SESSION 1 - NEURORADIOLOGY

1-01 Utility of MR, 1H-MRS, MR angiography and diffusion in the evaluation of brain death
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Aim: to evaluate the importance of MR (spectroscopy, angiography, and diffusion) in the evaluation of brain death. Material and Methods: we have studied 3 children affected by severe hypoxic-hypoaemicencephalopathy with conventional MR (SE T1wi axial and sagittal, FSE T2wi axial and coronal), 1H-MRS (single voxel 8 cm3 at level of basal ganglia and white matter with PRESS sequences, TE 40,270,135), diffusion acquisitions (b value 800-1200) and MR angiography (ToF) with evaluation of venous and arterial flow. Results: in all patients we have found the following data: severe brain oedema with hypointensity in T1wi and hyperintensity in T2wi of the brain white matter, lack of subarachoid spaces, signal alterations of brainstem and of the basal ganglia, absent intracerebral blood flow, and elevation of lactate peak and reduction of NAA peak. ADC values are reduced with different regional distribution. Conclusions: MR angiography, diffusion and spectroscopy can help in the brain death.

1-02 Brain perfusion in childhood: evolution with age assessed by quantitative perfusion-CT
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The purpose of this study was to assess age-related variations of quantitative cerebral perfusion-CT results in 75 children, aged 7 days to 18 years. These patients were admitted in our institution for contrast-enhanced cerebral CT. Only those children, whose conventional cerebral CT and clinical/radiological follow-up including further investigations were normal, were enrolled in this study (53 out of 75).

The average regional cerebral blood flow (rCBF) amounts to 40 [ccx100g-1xmin-1] for the first 6 months of life, peaks around 130 [ccx100g-1xmin-1] at the age of 2-4 years and finally stabilizes around 50 [ccx100g-1xmin-1] by the age of 7-8 years, with a small increase of rCBF values around the age of 12 years. Specific evolution patterns with respect to age were identified in the different anatomic areas of the cerebral parenchyma, which could be related to the development of neuroanatomic structures and to the emergence of corresponding cognitive functions.

Quantitative perfusion-CT characterization of brain perfusion shows specific age variations. Brain perfusion of each cortical area evolves according to a specific time course, in close correlation with the development of cognitive functions.

1-03 Intracranial Vascular Anomalies (ICVA) in patients with fronto-orbital Lymphatic Malformation (LM)
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Retrospective review of 33 patients (age range: from neonatal period to 39.2 years) evaluated for orbital LM between 1953 to 2002. ICVA are present in 69% of children with fronto-orbital LM including DVA, DAVM, CCM and intraventricular arteriovenous malformation, cerebral hemiatrophy, sinus pericranii, focal cerebral atrophy and dural enhancement. We speculate common embryonic origin between LMs and ICVA.

Detection of certain ICVA (dural aVM) during initial evaluation for orbital LM is important. The initial radiological study should evaluate both the orbital LM and the brain.

1-04 Sacral dimples and masses – Which babies need to be investigated?
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Spinal cutaneous stigmata such as sacral dimples or haemangiomas or masses may be associated with spinal dysraphism, which can be detected by ultrasound in the neonatal period. We aimed to assess which type of cutaneous stigmata is most likely to be associated with spinal dysraphism. The records of neonates who underwent spinal ultrasound between August 1997 and June 2002 were reviewed. The indications for, and the findings of the ultrasounds were recorded. Spinal ultrasound was performed on 93 babies of whom 83 had cutaneous stigmata. The commonest dorsal cutaneous lesion is the simple dimple and this is associated with a low risk of spinal dysraphism. The most common dorsal cutaneous lesion is the simple dimple and this is associated with a high risk of spinal dysraphism. Masses are associated with a high risk of spinal dysraphism.
1-05 A comparison of MRI and cranial ultrasound findings in the preterm infant

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We aimed to compare the cranial ultrasound and MRI findings in a group of preterm very low birth weight babies, with particular reference to any evidence of periventricular leukomalacia (PVL). We retrospectively reviewed the imaging findings in a group of 27 babies, all of who were premature (<34 weeks gestation), and of low birth weight (<1500g). All patients underwent cranial ultrasound within 72 hrs of birth and at regular intervals subsequently. MRI scans (axial T2, axial T1 inversion recovery, sagittal T1 and diffusion sequences) were performed at term.

Of 27 babies, 20(74%) had both normal MRI and ultrasound scans. Similar abnormal findings were seen on MR and US in 3 patients (11%). There were four patients (15%) in whom additional findings were seen on MR. One infant had unilateral abnormal echogenicity in the cerebellum on US. MR showed bilateral cerebellar atrophy. One patient was noted to have intraventricular blood on MR. One had an area of abnormal signal in the periventricular white matter, another in the head of the caudate nucleus.

Our study showed an agreement rate of 85% between both modalities. Cranial ultrasound compares well with MR at term for detecting significant intracranial pathology in preterm babies.

1-06 MR findings of acute disseminated encephalomyelitis (ADEM) in children

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Although ADEM, uncommon inflammatory demyelinating disease of the central nervous system in children, is classically considered a white matter disease, gray matter involvement is not uncommon. We reviewed 62 MR examinations of 21 patients for the distribution of lesion and characteristics of MR findings. Locations of lesions were analyzed and signal abnormality of the lesions were compared with that of CSF on T2WI and graded as higher or iso and lower ones. All the patients had white matter abnormalities in the initial MR: subcortical white matter (14), deep white matter (11), internal capsule (8), external capsule (1) and corpus callosum (5). Sixteen patients (76%) had foci of increased signal intensity on T2WI in the gray matter: thalamus (16), globus pallidus (14), putamen (10) and brain stem (8). The signal intensity of the lesion was lower than CSF in 14 patients and higher or iso with CSF in 8 patients. On postcontrast image, 7 of 21 patients showed enhancement of some lesions but not all. All of the enhanced lesions were higher or iso signal intensity with that of CSF on T2WI. On follow-up imaging, all patients showed decreased signal intensity and enhancement of the lesions. Seven patients revealed mild brain atrophy and focal high signal intensity on T2WI as a residue.

1-07 Central nervous system metastases in neuroblastoma: radiologic features in 24 patients

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Objective: To describe the radiologic features of CNS metastases in neuroblastoma. Patients and Methods: Retrospective analysis of 434 patients treated for stage 4 neuroblastoma between 1985 through 2000 with a median follow-up of 100 months. Review of neuroimaging (CT/MR) and MIBG-scan at diagnosis and relapse. Results: 225 patients developed disease progression. 24 children had CNS locations: at diagnosis (n=1), at first relapse (n=22) or after bone relapse (n=1). Sites were intraventricular (n=1), parenchymal (n=9), meningeal (n=7) or both (n=7). Parenchymal locations were single (n=7) or multiple (n=9), supra-tentorial (n=12), infratentorial (n=1) or both (n=3). Although nonspecific, some particular patterns were observed: hemorrhagic (n=8) or cystic (n=3) parenchymal lesions, and localized supra-sellar meningeal locations (n=3). MIBG-scan was positive in the CNS in only one third of the cases. Conclusion: CNS metastases in neuroblastoma were observed in about 10% of all relapses. Various radiological patterns were associated to these locations which occurred mainly at first relapse.

1-R1 Neonatal Necrotising Meningo-encephalitis: a new diagnosis?

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We wish to present a case of fulminant and rapidly progressive meningitis. A 17 days old baby presented with hypothermia and fits. Diagnosed as septicaemia and meningitis, a lumbar puncture was performed which showed a raised white cell count but no organisms. An initial US showed diffuse increase in parenchymal echogenicity suggestive of cerebral oedema. However over the next few hours the anterior fontanelle started bulging rapidly and a CT was done. This showed dramatic changes of extensive intracranial air distributed throughout the subarachnoid space, within both cerebral and cerebellar hemispheres, brain stem and within the cerebral vessels. In view of the extensive intracranial damage, life support was withdrawn with parental consent. Meanwhile cultures from the CSF grew gram negative rods, later proven to be Citrobacter Diversus. Citrobacter infections, although uncommon have been reported in the past to cause large intracranial abscesses. This case is unique due to the diffuse involvement of brain substance and meninges rather than discreet abscesses. The post-mortem revealed a friable, macerated brain with extensive haemorrhagic infarction and bubbles issuing from vacuoles in the brain and spinal theca. We wish to highlight this case and propose a new clinical and radiological diagnosis of Acute Necrotising Meningo-encephalitis due to Citrobacter.
 SESSION 2 - FETAL IMAGING

2-01 Fetal imaging: comparison between ultrasound and magnetic resonance imaging

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Compared to US, MRI provides better images of certain fetal structures, including the posterior cranial fossa and lungs. Additionally, MRI might be preferable to US in cases of maternal overweight. References for US fetal anthropometric measurements are used for assessment of fetal growth stage, which is an important part of the antenatal examination. However, it is not clear whether the same references can be used for MRI. Aims: 1) Compare the abilities of US and MRI to represent fetal structures in cases of maternal overweight. 2) Compare fetal anthropometric measurements made by US and MRI. A regional review board ethically approved this study. 50 women who had been referred for routine antenatal US were prospectively included after signing an informed consent. A selection was made so that half of the women included had a body weight of 90 kg or above. At gestational age 20-25 w, both US and MRI were performed on the same day, and measurements were made, including biparietal diameter, abdominal diameter and femur lengths. The MRI sequence was HASTE, and the planes were adjusted according to the fetal position. The successfullness of both US and MRI to represent fetal structures (including diaphragm, bronchi, pulmonary vessels, corpus callosum and brain stem) was assessed blindly. The successfullness of the two modalities was then compared between the higher and lower maternal weight groups.

