0.01 mg/kg; diazepam 0.5 mg/kg; ketamine 2 mg/kg i.v.). No complication, especially of haemorrhagic type, occurred.

1) With an average of 2 consecutive punctures, a sufficient number of cells was obtained to confirm the diagnosis by cytological and immunological analysis; the average number of mononuclear cells was of $5 \times 10^6$ (average 80% malignant cells, range 50-95%).

2) The N-Myc amplification analysis, as a prognostical evaluation, was performed for the last 8 cases. These preliminary results show that this less aggressive method allows a cytological diagnosis and the N-Myc amplification analysis on these samples. For routine analysis and clinical purpose, there is no obvious advantage to obtain histological analysis of the tumor with a surgical biopsy rather than using our technique.

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TYPE I RECTAL DUPLICATION: ASSOCIATED ABNORMALITIES AND ULTRASONIC DIAGNOSIS.

A.G. Wilkinson and G.M.A. Hendry.

Type I (partial) duplication of the rectum is a rare condition which in most reported cases does not occur in association with other congenital malformations. Complete (type II) duplication of the colon is often associated with duplication of other hindgut structures. We describe three cases of type I rectal duplication, two of which had duplication of other structures; the first had a free supernumary pelvic kidney, the second had duplication of the bladder, urethra and vagina. The third case had no associated malformations but was unusual because the duplication cyst lay anterior to the rectum, and unique in that the diagnosis was made preoperatively by ultrasonographic examination.

The theories of rectal duplication are discussed. These unusual cases suggest that the embryological abnormalities leading to complete and partial rectal duplication may be more closely related than previously believed. Ultrasound is the method of choice in diagnosing duplication cysts of the rectum.

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PARENTERAL NUTRITION AND CHOLESTASIS IN INFANTS: A SONOGRAPHIC - CLINICAL STUDY

K.A. Vergesslich, S. Toussofrazzèh, M. Rosenkranz, M. Keninger, W. Panhold and A. Pollak

To assess the diagnostic accuracy of sonography in evaluation of the biliary system during parenteral nutrition (PN), a prospective study was performed in 20 premature infants with various causes of respiratory insufficiency. The infants were randomly assigned into 2 groups receiving compositions of PN differing in their amino acid content. Group I (n=11, mean GA 32.3 weeks) received PAEDAMIN® R, group II (n=9, mean GA 31.8 weeks) received VAMINOLAC® R. All infants were additionally fed with pooled human milk (1ml/bid to 40ml/axd). Over a period of 20 days each infant was examined 5 times. The study protocol included sonographic assessment of size and content of the gallbladder as well as evaluation of the bile ducts. In addition, direct bilirubin and alkaline phosphatase were determined as representative laboratory parameters.

Throughout the study, gallbladder size remained within normal limits (mean length 19.4 cm group I, 20.6 cm group II), moreover no dilatation of the bile ducts was noted. However, 9 infants in group I (90%) and 5 infants in group II (55%) exhibited echogenic collections within the gallbladder interpreted as sludge. Concomitantly, a rise of direct bilirubin and alkaline phosphatase was detected.

Our findings indicate that different amino acid content of the infusate seems to have a different effect on the lithogenic index. Sonography appears to be an excellent means to evaluate the biliary system and should therefore be integrated in the monitoring of premature infants on PN.

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IMPACT OF AN ON-LINE MOTTLE REDUCTION DEVICE IN FLUOROSCOPY ON IMAGE QUALITY
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Improvement of image quality in respect of radiation dose is one of the aims of paediatric radiology. On the occasion of X-ray- and image intensifier tube (23cm) replacement of our fluoroscopy machine (Diagnost 70) we installed an on-line mottle reduction device (SR 100). It reduces the noise in the television chain. It effects only the fluoroscopic image but not the 100 mm spot film. We studied its impact on image quality (contrast and radiographic sharpness). The standard dose measured at the image intensifier entrance was 15 Gys, 30 Gys respectively. For these studies we used an homogenous lucite block (to produce scattered radiation) an aluminium stepped wedge and a linear lead grid with variable spatial frequency. The fluoroscopic scenes were recorded on a video tape (U-matic) for repeated revision and documented on film using a video camera (Matrix). Results: Video contrast was visibly enhanced, the fluoroscopic image showed clearly less mottle; detail recognition was reduced from 1.2 to 1.0, 1.0 to 0.8 line pairs/mm respectively. The device delivers a pleasant fluoroscopic image with higher contrast and less mottle. Only a detailed examination reveals a loss of detail recognition. The device allows no substantial dose reduction.