2-02 A comparative MR and US study on fetal CNS disorders

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Objective: To present the correlation between US and MRI features in fetal brain anomalies. M&M: We retrospectively reviewed 32 fetal brains in 24 pregnant women, whose gestational age ranged from 19 to 36 weeks. Eight of the fetuses were twins with suspected twin-twin transfusion. Fetal MR exams were performed with a 1.5T magnet using a body-phased-array coil and an ultra fast imaging technique. Results: MRI demonstrated additional information in 11 cases (34%). Congenital anomalies assessed with MR were agenesis of corpus callosum (3), pontocerebellar cistern arachnoid cyst (1) and cerebellar vermis hypoplasia (1). In three fetuses with parenchymal cystic lesions on US, MR also discovered hemorrhagic contents allowing the diagnosis of hemorrhagic infarction or hematoma (1 abused fetus). In one case with suspected vascular malformation by US, MR was valuable to show the intraventricular location and associated encephalomalacia. MR was definite to assess a suspected cerebral hypoxic-ischemic lesion in a twin-twin transfusion syndrome. A cerebellar malformation (rhombencephalosynapsis) was missed on MR. Conclusions: Fetal MRI often adds valuable information to US that commonly influences parents counseling and sometimes pregnancy management.

2-03 The role of MRI in the investigation of fetal ocular anomalies

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Background: US of ocular and facial anomalies in the prenatal period is often imprecise. A subsequent MRI of the fetus can be achieved in order to precise the nature of ocular anomalies and to search for associated cerebral malformations. This study was to determine the limits of MRI in the evaluation of the fetal eye and to establish normal values in correlation with the gestational weeks. Materials and Methods: Prospective study in 63 normal fetuses between 26 and 36 gestational weeks. FSE T2 acquisitions were obtained in the 3 planes using a GE Signa 1.5T. Results: Different parameters were measured in order to define microphthalmia, hypotelorism, hypertelorism. T2 sequences permitted to analyze the morphology of the orbit, ocular globe, lens, optic nerve, optic chiasm and lacrimal fossa. Analyzing the oculomotor muscles was more difficult and the hyaloid and ophthalmic arteries were too small to visualize. Normal biometry values were obtained in correlation with the gestational weeks. Many prenatal pathologies can be appreciated on MRI: microphthalmia, anophthalmia, hypotelorism, hypertelorism (midline brain anomalies, holoprosencephaly), hypertelorism (dysostosis, cleft palate), coloboma, lacrimal gland pathologies and ocular anomalies associated with the Walker-Warburg syndrome. Conclusions: MRI is a useful, in complement to US, in the study of fetal ocular disease. There is a linear growth of the ocular biometry in correlation with the gestational weeks. Normal values for the fetal eye were established in the normal fetus.
2-04 Prenatal MRI diagnosis of vein of Galen vascular malformation: prognostic-diagnostic aspects
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The role of our study is to define the importance of fetal MRI in the management of vein of Galen vascular malformation. Between January 1993 and November 2002, ten of these malformations have been studied in our institute using prenatal MRI. In every patient MRI was performed (average 34.6 weeks GA) after ultrasound (average 33.4 weeks GA). Pregnancy was terminated in 7 cases because of brain ischemic lesions and ventricular dilatation. One baby died two days after birth due to the malformation. One neonate has been treated immediately after birth and is now 8 years old and in good condition. In one case the baby is born in good condition and embolization is planned at 1 month of age. Fetopathology exam correlated well with the result of the MRI (8 cases), particularly the encephalic alterations due to the malformation, which cannot be completely evaluated with ultrasound. MRI then enabled us to make a precise prognosis, needed for the management of the pregnancy.

2-05 Fetal cerebral MR in the evaluation of the prognosis in fetuses with IUGR and pathological cerebral Doppler
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1/ This prospective study was designed to look for fetal MR prognostic criteria in fetuses with IUGR and Doppler abnormalities.
2/ A fetal cerebral MR was performed between 27 and 34WG in 49 fetuses presenting with an IUGR and pathological umbilical and cerebral Doppler examination.

Doppler evaluations were periodically repeated. MR included T1 and T2 weighted sequences with measurement of infra and supratentorial biometry, pericerebral spaces and atrial index. Prognostic evaluation included perinatal mortality rate and cephalization index for surviving neonates.
3/ Preliminary results indicate a good correlation between decrease of infra and supra tentorial biometry and both mortality rate and cephalization index.
4/ Fetal cerebral MR is accurate in the evaluation of fetuses with IUGR and Doppler abnormalities.

2-06 Microstructural development of fetal brain assessed in utero by diffusion tensor imaging
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Purpose: To assess in utero maturation-dependent microstructural changes of fetal cerebral white matter using diffusion tensor MR Imaging

Materials and methods: A multishot EPI sequence with diffusion gradient (b=600 s/mm^2) applied in 6 non-collinear directions was performed between 31 to 38 weeks of gestation in 25 fetuses without cerebral abnormality on T1 and T2 images.

Apparent diffusion coefficient (ADC) and anisotropy fraction (AF) were measured in the white matter.

Results: Mean ADC was significantly different in the frontal white matter (1.8 µm^2/ms), genu corpus callosum (1.3 µm^2/ms) and peduncular pyramidal tract (1.2 µm^2/ms).

Significant age-related ADC decrease and FA increase toward term were demonstrated in the pyramidal tract and corpus callosum.

Conclusion: Diffusion tensor imaging can provide in utero a quantitative assessment of the microstructural development of fetal white matter.

2-07 MR Autopsy in fetuses
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Objective: The purpose of this study was to determine whether postmortem magnetic resonance imaging (MR-autopsy) could serve as alternative to necropsy in fetuses and neonates. The value of MR-autopsy in the validation of the obstetric management and in risk counseling for future pregnancies is discussed.

Methods: 10 consecutive, malformed fetuses were examined by postmortem MRI within 24h of delivery. Prenatal ultrasound (US) was performed in all fetuses. Necropsy served as gold standard. Results: MR-autopsy confirmed every US diagnosis responsible for termination. All MRI-findings were confirmed by necropsy. Necropsy gave additional information relevant for risk counseling in two fetuses. Histologic examination corrected diagnosis in one fetus.

Conclusions: MR-autopsy provides valuable information previously only available from necropsy. In parents who refuse perinatal necropsy, the information obtained by MR-autopsy can be used to validate obstetric management and to evaluate the risk for future pregnancies. Necropsy however remains the gold standard.
SESSION 3 - MUSCULOSKELETAL

3-01 Early treatment of X-linked hypophosphatemic rickets attenuates but does not prevent skeletal changes seen radiographically
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We performed a retrospective review of knee and wrist radiographs of 19 XLH patients evaluated at the diagnosis, at the end of 1st treatment year and at the latest prepubertal timepoint available for analysis. Patients were divided into 2 groups based on age at treatment onset: Group 1, <1.0 years; Group 2, 1.0 years). Radiographic findings were graded as normal (0), normal/mild (1), mild (2), mild/moderate (3), moderate (4), moderate/severe (5) or severe (6). Results: Group 1 patients had milder radiographic scores of rickets as compared to Group 2 patients at treatment onset; rickets severity median score was 2.0 (±0.3) (±SE) for Group 1 (mild) and 4.5 (±0.3) for Group 2 (P=0.0002). At the end of the 1st treatment year the median score for Group 1 was unchanged, and improved to 4.0 (±0.4) in Group 2 (P=0.052). At pubertal median age 10.4 years the median scores were respectively 4.0 (±0.5) and 5.0 (±0.7) for Groups 1 and 2 (P=0.27). The degree of severity of rickets at the treatment onset correlated positively with age at treatment onset (r=0.65, P=0.0055): the later the diagnosis the more marked the rickets radiographic changes were. Conclusion: treatment started in early infancy, as compared to treatment initialized after 1.0 year of age, resulted in slightly improved radiographic skeletal outcome but did not completely prevent radiographic signs of rickets.

3-02 US and MR imaging of deep soft tissue masses: efficacy in distinguishing between benign and malignant lesions
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Aim of this study was to assess the efficacy of US and MR imaging in differentiating benign from malignant deep soft tissue masses (DSTM). Lymphangiomas and haemangiomas were not considered in this study. The imaging features of 34 DSTM (18 benign, 16 malign) in 34 patients were analysed. Univariate analysis of multiple individual imaging features (size, site, margins, calcifications, Doppler pattern, T1 and T2 signals, contrast enhancement) and logistic regression analysis of combination of them were done to determine how useful these are for predicting benignity or malignancy. Results were compared with the final diagnosis established by pathologic examination. By quantitative analysis, neither single imaging feature nor combination of features was significantly predictive of benign or malignant lesion. In our experience, the US and MR appearance of DSTM is largely non-specific. Therefore, for most of these masses it is not possible to distinguish benignity from malignancy and biopsy is mandatory.

3-03 Anterior joint capsule of the hip in children: ecocolorDoppler evaluation in healthy and painful hips
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Purpose: To study the normal US patterns of the anterior joint capsule and colorDoppler changes in healthy and painful hip in children. Materials and methods: 133 children (44 symptomatic, 89 asymptomatic), aged between 2 and 7 years, were examined. The US examinations were performed with use of US equipment with 10 MHz transducer, in the supine position with the hip in neutral position. Both right and left hips were examined. The anterior joint capsule was identified, and the thickness of the capsule was assessed. The anterior ascending cervical arteries of the hip were easily identified in all hips. In the 89 asymptomatic patients the mean thickness of the anterior joint capsule of the hip was 4.2 +/- 0.4 mm. In the 44 symptomatic patients the diagnosis was: in 34 patients transient synovitis (TS); in 4 patients Perthes’s disease (PD); in 6 patients no definite diagnosis could be determined. The mean values of RI was: In asymptomatic patients: RI = 0.62±0.4; in patients with TS: RI=0.80±0.7; in patients with PD: RI = 0.68±0.02. Conclusions: Ultrasound is a non-invasive, relatively inexpensive, not employing ionizing radiation technique for accurate visualization of the pediatric hip. RI in patients with TS was significantly higher than that PD and asymptomatic patients.
3-04 One-stop evaluation of adolescent scoliosis with fast Magnetic Resonance Imaging: substitute for plain radiography

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Structural scoliosis is a three-dimensional torsion deformity of the spine. Knowledge of the Cobb angle and axial rotation of individual vertebrae are important for preop planning. Twenty girls (aged 11- 16, mean 13.2) with adolescent scoliosis were included in the present study. The spine from C2 to S5 were imaged with MR acquisition using a 1.5T MR scanner (Sonata, Erlanger, Siemens) with a total acquisition time of 5 minutes 28 seconds. Any intraspinal abnormality and congenital vertebral anomalies were identified. The images were reformatted into true sagittal, coronal and transverse axes (desired orientations) so that the Cobb angle, the sagittal curvature and the axial rotation of the vertebrae around the apex were measured. Three measurements were taken for each angle and there were good inter and intraobserver correlation with insignificant variations (p=0.05). We conclude that three-dimensional MR imaging is an accurate, reproducible, non-ionizing imaging technique that provides detail evaluation of the spinal and intraspinal abnormality, and accurate measurements for preop planning of scoliotic deformity. MR should serve as a substitute for plain radiography for assessment of scoliotic deformity.

3-05 Measuring secondary deformities of the shoulder in obpl children: reliability of three MRI methods

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In this study the interobserver reliability of three established measurement methods to objectify secondary deformities of the shoulder in Obstetric Brachial Plexus Lesion (OBPL) was evaluated. MRI scans of 30 affected shoulders of 29 OBPL children, mean age 1 year 9 months (range 3 months-6.3 years) were used. The reliability of the measurement of glenoid version had a standard deviation of differences (S.D.) of measurements between 5.4 degrees and 5.9 degrees. The reliability of the glenoid form showed a kappa between 0.52 and 0.64, and the reliability of the humeral subluxation hab a S.D. between 7.7 degrees and 12.4 degrees. The measurement methods showed no systematic bias.

3-06 Magnetic Resonance Imaging assessment of exercise induced change in Juvenile Dermatomyositis (JDM)

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Purpose: The study aims to quantify MRI T2 Relaxation Time (T2RT) pre and post exercise in children with JDM and compare with healthy controls. 

M+S: 40 children (age 4 -15yrs, median age = 9yrs) with active JDM (n=10), inactive JDM (n=10) as assessed using the Physicians Global Assessment and healthy controls (n=20), underwent Carr-Purcell-Meiboom-Gill T2RT mapping, pre, immediately post and 60 minutes post physiotherapist supervised exercise programme. Any resultant changes in T2RT were statistically analysed using non-parametric tests. 

Results: Although the absolute T2RT levels were higher in the JDM group [due to muscle inflammation], there were no statistically significant differences in the exercise induced changes between the study groups (p=0.9). 

Conclusion: This study enabled direct comparison of T2RT response in children with JDM compared to healthy controls. The exercise induced changes in JDM patients were similar to control groups suggesting that exercise has no significant adverse effect on T2RT values and is not clinically contra-indicated in these patients.

3-07 CT-Guided Resection of osteoid osteoma: the technique of choice

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CT-guided resection of osteoid osteoma is safer and more effective than other techniques. We investigated its success rate between November 1992 and August 2002 from two sites. 37 subjects (23 male, 14 female) ranging in age from 2.5 to 20.0 years with a mean of 11.6 years and a median of 11.4 years were seen. 21 lesions were in the femur; 13 in the tibia; 2 in the knee; 1 in the fibula, iliac, and scapula. Subjects were admitted as outpatients. Preliminary CT imaging located the lesion and was used for planning removal. A Stinemann pin was inserted into the nidus using a mallet or drill under CT-guidance. A trephine was then placed coaxially and the entire lesion was removed en bloc. Pathology samples were obtained in all cases. 2 subjects (5.1%) had post-operative pain. To date, 36 subjects (92.3%) appear to be cured. One subject (2.6%) had a recurrence that was successfully treated with a second procedure. CT-guided percutaneous removal of osteoid osteoma appears to be the procedure of choice with greater success and fewer complications when compared to surgery or radiofrequency ablation.
3-08 Direct percutaneous Ethibloc injection in the treatment of Aneurysmal Bone Cysts: long term follow-up
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Objective: Long term efficacy of Aneurysmal Bone Cysts (ABC) treatment with Ethibloc. Material and Methods: Eighteen patients with ABC were treated with direct percutaneous Ethibloc injection. No severe complications were observed; three patients had a local leakage of Ethibloc through the injection site self-resolving without complications. Follow-up lasted from 2 to 93 months. Results: seventeen patients showed a remarkable shrinkage of the cystic lesion with cortex thickening. The reduction of the lesion was not satisfactory for only one patient who has been successively operated. Pain disappeared in 12 patients; it persisted in 2 and occurred occasionally in 4 during follow-up. Conclusions: in our experience the direct percutaneous Ethibloc injection is effective in the treatment of ABC and can be recommended as the first-choice treatment after a mandatory histological diagnosis; furthermore scleroembolization does not preclude any subsequent surgical approach. MRI must be considered in all the phases, including follow-up.

3-R1 Fibrodysplasia ossificans progressiva: radiographic findings
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Objective: To demonstrate the radiologic findings of fibrodysplasia ossificans progressiva with emphasis on the importance of diagnosing the entity with imaging. Materials and methods: A review of the clinical radiologic CT, MR and scintigraphic findings in 9 patients with documented fibrodysplasia ossificans progressiva. Results: Typical radiographic findings were seen in all patients. This included heterotopic ossification of the soft tissues and the congenital malformation seen in the great toes. CT findings included soft tissue swelling encompassing multiple soft tissue groups as well as ossification of the soft tissues. Nuclear Medicine scintigraphy confirmed uptake of diphosphonates in areas involved with heterotopic bone formation as well as in the malformed first rays (likely due to mechanical abnormalities). MR demonstrated high signal of the involved soft tissues on T2-weighted images as well as enhancement of the involved areas. Conclusion: Fibrodysplasia ossificans progressiva has imaging findings which can, in many cases, confirm the diagnosis if suspected clinically and in other cases suggest the diagnosis if not suspected clinically. This latter aspect is particularly important as biopsy can, in fact, exacerbate the condition.

3-R2 Frequency of occult skeletal and neurological injuries in children undergoing a skeletal survey for suspected Non Accidental Injury
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The value of routine cranial imaging in children undergoing radiographic examination for suspected Non Accidental Injury (NAI) remains uncertain. Skeletal surveys and cranial Computed Tomography (CT) of 100 consecutive patients with suspected NAI were retrospectively reviewed to determine the detection rate of occult fractures as well as neurological injury correlated with clinical indicators. The value of the routine follow up chest X-ray was also assessed. Occult fractures were detected in 34 patients. 29 follow up chest radiographs were available. In 3 cases (14%) further useful information about dating was obtained and in 1 case rib fractures not visible on the initial film were revealed. 31 pts had an intracranial abnormality demonstrated on cranial CT. 23% (7 patients) of these had no neurological symptoms or signs. 1 patient had a subdural haematoma of differing ages highly suggestive of abuse with no neurological signs or symptoms and a normal skeletal survey. Follow up chest radiograph did not alter the diagnosis in any patient but was helpful in 14% of cases. Routine cranial imaging is advocated to detect occult intracranial injuries, which maybe the only radiological manifestation of NAI.

SESSION 4 - MISCELLANEOUS

4.01 A conceptual approach to clinical research in pediatric radiology
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The history of the development of clinical advances in pediatric imaging is, in many ways, a microcosm of the history of advances in clinical medicine generally. The stages in development are Description, Quantification, Refinement, and Analysis. Recognizing these stages, and where on the spectrum a particular problem can be found, permits us to apply accepted and newly-developed research principles to determine the value of an imaging study, its appropriate use in clinical settings, and the potential hazards associated with it. Using hypertrophic pyloric stenosis as a paradigm, these principles can be shown to provide a framework in which targeted clinical pediatric imaging research can play a vital role now and in the future.
4.02 The "Sharp Edge" sign in conventional radiology - An important aid to perception
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To illustrate the usefulness of sharper-than-normal interfaces on plain chest and abdomen images, often in critical situations. Examples of the sharp edge sign in pneumothorax, pneumomediastinum, and pneumoperitoneum, as well as congenital absence of the pericardium, have been presented to 16 medical students to assess its value in perception and diagnosis. This presentation gives the audience the opportunity to judge sharp-ness of contours in these situations. The students were all able to use the sharpness of contours to perceive abnormality leading to a proper diagnosis. Sharp edges of heart, pericardium, pleura, liver, and structures adjoining Morison's pouch of the peritoneum are included. In particular, free gas in Morison's pouch has sharper margins than gas within bowel loops. The audience hopefully will "see for themselves" the usefulness of the sharp edge sign. Persons learning and practicing conventional imaging can use the perception of sharper-than-normal contours for detection of even subtle pneumothorax and pneumoperitoneum.