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LOW-DOSE DIGITAL SPOT FILM IMAGING AND VIDEOFLUOROSCOPY IN PEDIATRIC RADIOLGY
L.W. Young, W.R. Hodrick, T. Keaveny, R.A. Kraus and K. McNell

Videofluoroscopic and digital spot film imaging systems designed to reduce radiation exposure in pediatric radiology are now commercially available. Test results from a special system in each of two fluororadiographic rooms at the Akron Children's Hospital Medical Center characterize radiation dose reduction and other benefits of this system.

The CMCA system consists of a sixth generation image intensifier with Iacson television tube in digital mode. In digital spot film mode the video signal is digitized in 8 bits and stored in a 1024 x 1024 matrix for subsequent processing and hard copy recording. We have measured radiation dose, contrast, and special resolution for each imaging chain.

Decreased radiation dose, increased contrast resolution, and highly acceptable special resolution have been achieved. The Iacson camera has increased sensitivity to low light levels at the output phosphor enabling the image intensifier exposure rate to be maintained at 2.2 MR/min by automatic brightness control in the unmagnified mode during fluoro and simultaneous video-recording. Digital spot film imaging provides a factor of 10 reduction in entrance exposure compared with cassette spot film imaging.

This coordinated fluoro/digital system is an excellent means for achieving low dose videofluoroscopy and high resolution laser hard copy images for study and review.

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POSSIBILITIES OF DSA AT PEDIATRIC PULMONOLGY
D.Y. Kvithevich, S.V. Lysak

Possibilities of DSA in diagnosis of reasons and expressivity breath function disorders were studied in 46 children. Selective DSA was conducted with determination of relative regional lung tissue perfusion and cartographic definition of blood flow according to our worked out method. Contrasting dose didn't rise more than 450 mg of iodine on 1 kg body mass. There were no complications. Angiography and DSA computer (Siemens) were used. Children with lung hypoplasia (1-17 patients), chronic pneumonias (II-18 patients), anomalous development of aortic arch (II-16 patients) and pulmonary artery (IV-4 patients) were observed. The children were of age: up to 1 year - 16 pat., from 1 to 5 years - 10 pat., more than 5 years - 19 patients.

In the 1st group considerable lowering of blood flow in lung parenchyma with small changes in large vessels morphology was determined. Cartographic cases of the second group revealed irregularity of perfusion in affected lung parts. In the 1st and 2nd groups regional blood flow depends on the hemodynamical resistance of arteries. Congenital stridor is often stipulated by anomalous development of aortic arch (3rd group), or pulmonary artery. At the 4th group considerable lowering of strictly lung blood flow was marked with moderately lowered ventilation. So DSA rises diagnostic value in angiography in children emergencies and cartography of regional perfusion makes it possible to evaluate the volume of lung affection.

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RADIOLOGIC DIAGNOSIS OF VASCULAR RING IN CHILDREN WITH CONGENITAL HEART DISEASE BEFORE OPERATION
A.V. Ivanitsky, N.N. Petrova and S.N. Besedin

Diagnosis of the vascular ring in patients with congenital heart disease is difficult. Data of conventional radiologic and ACG investigations in 21 patients with this combination were studied. Age of patients varied from 3 months to 14 years. 8 of them were younger than 1 year.