4.03 Currarino triad: variability of imaging findings in 23 molecularly geneticaly identified patients
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Purpose: To analyze the variability of imaging findings in patients with molecularly geneticaly proven Currarino triad. Materials and Methods: 23 family members of 5 patients with clinically diagnosed Currarino triad showed mutations in the homeobox-gene HLXB9. Their imaging documents were analyzed retrospectively looking for abnormalities in the sacral bone as well as in the presacral, intraspinal, anorectal, and urogenital region. Results: All and even clinically asymptomatic individuals with HLXB9-mutations had a sacral anomaly. Complete Currarino triad was only found in the 5 „index patients“ and further 3 relatives. Otherwise, one or more of the following abnormalities were detected: anterior meningocoele (12), presacral tumor (11), tethered cord (10), intraspinal lipoma (8), anorectal stenosis/atresia (8), syringomyelia (5), rectal fistula (3), urogenital (2). Conclusion: Currarino triad has to be thought of in all individuals with chronic constipation since early childhood. A sacral anomaly as the imaging index abnormality should be looked for by plain radiography. If positive, further imaging and a molecular genetical search for HLXB9-mutations should follow.

4.04 Feasibility of diffusion-weighted MR Imaging in pediatric abdomen: a preliminary report
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Diffusion-weighted magnetic resonance imaging (DW-MRI) of abdomen is still a technical challenge. We investigate the feasibility of DW-MRI in paediatric population by echo-planar sequences. Eight little patients (mean age 8 years, range 4 months – 12 years old) were examined by MRI of abdomen for studying abdominal focal lesions; diffuse parenchimal disease of abdominal organs were excluded. Spin-echo echo-planar sequence with application of a diffusion gradient (SE-EPI-DWI) was performed other than conventional sequences; apparent diffusion coefficient (ADC) of liver, spleen, pancreas and kidneys was calculated by application of three different diffusion-sensitising gradient (beta value of 300, 600 and 800 mm²/sec). The ADCs at higher beta-value were 1.19±0.36 mm²/sec in the liver, 1.06±0.13 mm²/sec in the spleen, 1.64±0.64 mm²/sec in the pancreas and 1.95±0.18 mm²/sec and 2.03±0.33 mm²/sec in the renal cortex and medullary, respectively. Magnetic susceptibility and motion artefacts made difficult calculation of pancreatic ADC in one case. DW-MRI may be a fast non-invasive technique for studying abdominal organs also in no-cooperative paediatric patients. Further studies need to assess the availability to reduce artefacts.

4.05 Oral pentobarbital is superior to chloral hydrate for infant sedation in MRI and CT
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This study utilized a database of pediatric sedations in order to evaluate the efficacy and safety of oral chloral hydrate (CH) vs. pentobarbital (PB). Because of increased palatability to PB, in 1999 the radiology sedation protocol replaced CH with oral PB for all infants less than 1 year of age. We conducted a review of all infants between 1997-2002 that received oral sedation per protocol with either CH or PB. A total of 1316 infants received oral sedation (985 PB, 331 CH). The mean dosages administered was 50mg/kg CH and 4 mg/kg PB. Age, weight and sex were similarly distributed. Student t-test demonstrates no difference in mean time to sedation: 18 minutes PB and 17 minutes CH (p=0.47). There was no difference in time to discharge between the groups. The overall adverse event rate during sedation was significantly lower with PB (0.7%) vs. CH (4.5%) with p value <0.01. There were significantly less episodes of oxygen desaturation with PB (0.2%) vs. CH (1.6%), p value <0.01. Both medications were equally efficacious in providing successful sedation. This is the first study to demonstrate equal efficacy of both sedatives but a significantly reduced incidence of adverse events with oral pentobarbital.
4.06 The use of nitrous oxide-oxygen mixture (Entonox) for painful interventional procedures in children

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General anesthetic or sedation are often used for painful interventional radiology (IR) procedures in children. These have the disadvantage that they require highly-trained staff, patient fasting and periprocedural monitoring (for example of oxygen saturation). We are performing a non-randomized prospective study to assess the safety, technical success and patient acceptability of the use of Entonox for various painful IR procedures. This technique has been adopted by IR nurses as part of a role extension program in our department. The patient and parents are interviewed by an IR nurse before the procedure, their suitability for Entonox is assessed and consent is obtained. The nurse then supervises the patient’s self-administration of Entonox during the procedure. A questionnaire is given to the patient to complete on the ward the same day. We have used this technique for 22 procedures (including 9 renal transplant biopsies, 5 native renal biopsies and 5 peripherally-inserted central venous catheters). All procedures were successful. Only 9% found the procedure uncomfortable, and 86% stated that they would prefer to use Entonox if they needed to have the same procedure again in the future. Self-administered Entonox appears to be a promising technique in paediatric IR.

4.07 A methodology to find a compromise between patient dose and image noise for pediatric abdominal CT

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The aim of this study is to propose a methodology to define the acquisition parameters of abdominal CT taking into account patient dose and image noise. Weighted CT Dose Index (CTDIw) were measured on a multiple slice CT (MSCT) using three CTDI phantoms (i.e. ø 16, 24 and 32 cm). These phantoms were scanned in a wide range of tube currents and tube voltages using the reconstructed slice thickness of 5 mm and pitch values of 0.75. A dose-image quality compromise was proposed for each test object using the Rose model observer. The CT parameters obtained were used in routine during one year (i.e. 507 standard abdominal examinations). Based on the results of the Rose model, CTDIvol of 6.0, 9.5, 17.0 and 23.5 mGy were proposed for children of various ages: [neonate - < 1 year] [1 - < 5 years], [5 - < 10 years] and [10 - 15 years]. These values represent one third to one half of the reference dose levels published in the literature. None of the clinical examinations justified any dose increase. The proposed methodology provides a way to define the acquisition protocols taking image noise into account. This brings down the CTDIvol values used in routine while keeping an adequate image noise.

4.08 Increased stiffness of the thoracic aorta in patients with Juvenile Idiopathic Arthritis: a prospective study

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Increased incidence of cardiovascular disease has been found in rheumatic disorders. Changes in aortic elastic properties of patients with Juvenile Idiopathic Arthritis (JIA) were evaluated and their relation to inflammation, antirheumatic drugs and traditional cardiovascular risk factors was investigated. Phase contrast MR was performed in 31 patients with JIA and 28 controls to evaluate the aortic distensibility and pulse wave velocity (PWV). Distensibility was lower in patients (mean:10.25; SD:4.18) than in controls (mean: 13.4; SD: 4.99), (p <0.01) and PWV was higher in patients (mean:3.68; SD:1.59) than in controls (mean:1.38; SD:0.54), (p <0.01). A positive correlation of PWV with age was observed in patients (rs = 0.47) and controls (rs = 0.72), p <0.01. A negative correlation of distensibility with age was found in patients (rs=- 0.59) and controls (rs=- 0.63), p<0.01. These results suggest that JIA is associated with increased aortic stiffness that might suggest subclinical atherosclerosis. Early detection and follow up by non-invasive methods may be useful in the prevention of future cardiovascular disease.

4.09 In vitro experiment designed to explain lack of sonographic (US) visualization of catheters in vivo

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Purpose: The objective of the present paper was to study variations of sonographic appearance of catheters (C) in vitro in order to explain difficulties of C visualization in vivo. Materials and methods: Multiple catheters (3, 6.5, 8.5, 9 Fr) were evaluated in a water bath by US, using a 15 MHz linear transducer. Images were obtained longitudinal and transverse to the catheter axis. Catheters were evaluated perpendicularly and then gradually angled up to 45 degrees in relation to the US beam. Results: Catheters were well visualized when the incidence of the US beam was between 78-90 degrees to the catheter, despite catheter’s caliber or material. The catheter’s image became fragmented when the US beam reached the catheter below a 78 degree angle. Although multiple focal zones can improve catheter’s definition, it also creates a ghost artifact between 60-72 degrees. Conclusion: Catheter visualization depends on the angle of incidence of US beam with the catheter. Therefore, catheter’s tip position may not be identified. Images of a fragmented catheter may mimic a thrombus in the vessel.

4.R1 In vitro experiment designed to explain lack of sonographic (US) visualization of catheters in vivo
SESSION 5 - GASTROINTESTINAL

5.01 Dynamic MR pancreatography (MRP) in children: diagnostic value of secretin injection
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Objective: to evaluate the effect of i.v. injection of secretin during MRP and to determine the practicability and diagnostic accuracy for diagnosis of pancreatic diseases in children. Material and Methods: MRP was performed on 1.5 T scanner using heavily T2-weighted Turbo-Spin-Echo sequences with fat-suppression (HASTE). From 1999 to 2002, 25 pts with pancreatic disease were studied. Pts received an injection of secretin followed by multiple MRP’s (every 2 min) up to 10 min. Morphologic features of pancreatic duct were monitored before and during secretin stimulation. There were: anomalous union of pancreatobiliary ducts (N=5), pancreas divisum (N=3), chronic pancreatitis (N=8), choledochal cyst (N=2), duodenal duplication (N=1), annular pancreas (N=1), normal controls (N=5). Results: visualization of all portions of both main duct and accessory pancreatic duct was significantly improved with dynamic MRP in pts with normal pancreatic duct as well in pts with chronic pancreatitis (p<0.05). Conclusion: MRP increases image quality in pts with a normal or non dilatated main pancreatic duct and may obviate CT or ERCP.

5.02 Imaging of bowel and mesenteric injuries in pediatric blunt abdominal trauma
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To define the role of imaging, in particular CT, in the early detection of traumatic gastrointestinal and mesenteric injuries in pediatric blunt abdominal trauma. Retrospective study of 14 observations between July 1999 and December 2002. Clinical and operative findings were correlated with imaging findings in children following blunt abdominal trauma with intestinal and mesenteric injuries. Early diagnostic efficiency of each imaging method (abdomen X-ray, ultrasound and CT) were compared to become clearer the contribution of imaging in pediatric bowel and mesenteric trauma. CT is the gold standard for the complete assessment of pediatric blunt abdominal trauma. CT plays a major role in the evaluation of children suspected mesenteric or bowel injury. Detection of bowel and mesenteric injuries in pediatric blunt abdominal trauma will improve in searching subtle CT findings. It is an imperative challenge because although most traumatic abdominal injuries in children are treated with conservative non surgical management, traumatic perforation or infarction of gastrointestinal tract still necessitates surgical management. CT is the best modality to help surgeon management and to reduce the significant mortality and morbidity associated with gastrointestinal perforation or infarction.

5.03 Congenital portacaval fistula: a series of 12 children
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Congenital portacaval fistula (CPCF) is a rare anomaly, often called congenital absence of the portal vein because of the absence of visibility of the intra hepatic portal branches. We report on a series of 7 girls and 5 boys, explored and followed since 1976. The diagnosis was made on US, antenatally in 2, neonatally in 2 and at the age of 13 for the oldest. It was associated with other malformations in 5 (Goldenhar, Down and Noonan syndrome…). It was complicated by pulmonary arterial hypertension in 2, hypoxia due to arteriovenous pulmonary shunting in 2, liver tumors in 5 (nodular regenerative hyperplasia, adenoma, hepatocarcinoma). After a complete work up including angiography 6 were treated : by surgery only in 3 (closure of the fistula in 2 and liver transplantation in 1), by interventional radiology only in 1 and by a combination of both in 2. Treatment has been completely successful with resolution of the complications in 3 and only partially up to now in 3. This series shows that CPCF can present with severe pulmonary and tumoral complications which have to be searched for by imaging, and that closure of the fistula may be possible surgically and/or radiologically with development of normal intra hepatic portal vein branches and regression of the complications.

5.04 Feasibility of MR imaging of liver transplantation in children
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Postoperative imaging in paediatric liver transplants is highly specialized. Evaluation of the arterial, portal and venous system as well as the biliary tree by US, CT +/- DSA are important for post op follow up. In this study, we assessed the feasibility of magnetic resonance imaging for follow up of these patients. 12 paediatric patients with biliary atresia and received reduced size allograft liver transplantation were included in this study. The mean age was 10.6 years (range 8-15). The mean duration of liver transplant was 6.4 years. 8 out of 12 children showed derangement in liver function. MRI was performed with a 1.5T scanner (Sonata, Erlanger, Siemens). Standard imaging sequences (T1 weighted and T2 fat sat images) and special techniques including MR arteriography, venography and cholangiography were performed using breath-hold technique. All 12 patients completed the examination. The anatomy and anastomosis of the hepatic artery, portal veins, hepatic veins, inferior vena and biliary tree were successfully demonstrated in all patients. We conclude that breath-hold MR is feasible in imaging liver transplants in the paediatric group. It is a non-ionizing imaging technique which provides superb anatomical delineation of hepatic segmental, vascular and biliary anatomy in one examination. It is therefore useful in follow up in post liver transplant patients.
5.05 Biliary Atresia: making the diagnosis by the gallbladder ghost triad
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Purpose: To describe the gallbladder ghost triad and evaluate its usefulness in the US diagnosis of extrahepatic biliary atresia (BA).

Methods: 217 fasted infants with cholestatic jaundice aged 2-12 weeks were examined by US from October 1997 to Feb 2002. We defined the gallbladder ghost triad as gallbladder length <1.9cm, irregular/lobular shape, lack of smooth/complete echogenic mucosal lining and no wall thickening, and used it as a criteria for BA. Gallbladder wall thickness, triangular cord, diffuse periportal echogenicity and hepatic artery calibre were also recorded. Diagnosis of BA was confirmed surgically and histologically.

Results: 30/31 babies with BA demonstrated the ghost triad. No false positives were recorded. The 31st baby showed a normal gallbladder at 6 weeks but developed the ghost triad at 8 weeks. Gallbladder wall thickening was seen in 46/186 non-BA babies but not in BA. Triangular cord was observed in 24/31 BA babies. 22/186 non-BA babies and 5/31 BA babies showed diffuse periportal echogenicity. The hepatic artery appeared more prominent in BA. All 31 babies diagnosed by US as BA had surgery. 3 non-BA babies had ‘negative’ laparotomies showing hypoplastic bile ducts. 

Conclusion: The gallbladder ghost triad is a very accurate sign of BA. Indeterminate cases require close follow-up.

5.06 Wedged hepatic venography in portal cavernomas: an imaging window before mesoportal bypass surgery
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Objective: To report the usage of wedged hepatic venography (WHV) in demonstrating intrahepatic portal vein (IHPV) anatomy prior to mesoportal bypass (MPB) surgery in cavernous transformation of the portal vein. Successful MPB surgery requires a patent umbilical segment of the left portal vein (uLPV). 

Methods: Retrospective review of 30 consecutive pt (aged 5 wk-18yrs). Clinical, WHV, other imaging data (ultrasound, MR venography, arteriopography), surgical findings and outcomes were analysed. IHPV patency, size, vessel wall appearance and flow of contrast between the uLPV and the right portal vein (RPV) were evaluated on WHV. Results: WHV was performed in 30/30. 25/30 underwent surgery (uLPV patent on WHV); 23 had successful MPB (uLPV patent on WHV) and 2 had failed/no MPB performed (uLPV patent though small + irregular / partially occluded on WHV). 3/30 did not undergo surgery (uLPV totally occluded on WHV). 2/30 are awaiting surgery. Ultrasound demonstrated the uLPV in 11/23 (showing patency in 9 and uLPV-RPV continuity in 1). Arteriopography (n=30) and MR venography (n=17) failed to demonstrate the uLPV in all. Conclusion: In portal cavernomas, WHV displays detailed IHPV anatomy which may not be demonstrated otherwise. WHV allows for appropriate patient selection for MPB surgery.

5.07 Evaluation of children with congenital hyperinsulinism with arterial stimulation and hepatic venous sampling
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The purpose is to describe the results of arterial stimulation and hepatic venous sampling (ASVS) for surgical planning in patients with congenital hyperinsulinism. From 7/98-9/02, we performed ASVS on 56 patients with congenital hyperinsulinism requiring surgical treatment. Preoperatively, under general anesthesia, angiography with selective arterial catheterization of the splenic, gastroduodenal, proximal SMA, and a control artery was performed. All vessels were selected using a co-axial system consisting of a 4F RIM catheter and Tracker 18. Hepatic venous sampling was then performed at 30, 60, 90 and 120 seconds to measure insulin response. 36 (64%) had focal disease (FHI) and 20 (36%) had diffuse disease (DHI). ASVS was attempted in 34/36 patients with FHI and was successfully performed in 33. 21/33 (64%) had ASVS results that were informative about the site of the lesion. 15/20 with DHI underwent ASVS successfully. Results of the ASVS were consistent with DHI in only 6/15 (40%). Complications occurred in 7/56 (12.5%) of cases. FHI and DHI are completely separate entities. ASVS is not for differentiation of diffuse versus focal disease, but rather for localization of focal lesions, to direct surgery.