In 13 cases the ACG diagnosis of double aortic arch (DAA) was made: in 11 - functioning, in 2 with atretic segment of the left arch. In 9 of those patients the diagnosis of functioning DAA was supposed on the basis of radiologic data. In 8 patients vascular ring was formed by patent ductus or ligamentum arteriosum. In 5 with right aortic arch, in 1 with retroesophageal segment of the left aortic arch, in 2 with A. lusoria and left aortic arch. All 21 patients were operated on. In 9 patients with tetralogy of Fallot and DAA an aorto-pulmonary anastomosis was made: in 6 from the part of dissected left arch, in 3 from the left subclavian artery with division of the left arch. In the remaining 12 patients an intracardiac correction of the disease with separation of the vascular ring was made: division of the left arch in DAA (4 patients), division of the patent ductus or ligamentum arteriosum (8 patients). Conclusion: precise diagnosis of the vascular ring is possible by combination of the radiologic and ACG investigation and it determines the surgical tactic.

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RATIONAL USE OF IMAGING MODALITIES IN THE DIAGNOSIS OF VASCULAR RINGS
M.T. GYEPES and D. BETHENCOURT

This presentation will echo the theme of the post-graduate course, as it relates to Vascular Rings. We will stress the importance of early recognition, and emphasize the key role of the first line imaging study, i.e. the esophagram. We shall discuss, briefly, conventional arteriography, DSA, CT and MRI. The presentation will be completed with a surgical videotape, which will help to define the usefulness of the various imaging modalities from the therapeutic perspective.

Our conclusion is, that while modern imaging techniques are elegant exercises, their use is largely optional prior to surgery.

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VIDEO DEMONSTRATION OF AN ATRIAL MYXOMA - ULTRASOUND IN COMPARISON WITH CINE-MR CAPABILITIES
M. Reither

Magnetic resonance imaging (MRI) is a new technique that permits noninvasive imaging of the heart. It does not require the use of ionizing radiation or contrast media. MRI of the heart offers the advantages of the natural contrast between the blood pool and cardiac structures, because flowing blood produces minimal MR signal; high soft tissue contrast, enabling sharp delineation of myocardium, pericardium and pericardial fat; and the ease of synchronization of pulse sequences to a fixed segment of the cardiac cycle.

Ultrasound (US) of the heart provides some of these advantages too. Moreover it is a cost-effective bedside modality and facilitates the evaluation of hemodynamic patterns by color Doppler.

Thus both methods are useful for visualization of morphology and function of congenital and acquired heart diseases. Concerning intra- and para-cardiac masses MRI is very helpful demonstrating presence, location and extent of the mass, in some cases more clearly than US because of its larger field of view. Cine-MR allows imaging of hemodynamic disturbances related to changes of intraluminal signal intensities due to different velocities of blood flow at a given cross-sectional area.

The capability of MRI to measure blood flow has been only partially explored. To give some impressions of these possibilities an ultrasound and cine-MR study of an atrial myxoma is given.

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3-D RECONSTRUCTION OF CARDIAC MR IMAGES
K. E. Fellows, P. M. Weinberg, A. J. Chin, E. A. Hoffman

Since 1987, 3-dimensional (3-D) reconstruction of the heart and great arteries has evolved at CHOP using commercially available software (Analyze) and our own development (Vida). Over 50 patients with complex congenital heart disease and aortic arch anomalies have been studied. Shaded surface displays for cardiac anatomy, realtime cardiac function, central pulmonary arteries, aortic arch and branches, and vascular-tracheal-esophageal relationships are now possible.

Clinical usefulness has been demonstrated for definition of complicated spatial relationships between the ventricles and great arteries and between mediastinal airways and the great arteries.

Potential benefits are improved anatomic and physiologic data, and enhanced display for teaching. The 3-D images can be sliced at any angle; imaging time may be reduced because acquisition in multiple views will be unnecessary. Rotational video display enhances the 3-D effect.

Present limitations are intensive physician involvement and 3 hour reconstruction time. The project aim is an on-line, real time 3-D reconstruction of MR, CT and possibly ultrasound images.

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COMPARISON OF PARAMETERS OF DIFFERENT SCREEN SYSTEMS IN CHEST X-RAY PHOTOGRAPHS OF CHILDREN
R. Braunschweig, B. Hohberg, C.W. Weisser

Through the replacement of Ca-Wolframate commercial intensifying screens by screen systems on the basis of Rare Earths, a significant improvement of the local resolution capacity, also with higher and highly intensifying screens, can be achieved.