5.08 Preoperative invasive tests of 54 operated patients with focal forms of persistent hyperinsulinism of infancy
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Objective: to provide guidelines for accurate diagnosis and location of focal forms of persistent hypoglycemic hyperinsulinism of infancy (PHHI). Material: The records of 54 operated patients with proven focal forms who underwent preoperative pancreatic venous samplings (PVS) and/or pancreatic arterial calcium stimulation (PACS) were reviewed. Results: 52/54 patients had preoperative diagnosis of focal form. No focal form was misdiagnosed as a diffuse one. The 2 failures were due to inconclusive PVS before we performed PACS. 55 PVS were performed to investigate 51 patients. Before 1995, 4 PVS were classified as inconclusive. Therefore, when insulin plasma concentration were low in every sample, PVS was analysed as in favor of a “missed” focal forms (4 cases). 16 patients were investigated with 17 PACS. There were 2 femoral artery complications. In 11 patients, PACS was crucial for the diagnosis: 4 of them had a prior PVS which was in favour of a "missed" focal forms, the 7 other patients did not undergo PVS because of technical problems. Conclusion: to be accurate for location of focal forms of PHHI, PVS should include at least 2 hyperselective venous samplings in the head, 1 in the body and 1 in the tail of the pancreas. Non selective samplings are usually inconclusive.
5.09 18F-fluoro-L-DOPA PET SCAN in focal forms of hyperinsulinism of infancy

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Purpose: Hyperinsulinism (HI) in infancy is secondary to either focal lesions of the pancreas or diffuse hypersecretion of insulin. Children with focal lesions can be cured by oriented surgical resection. Up to now because of their small size the only diagnostic tool is invasive pancreatic venous sampling (PVS). The aim of the study is to localize with non invasive positron emission tomography (PET) the focal forms of hyperinsulinism of infancy. Methods: Three patients (mean age: 3.6 months) with proven focal form of HI (by PVS) were studied with 18F-Fluoro-L-DOPA PET. Under sedation (Pentobarbital and chloral), 4 MBq/kg weight were injected intravenously. Six scans of 5 minutes were obtained 60 minutes after injection. Results: In all patients, a focal fixation was seen in the pancreas. One in the head and two at the level of the isthmus of the pancreas. The three focal lesions were resected by surgery and confirmed by pathology. Conclusion: 18F Fluoro DOPA appears as a promising tool to diagnose and localize focal forms of HI. Its role in diffuse forms needs further evaluation.

5.10 Spiral CT in childhood Crohn’s disease - CT patterns

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Objective: Regional enteritis has been reported in childhood. Approximately 20% of Crohn’s disease are diagnosed in children. We retrospectively assessed the value of spiral CT in the diagnosis of pediatric Crohn’s disease and its complications. Materials and Methods: Sixteen symptomatic patients, aged from ten months to 18 years, underwent spiral CT because of suspected or known Crohn’s disease. All patients received oral and intravenous contrast medium helical CT series and 5 mm section thickness was performed. Results: The colon was primarily affected in four patients and the terminal ileitis was discovered in 17 – ileocolitis in five patients. The following CT patterns were observed: 1. Bowel wall thickening n = 10. 2. Lumen narrowing n = 7. 3. Target sign n = 1. 4. Mucosal disease n = 2. 5. Prominent vessels and enlarged mesenteric lymphnodes n = 12. 6. Fibropatty proliferation n = 6. 7. Phlegmon or abscess formation was present in four patients. Illeocutaneous fistula was demonstrated in one child. Conclusion: In adults, CT scan accurately diagnosed Crohn’s disease in the pediatric population. 2. Spiral CT demonstrates well in a very short period of time the most severe complications of childhood Crohn’s disease. Whenever it is necessary CT enables abscess drainage.

5.11 MRI evaluation of inflammatory bowel disease in pediatric patients: what is the best after intravenous gadolinium injection?

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Aim of this report is to compare T1 gradient-echo in-phase, out-of-phase and with fat saturation sequences after intravenous gadolinium administration to assess their accuracy in evaluation of intestinal bowel disease (IBD) in children. Material and Methods: we have studied by MR 15 children (mean age 12.4 years, range 16 months-16 years) with IBD assessed with clinical examinations and disease scores, small bowel enema (9 cases) and endoscopy. After Polyethylene Glicol (PEG) administration, images was acquired using T2 EXPRESS, T1-RF FAST in phase, out-of-phase and with spectral saturation of the fat on axial and coronal planes, before and after gadolinium intravenous administration. Signal-to-noise ratio (SNR) and contrast-to-noise ratio was calculated in all contrast enhanced sequences and findings was correlated with clinical and endoscopic assessments. Results: fat saturation assessed better than other sequences bowel localization of disease (<0.01) and inter-observer variability in this sequence was smaller. Conclusions: MRI is accurate technique in the assessment of pediatric IBD; T1 RF-FAST with fat saturation seems the best sequence to evaluate bowel wall enhancement.

5.12 MRI of the terminal ileum in children with suspected crohn’s disease using peg solution as oral contrast agent

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The aim of our study was to assess the usefulness of small bowel MRI using PEG solution as an oral contrast medium in the evaluation of distal small bowel inflammation in pediatric patients suspected for Crohn’s Disease (CD). We investigated 41 consecutive children with suspected CD. A fixed amount of 10ml/Kg of weight of PEG solution was orally administered. MR study was performed using HASTE and truFISP sequences T1 weighted FLASH sequence were acquired after iv administration of Gd-DTPA. An MRI score was created by means of bowel wall thickening and enhancement. All patients underwent ileo-colonoscopy, Spearman rank correlation was used to compare MRI and endoscopic scores as well as MRI score and CD activity index (PCDAI). Final diagnoses were: active CD in 14 cases, active ulcerative colitis in 9, indeterminate colitis in 4, irritable bowel syndrome in 6, recurrent functional abdominal pain in 5, juvenile colonic polyps in 3. A significant correlation was observed between the overall MRI and endoscopic score in all investigated patients as well as between overall MRI score and PCDAI in CD patients. MR imaging of the small bowel after oral administration of PEG solution is a reliable, and safe imaging modality providing optimal evaluation of the terminal ileum in patients with CD.
5.R1 MRI of the small bowel using a PEG solution as an oral contrast agent in a pediatric population with celiac disease

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The aim of our study was to describe morphological abnormalities of the small bowel in a pediatric population with known celiac disease using MR Imaging with PEG solution as an oral contrast agent. We analyzed 10 children (mean age 8.9 years) with celiac disease. Each patient drank a fixed amount of 10 ml/kg of body weight of PEG solution. MR study protocol included HASTE and True-FISP sequence. Images analysis showed alterations of mucosal pattern of ileal loops with an increased number of folds (“ileal jejunalization”) in 7 patients; reversal jejuno-ileal fold pattern in 2 patients; intestinal intussusception was observed in two patients and hypothesplenia in one patient. PEG-MRI may suggest a diagnosis of celiac disease as well as it is able to identify potential intestinal complications together with extra-intestinal findings.

5.R2 MRI of the gastro-intestinal tract in children

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Objective: To compare MRI of the gastrointestinal tract with other imaging modalities (US, CT, barium study) for the assessment of bowel abnormalities. Methods: Twelve children aged between 2 and 16 years with known or suspected lesions of the bowel underwent MRI. Hydropolyethylene glycol was given for bowel opacification and an antispasmodic drug was injected before the scan. MRI (1.5T) was performed: T2, GE, 3DT2, T1 pre and post gadolinium enhancement. MRI findings were compared with US (n=12), CT was performed: T2, GE, 3DT2, T1 pre and post gadolinium and an antispasmodic drug was injected before the scan. MRI (1.5T) was performed in 11 cases. Results: The final diagnosis were Crohn’s disease (n=7), protein losing enteropathy (n=2), lymphoma (n=1), infectious ileitis (n=1), normal (n=1). The advantages of MRI were: entire visualisation of the small and large bowel, evaluation of the extension of the lesions such as stenoses, bowel thickening, active inflammatory changes seen by increased uptake of gadolinium, mesenteric adipose tissue hyperplasia and lymph nodes, presence of intraperitoneal fluid. Superficial mucosal abnormalities, usually depicted by endoscopy or enterolysis, were not shown by MRI. Conclusion: MRI is a valuable, non-invasive technique in the follow-up of bowel disease in children, since it demonstrates extramucosal extent and activity of the disease and may replace ionizing barium studies.

6.01 Acute limb ischaemia in infants and children

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Objective: Acute limb ischaemia (ALI) is a rare event in paediatric practice. The purpose of this paper is to describe our recent experience of ALI in infants and children at a territory referral childrens hospital. Methods: Retrospective study of a 36 month period ending Dec 2001 on 14 consecutive patients (age range 2 days–15 yrs) with ALI. Cases notes and vascular imaging was analysed. 11/14 underwent vascular imaging; catheter angiography in 8, MR angiography in 5 and Doppler ultrasound in 5. Results: 9/14 had lower limb (5/9<12 mo age) and 5/14 had upper limb ALI (4/5>12 mo age). ALI followed iatrogenic events in 9 pt (transarterial procedures in 6, arterial surgery in 2 and venous malformation sclerosis in 1), trauma in 2 pts and vasculitis in 3 pts. 4/14 developed limb threatening. Anticoagulation was used in 12 pt, thrombolysis in 7 pt and local vasodilators in 7pt. 5/14 were commenced on oral steroids. 7/14 underwent surgery (revascularisation in 5 and partial amputation in 2). Conclusion: Lower limb ischaemic events predominate in infancy from catheter related injury. Upper limb ischaemic events predominate in those >12 months of age from various causes. Limb threatening is a major risk. Thrombolysis and surgical revascularisation can be effective in selected cases. The short-term outcome is good for most children with ALI. Non-iatrogenic progressive vasculopathies can influence long-term outcomes.