Now as before, chest roentgenography in pediatrics requires both, utmost reduction of the radiation dose by applying highly intensifying fluorescent screens and exact verification of relevant evaluation structures.

In a comparative examination of four different screen systems - Cronox Ortho Fein, Medium, Regular and Quanta 3 - necessary exposure doses for a defined optical density, local resolution and resolution degree of the findings are evaluated. In our conclusions we give recommendations for the routine application of highly intensifying screens in chest roentgenography in pediatrics.

Abteilung für Röntgendiagnostik der Klinik für Radiologie der Eberhard-Karls-Universität, Tübingen, und Firma Dupont, Bad Homburg
EMBOLISATION OF CAVERNOUS SINUS FISTULA IN CHILDREN AND ADOLESCENTS USING A NEW BALLOON-DETACHMENT SYSTEM

K. Helmke, P. Winkler, C. Flüge

A catheter with attached balloon has been used successfully for selective occlusion of arteriovenous fistulas (Debrun et al., 1975). One of the problems with such systems is the forced mechanical detachment of the catheter from the correctly placed balloon. This risks displacement of the balloon, which has been filled with a polymerising substance. We have therefore developed a catheter-balloon system which allows thermal detachment of the balloon from the catheter (Helmke et al., 1981). A filament integrated in the tip of an outer catheter used for detachment is heated electrically until the melting point of the inner catheter is reached. Both catheters are then removed.

We have therefore developed a catheter-balloon system described above. A primary selective occlusion of 15 CCF was achieved. Early recurrence of fistula occurred in two patients, making necessary complete interventional occlusion of the internal carotid artery at the fistula. 13 patients treated successfully were examined one to seven years following selective treatment. Clinical examination, Doppler sonography and angiography demonstrated no further recurrences of CCF, indicating long-term success of selective interventional treatment in these cases.

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References: Debrun et al., Neuroradiology 9 : 9, 1975
Helmke et al., Acta Neurol Scand 60 : 87, 1981

EMBOLOTHERAPY OF THE HEAD AND NECK: A NINeteen YEAR EXPERIENCE

R.B. Tobvin, W. Ball, B. Ey, and C. Becker

The indications for vascular intervention have dramatically increased. Embolotherapy has become increasingly important as a primary treatment for intracranial and extracranial vascular abnormalities and as an adjunctive therapy to reduce blood flow prior to surgery. The purpose of this report is to demonstrate the effectiveness and indications of embolotherapy in the head and neck in the pediatric population.

Patient records were retrospectively reviewed. 146 vascular interventions were performed in 109 children ranging in age from 0 to 20 yrs. Of the 146 procedures, 71 involved the head and neck. Indications include facial and brain AVM's (22 patients/38 procedures), tumor vascular resection (15/4), veins of Galen malformations (27/7), cavernous carotid fistulas (2/4) and miscellaneous (1/8). A variety of embolic agents including Gelfoam, Ethibloc coils, detachable balloons, absolute alcohol and tissue adhesive were utilized.

The goals of embolotherapy vary depending upon the indication(s) for the procedure. Palliation and control of AVM's was achieved in most instances leading to cosmetic and functional improvement. Control of facial growth AVM's was achieved after multiple distal embolizations. This approach was selected so that the vascular bed could be gradually reduced without ischemic or paralytic complications. This was successful in all cases. Those embolization limited intra-operative blood loss and subjectively reduced the tumor volume in all 13 cases. A variety of embolic approaches were utilized in 5 neonates with vein of Galen malformations (4/7), cavernous carotid fistulas (2/4) and miscellaneous (1/8). A variety of embolic agents including Gelfoam, coil packs, detachable balloons, absolute alcohol and tissue adhesive were utilized.

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CAVERNOUS HEMANGIOMA IN CHILDREN. PERCUTANEOUS SCLEROTHERAPY WITH ETHIBLOC

J. Dubois, G. Sebag, F. Kuntz, V. Tach, L. Pignard, S. Camara, F. Brunelle

Cavernous hemangioma or phlebangioma in children represent a difficult problem. Surgery is difficult, often limited and carries a high risk. The choice of optimal therapeutic method depends on the diagnosis of nature and extent of lesion. MRI and direct vascular percutaneous opacification are the examination of choice. We present 35 children (1 year to 18 years) with cavernous hemangiomas treated by percutaneous thromboembolization with Ethibloc.

Under general anesthesia, direct puncture of the mass is performed and opacification allows measurement of the volume of the mass. The same volume of Ethibloc is then injected under fluoroscopic control.

Clinical evaluation of the residual mass is performed 1 month later. Surgery when necessary is then performed and consists in resecting the thrombosed angiomatous mass. Ethibloc seems to represent the treatment of choice for cavernous hemangioma in children either combined with surgery or as the only treatment in selected cases.

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CATHETER TREATMENT OF INFANTS WITH LARGE SYSTEMIC-PULMONARY ARTERIAL COLLATERALS AND CONGESTIVE HEART FAILURE

P.E. Burrows, L.N. Benson, S.H. Chuang

Five infants under six weeks of age underwent catheter occlusion of large systemic-to-pulmonary artery collaterals for the treatment of congestive heart failure. Four of these patients had Scimitar syndrome with arterial supply to the right lung from the pulmonary artery and large anomalous systemic collateral arteries. The fifth patient had pulmonary artery atresia with VSD, multiple large systemic-to-pulmonary arterial collaterals, and confluent central pulmonary arteries. Embolization was carried out via percutaneous catheterization of the left internal artery in three infants and the femoral artery in two. No complications occurred at the arterial puncture site. Two patients underwent Embolization of arterial collaterals in two sessions. A total of 8 systemic collateral arteries were occluded using detachable balloon (3), steel wire coils (4) and tissue adhesive (NBCA) (1). One of the patients with Scimitar syndrome had stenosis of the anomalous pulmonary vein which was treated with balloon dilation and stenting (Palmaz stent) during the same procedure as the embolization.

All patients had rapid, marked improvement in the congestive heart failure after occlusion of all, or the majority, of the anomalous systemic arteries. The one patient who did not respond had Scimitar syndrome with diaphragmatic hernia and congenital absence of the right lung. He underwent surgical thoracotomy and ligation of the anomalous arterial supply to the right lung.

In conclusion, transcatheter techniques are highly effective in the treatment of congestive heart failure in infants, and are safe, in the absence of associated lung sequestration.

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ANATOMY OF THE COLLATERAL BLOOD SUPPLY IN PULMONARY ATRESIA
PREDICTION FOR TRANSCATHETER EMBOLIZATION
S. Toma and P. Tax

Major aortopulmonary collateral arteries accompanying pulmonary atresia with ventricular septal defect complicate hemodynamic conditions and aggravate the treatment. Angiographic study of anatomy of these collaterals in 42 children detected the relatively constant variation of their number, origin and connection. Three of these isolated collaterals leading to segments of the upper and lower lobes of the right lung or to the left lung can be closed by interventional embolization providing sufficient blood flow in the pulmonary arterial bed in both lungs is maintained. Interventional embolization is an integral part of complex surgical treatment. It contributes to full focalization of pulmonary blood supply. Based on this analysis 3 children were treated successfully by the described method. Gianturco coils or detachable balloons were used.

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BRONCHIAL ARTERY EMBOLIZATION FOR MASSIVE HEMOPTYSIS IN CYSTIC FIBROSIS.
M. Meradji, S.G.F. Robben

Massive hemoptysis is a potentially life threatening complication in patients with cystic fibrosis. Therapeutic bronchial artery embolization is a preferable approach in most of such conditions. In a period of 10 years 10 patients, 6 males and 4 females ranging in age from 9 to 20 years underwent bronchial artery embolization because of severe hemoptysis. After selective catheterization of 2 or more bronchial-arteries, Ivalon (polyvinylalcohol) in all cases was used. Immediate cessation of bronchial bleeding following embolic procedure was achieved in 9 of 10 cases. Because of severe recurrence within 2 years the embolization procedure was repeated in 2 cases successfully, there were no neurologic or other major complications observed. The clinical follow up in this patient-material ranged from 1 to 9 years. The diversity of the broncho-pulmonary vascular anatomy in these patients will be discussed in addition the clinical problems and angiographic technique will be reviewed.