6.02 Visceral angiography in children with suspected vasculitis

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Vasculitis is uncommon in childhood. Although angiography is believed to be useful in the evaluation of suspected paediatric vasculitis, no large studies exist to confirm this. We performed a prospective study to evaluate the diagnostic utility of angiography in this context. Over a 3-year period, angiography was performed in children with clinical evidence of vasculitis who had been referred to a large children’s hospital. Data on technique, angiographic findings, complications and outcome were recorded. 39 angiograms were performed in 38 children (25 male) aged from six months to 17 years (median 7 years). Each angiogram involved four to 26 runs (mean 12). The angiograms of 21 patients (55%) were considered positive and one with an equivocal angiogram were subsequently found to have an underlying neoplastic disease (anaplastic large cell lymphoma, angiomatoid fibrous histiocytoma, myelodysplastic syndrome). Biopsy of various organs was performed in 25 children but was positive for vasculitis in only six (24%). There were no procedural complications (95% confidence interval 0 to 8%). We conclude that visceral angiography may be helpful in the evaluation of children with suspected vasculitis. Vasculitis may be associated with malignancy in childhood.
6.03 MR quantification of flow in patients with AVM’s
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MRI gradient echo cine and velocity-encoded phase contrast sequences can provide accurate quantification of cardiac index (CI), ventricular function (VF) and differential flow. To evaluate the impact of MRI data on treatment, records of 10 patients with diffuse AVM who had MRI were retrospectively reviewed. Patients were treated with embolization (7), embolization and surgical resection (3) or pharmacologic therapy (2). 3 patients in Schobinger stage 1 or 2 with mild to moderate elevation in CI (4.95, 5.2 and 7.9L/min/m2) and normal VF were followed clinically. 2 patients in stage 3 (pain, ulceration) after previous treatment with moderately elevated CI and left ventricular dilation had further treatment. Of 5 patients with congestive heart failure (CHF)(stage 4), 1 had diffuse hepatic hemangiocendothelioma and extensive AVM to a lower extremity with severely elevated CI (11 L/min/m2). Flow to the affected extremity was 40% of CI. Aggressive embolization reduced CI to 4.4L/min/m2. 3 patients with CHF had elevated CI despite prior embolizations. Further embolization improved angiographic features, reduced differential flow or CI. 2 patients with extensive AVM’s were treated with matrix metalloproteinase inhibitor and had stable CI and VF on follow-up. In conclusion, MR quantification of vascular flow and VF correlates with clinical stage and therapeutic response of AVM’s and is an appropriate tool for therapeutic planning.

6.04 Vascular Anomalies: Use of 3D Gadolineum MR Angiography
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To study the added benefit of 3D Gadolinium MR angiography (Gd-MRA) in the evaluation of vascular anomalies, in comparison with previously reported anatomic cross-sectional spin echo imaging and non-contrast time-of-flight MRA techniques. We reviewed the imaging findings in 8 patients, who were evaluated Gd-MRA: 2 patients with hepatic portosystemic fistulae, 1 with a venous malformation, 3 with arteriovenous malformations and 2 with infantile hemangiomas. Gd-MRA was performed with multiple phases using a double dose of contrast. In all 3 arteriovenous malformations, Gd-MRA depicted the feeding arteries, nidus and draining veins better than conventional techniques. Gd-MRA was indispensable for the depiction of complex portosystemic fistulae. Whereas the soft tissue mass enhanced in the arterial phase in the hemangiomas, it was delayed in the venous malformation. Gd-MRA is a useful technique in the evaluation of vascular anomalies, can replace older MR angiographic techniques in guiding the decision which patients may benefit from subsequent diagnostic conventional angiography and percutaneous intervention, and can provide a 3D roadmap for such procedures.

6.05 3D Rotational Angiography - More than just pretty pictures: a real-time interventional tool
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Introduction: Three dimensional (3D) spatial understanding of vascular structures is key for both diagnostic angiography and interventional planning. Traditionally this has been achieved by performing several angiographic contrast injections in multiple different obliquities. Objective: To evaluate the clinical usefulness of 3D rotational angiography (RA) in children. Methods: RA and 3D reconstructions were performed in a Philips Integris Allura interventional suite. Results: 30 neuro and peripheral vascular rotational studies were performed on 25 patients, mean age 6 yrs. In all cases rotational angiography provided additional spatial understanding beyond that provided by multiple oblique projections. 3D reconstructions were performed within 180 seconds of injection allowing real-time precise aneurysm evaluation for coil embolization sizing and vascular stenosis evaluation for angioplasty. Conclusion: Rotational angiography can decrease the number of oblique projections necessary for diagnosis, potentially decreasing radiation exposure and contrast dose. Immediate 3D reconstruction provides a real-time tool for interventional planning.

6.06 Aortic dilatation in Turner syndrome: the value of MRI
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Aortic dilatation and dissection are rare but severe complications of Turner syndrome with a risk of sudden death even in young patients. Up to now study of the aorta requires invasive methods such as angiography, CT scanner or trans-oesophageal echography. The aim of this study was to evaluate the benefit of aortic MRI in patients with Turner syndrome. MRI studies with “black-blood” sequences were performed in 17 girls from 10 to 19 years of age. The diameter of the aorta was measured at 4 levels, 1cm above the aortic root, 1cm below the aortic arch, on each side of this arch, and finally 1cm above the diaphragm on the descending aorta. Comparison was made with the literature references values. In 15 cases, the results were within normal limits for age. In 1 case (12 y) a mild and isolated dilatation of the ascending aorta was noted. In the last case (19 y) an obvious dilatation of the whole ascending aorta was discovered. This patient presented also with a bicuspid aortic valve, hitherto well tolerated; her blood pressure is normal, surgery may be considered in this case. Conclusion: considering the risk of the disease, MRI, a non invasive method, seems highly contributive for patients with Turner syndrome. This preliminary study leads us to propose to repeat the examinations for these children in order to depict progressive aortic dilatation or other modifications.
6.07 Cardiac MRI in the follow-up of children receiving growth hormone (GH) substitution
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A preliminary study performed in 4 children treated for GH deficiency has allowed us to demonstrate the following points 1) GH induces cardiac early cardiac modifications at least by increasing the myocardial water content. 2) These modifications were clearly demonstrated thanks to MRI by measuring the T2 relaxation of the myocardium 3) No clinical sign was noted and EKG and echocardiography remained normal. Our aim in this topic is to present complementary and further data a) Our preliminary results are confirmed by 3 additional cases b) A longer follow-up (one year) in 3 patients shows that the initial cardiac modifications noted on MRI examinations persist, reflecting the increased water content; c) In our last recent case, the absence of modification of the T2 relaxation time was explained by the fact that GH was not properly administrated by the parents, which was confirmed by measuring the IGF1 levels. Conclusion: these results confirm the initial effects of GH on the myocardium; these modifications are persistent and clearly demonstrated thanks to MRI sequences. In addition this non-invasive method may be used in order to verify that the treatment has been correctly administrated.

6.08 Interventional MRI in Congenital Heart Disease
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Objective: to demonstrate the feasibility of MR guidance for right and left heart catheterization; balloon dilatation of the interatrial communications; delivery of ASD closure devices; and transcatheter delivery of pulmonic valves in a swine model (n=20). Methods and Results: Using an active catheter tracking technique and imaging at a rate of 10 images per second, the passage was monitored by continuous variation in the imaging plane so that the anatomic site at the signal of the catheter tip, venous tip, and the chamber to be entered were visualized. From the venous route, all right and left-side chambers were entered for pressure measurement and oximetry (in all 7 pigs). Using pulmonary arterial pressure measurements and flow measurements (cine phase contrast MR), pulmonary vascular resistance was measured. Acute ASDs were closed using a modified Amplatzer device delivered in MR fluoroscopy in all 7 pigs. Phase contrast MR measurements of pulmonary and systemic flow before and after the procedure documented closure. Transcatheter delivery of valved stents (nitinol) was done successfully in 5 pigs. Phase contrast MR imaging was used to measure antegrade and/or retrograde flow across the stents. Conclusion: Real time MR imaging can be used to guide cardiac catheterization and interventional procedures. Application in humans requires further development of guide wire, catheters, and devices in order to ensure safety.

6.01 Myocardial magnetic resonance T2-star relaxation time as a marker of cardiac iron overload in thalassaemia major - is it dissociated from total body iron overload?
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Objective. Dissociation between cardiac iron overload and total body iron status has recently been suggested. Our objective was to evaluate the relationship of myocardial iron overload with conventional markers of body iron overload. Patients and Methods. Twenty-nine beta thalassaemia major patients on regular blood transfusion and chelation therapy were recruited. T2* relaxation time of the myocardium was measured by obtaining a single mid-left ventricular short axis section of the heart at nine different echo times using ECG triggered breathhold FLASH 2D technique in a 1.5 T MR imager. Body iron level was assessed by serum ferritin and liver to muscle signal intensity ratio on T1-weighted MRI. Results. Significant correlation was found between T2* relaxation time of the myocardium and the liver iron status reflected by liver to muscle signal intensity ratio and significant inverse correlation between T2* relaxation time of the myocardium and serum ferritin. In both instances, the strength of correlation was modest (r=0.36 & -0.47 respectively). Conclusion. Myocardial iron overload is related to total body iron overload with a modest strength of correlation. Body iron status can be regarded as a general indicator for cardiac iron overload but individual discrepancy may exist.