In conclusion bronchial artery embolization is an alternative and useful method for treatment of severe hemoptysis by cystic fibrosis.

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Poster Presentations

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MRI MEASUREMENT OF SMALL STRUCTURES: A PHANTOM STUDY
V. Bonnetrot, M. Argypopoulou, J. Baraton, J.P. Jais, D. Lafrenand

In children accuracy of MRI measurement of small structures is important to determine the normal size of organs, such as spinal cord, pituitary gland, corpus callosum, etc....

To solve theoretical and practical problems two phantoms of Plexiglas filled with a copper-sulfate solution, depicting small round and square objects, were imaged at all field strengths used. The digital images were independently measured each of these high contrast images, in several directions with different interpolated magnification factors.

Isotropy was obtained in all circumstances, but image shape differs from object shape when size is smaller than twice the pixel size.

As the 256 matrix image is displayed on a 512 matrix, the smallest measurable value $E$ is half a pixel size, that is 0.5 mm in our study. Accuracy measurement is then defined as the object size plus or minus 0.5 mm.

Accuracy was expressed as the percentage of correct measurements: it was, for round objects with oblique measurements 70% without magnification ($E = 0.5$ mm), 92% for a magnification factor of 2 ($E = 0.25$ mm), 100% with a magnification factor of 4 ($E = 0.125$ mm).

Measurement of small structures should then be made on a 4 times magnified image.

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DIGITAL LUMINESCENCE RADIOGRAPHY (DLR) IN THE DIAGNOSIS OF PEDIATRIC HIP DISORDERS
T. Hilbertz, H. Schedel, M. Mayr, U. Fink, T. Pfeiffer

Undoubtedly US is the method of choice in the detection of pediatric hip disorders. Nevertheless conventional radiography can not be avoided in selected cases. It was our aim to evaluate the capabilities of DLR in these patients.

In the first five children we obtained a conventional and a DLR radiogram by putting the DLR screen behind the conventional film-screen system with only one X-ray exposure. The next 50 patients underwent DLR examination alone. Different aspects of image quality were analysed by three independent observers. The results were compared with those obtained from 50 conventional radiograms of the year 1988. Moreover dose measurements were performed in several patients.

Dose measurements demonstrated a possible dose reduction of at least 50% without any essential deterioration of image quality. In most cases contrast turned out to be superior on DL radiographs, whereas spatial resolution was a little bit inferior. Both items resulted in a comparable image quality of DLR and conventional radiographs. Due to the postprocessing capabilities of DLR double examinations can be avoided. DLR seems to be able to replace conventional radiography especially in pediatric radiology.

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VOLUMETRY OF THYROID GLAND AT CHILDREN AND JUNIORS FROM PRAGUE 10 WITH THE USE OF REAL-TIME SONOGRAPHY

J. Zikmund - V. Brychnáč

150 healthy children from the Prague region No. 10 were sonographically examined in order to establish the normal rate of volume. The age limit was from 5 days to 18 years. All the children were considered healthy according to their anamnesis, clinical examination and the newborn babies also to their laboratory tests. They were examined without premedication, lying down on their backs with the heads in hyperextension. The examination was carried out by one examiner with the help of the apparatus Ultramark 4 with the use of sector mechanical sonde with 7,5 MHz frequency under standardised conditions. The thickness, width and height of each fold were measured three times. The volume was calculated using the formula a. b. c. 0,479 (Brunno). The results are given in the following chart.

| age (years) | volume (ml) |
|------------|-------------|
| boys       |            |
| girls      |            |
| new-born babies | 0,63 | 0,62 |
| up to 1 year | 0,88 | 0,87 |
| 1 - 3      | 1,47 | 1,87 |
| 3 - 6      | 2,13 | 1,89 |
| 6 - 9      | 2,75 | 3,15 |
| 9 - 12     | 4,03 | 3,63 |
| 12 - 15    | 4,69 | 6,97 |
| 15 - 18    | 9,91 | 8,13 |

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