SESSION 7 - INTERVENTIONAL/MISCELLANEOUS

7.01 Morbidity and Mortality (M&M) records from a pediatric interventional radiology (IGT) program: a 4 year review
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Objective: Given increasing complexity of IR patients, and to improve patient care, monthly IGT M&M rounds commenced in 1997. IGT RNs, MRTs, MDs & other disciplines attend. We audited the minutes of the rounds to analyse the case spectrum and evaluate the lessons learned. Material/Methods: Records from 1997–2001 were reviewed. Cases were categorised as major or minor morbidity or organisational issues. Recommendations were evaluated for major/minor morbidity implementation. Results: 267 cases were discussed. Of 136 recommendations, 100 were implemented, directly influencing practices pre/per/post-procedure. There were 15 deaths, (9 < 1 week, 6>1 week postprocedure; 3 directly procedure related). Examples are presented. Conclusions: M&Ms are an essential component of an IGT service. They directly influence techniques, evaluate outcomes, audit practice and improve multidisciplinary communication.
7.02 Balloon dilatation of a laryngeal strictures in children without tracheostomy
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Balloon dilatation is a method of choice in a treatment of a laryngeal strictures in children. Removal of a tracheostomy canula after a procedure is considered as a successful result. However a recurrence of dyspnoea after decanulation is often present with possible risk of a new application of a tracheostomy. Dilatation without tracheostomy canula would be beneficial in such cases. Laryngeal strictures in 4 children without tracheostomy were dilated. Subglottic stricture was dilated by a balloon of an endotracheal canula in a boy after severe laryngeal inflammation. Other 3 children (2 girls with laryngeal stricture after intubation and girl with a posttraumatic glottic stricture) were older, their laryngeal strictures were wider than a balloon of an endotracheal canula. Therefore laryngeal dilatations by a balloon esophagoplasty catheter in an apoico pause were done. Procedures avoided tracheostomy placement in all patients. Balloon dilatation of a laryngeal stricture can be done even in an absence of a tracheostomy. Dilatation with usual balloon catheter in an apoico pause is more promising than a dilatation by a balloon of an endotracheal canula, particularly in an older children with a wider lumen of a laryngeal stricture.

7.03 Percutaneous mediastinal mass biopsy in children: techniques and outcomes
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Objective: To describe our techniques and results of mediastinal mass biopsy in children. Material and Methods: Over a ten year period 31 mediastinal mass biopsies were performed on 31 children (16F, 15M), mean age 11.5 years, range 1.54 – 23 years. The indications include: malignancy (25), metastatic disease (4), infection (1), post transplant lymphoproliferative disease (1). 17 biopsies were performed using a multiple pass core biopsy technique, 10 biopsies using a coaxial core biopsy technique and 4 biopsies using an aspiration technique. 29 biopsies were performed with CT guidance and 2 biopsies with ultrasound guidance. Results: 26/31 biopsies were diagnostic, 5 specimens were non-diagnostic necessitating surgical biopsy. There were no major complications. A subclinical pneumothorax occurred in two patients which spontaneously resolved. Conclusion: Percutaneous mediastinal mass biopsy is a safe and accurate method for diagnosis in children. Percutaneous techniques obviate the need for thoracoscopic or open surgical biopsy in most children.

7.04 Percutaneous biopsy of pediatric solid tumors
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Objective: To determine accuracy of percutaneous biopsy of pediatric solid tumors. Materials/Methods: Retrospective analysis was performed of 144 percutaneous biopsies of solid tumors on SJCRH patients obtained from 1997 through August 2002. Biopsy for diagnosis of lymphoma or for complications of tumor treatment were excluded. US, CT or fluoroscopic imaging were used for guidance. Core biopsy needles with a median of 15 gauge (range 13-20) were used to take a median of 5 samples (range 1-17). The specimens were submitted for histopathology including immunohistochemistry, molecular pathology, and/or cytogenetics. Truth was determined by subsequent surgery, pathology or outcome. Results: Of the 144 percutaneous biopsies, 101 were true positive (TP), 33 true negative, 10 false negative, and none false positive; 91% sensitivity, 100% specificity and 93% accuracy. All 49 percutaneous biopsies for initial diagnosis of malignancy (13 hepatic tumors, 13 sarcomas, 10 neuroblastomas, 6 Wilms tumors and 7 others) were TP; 100% accuracy (95% confidence interval [93%,100%]). Only 3 of these 49 percutaneous biopsies (6%) were repeated surgically for additional diagnostic material prior to therapy. Conclusion: Percutaneous imaging guided biopsy of pediatric solid tumors is accurate and can replace diagnostic surgical biopsy.

7.05 An audit of intussusception management in a tertiary pediatric hospital: a 3.5 year experience
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Purpose: To assess current intussusception (INT) reduction rate, value of delayed, repeat reduction attempts (DRRA), management of intussusception due to pathologic lead point (PLP) and reasons for irreducibility. Methods: Retrospective analysis of 115 children (age range 3m-17y) with 162 episodes of ileocolic or ileoileocolic INT between June 1999-December 2002. Recurrent INT (1-5 recurrences) occurred in 25 children. DRRA was performed in 20 INT in 19 patients. PLP was present in 11 patients (10%); 4 Meckel diverticulum, 3 duplication cyst, 2 cystic fibrosis, 1 lymphoma, 1 appendicitis. Enema reduction under fluoroscopic control was attempted in 157 INT episodes; the other 5 underwent spontaneous reduction as shown on US. Results: Successful enema reduction was achieved in 142 INT (90%) which included 4 INT due to PLP. Without DRRA successful reduction would have been achieved in 84%. Of the 20 INT that had DRRA 10 were reduced (including 4 PLP) and 10 were irreducible (including 3 PLP). Excluding INT due to PLP reduction rate would have been 94%. Of the 15 irreducible INT 7 had a PLP (47%). Of the other 8, bowel resection was required in only 2 and manual reduction was achieved at surgery in 6. Conclusion(s): DRRA was helpful in improving reduction rates, DRRA may have been more helpful in the 6 children with irreducible INT (without PLP) that were manually reduced at surgery. PLP were a significant cause of irreducible INT and their management remains a challenge.
7.06 Radiation dose assessment by Thermoluminescent Detectors (TLD’s) in fluoroscopically guided PICCs in children
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Criteria for PICC placement in children are changing, and risk benefit balance is important. Studies to date have not addressed radiation dose. Objective: To measure radiation dose during PICC placement. Material/Methods: Using TLD’s, radiation dose was measured during PICC insertions in 24 children [10M: 14F; ages 0-17 yrs; weight 2.4kg-61kg]. TLD’s were placed over the patient’s anterior and posterior chest, glabella, thyroid and pelvis and over the operator’s glabella, thyroid and inner thigh. 2 generations of fluoroscopic units and 2 TLD labs were employed. Results: Radiation exposure was highest posteriorly, ranging from 0.38-105mSv (mean 13mSv), with 0-16mSv (mean 1.6 mSv) detected anteriorly. Highest operator dose was to the legs at 0-6.3mSv. Procedures took between 20-150 (mean 66) minutes, fluoroscopy time 0.6-28.6 (mean 6) minutes. Dose & time (fluoroscopy, procedure) were less in those accessed by US, visually, and with newer equipment. Digital acquisitions increased the average patient dose three fold (4.5mSv to 18mSv). TLD measurement varied between labs. Conclusion: Awareness of radiation dose during PICC placement, and efforts to reduce it, are important.

7.07 Whole body Magnetic Resonance Imaging as a problem-solving tool in paediatric patients
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Whole-body magnetic resonance imaging (WBMR) allows the acquisition of images on the entire body in a matter of minutes. It has been shown to be a sensitive alternative to skeletal scintigraphy for the detection of bone marrow metastases in adults and children. We present imaging findings in seven children in whom WBMR imaging was added as an additional sequence to another MR study. In our study the primary diagnosis had not yet been made. Using WBMR led to the diagnosis of a variety of benign and malignant diagnoses. Seven children were scanned. Two scans were normal and these patients remain well. Two patients were diagnosed with ALL, unsuspected prior to the WBMR. One patient was diagnosed with a previously undiagnosed neuroblastoma with bone marrow metastases. One patient was diagnosed with Histiocytosis X. Another patient had lesions with the distribution and characteristic of Histiocytosis but biopsy showed only simple cysts. This study shows the potential of WBMR in paediatric patients. Although only a small number of patients were involved, it led to the diagnosis in all.

7.08 The Budd-Chiari Syndrome: improving treatment options with endovascular techniques
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Objective: To report our endovascular experience and results in children with Budd-Chiari Syndrome. Methods: Retrospective review of 7 consecutive patients with BCS (3 with native, 4 with grafted livers) aged between 10mo-18yrs. Patient charts, angiographic imaging and interventional procedures were analysed. Follow-up was 2wk-20 mo. Results: 2/3 native livers had cirrhosis/fibrosis, 3/4 grafted livers had rejection/fibrosis, 2/3 pt with native livers had protein C deficiency. 6/7 underwent endovascular treatment; balloon angioplasty in 6 with cutting recamalisation in 2/6, stent placement in 2/6 and mechanical thrombectomy in 1/6. Observed mean pressure gradient reduction with intervention = 12 mmHg (measured in 3/6). Anticoagulation was commenced in all. Technical success was achieved in 5/6 (minimal improvement in 1/6) in whom clinical improvement was seen early in all 5 and longer-term in 4 (8-20mo follow-up). 1pt died (non-procedural related) and 2pt underwent liver transplantation. Conclusion: Endovascular intervention is possible in children with BCS. We observed technical and early clinical success in up to 83% pt and longer-term improvement in 67% pt. The morbidity associated with BCS can be improved by endovascular intervention which may also improve overall patient survival.

SESSION 8 - UROGENITAL

8.01 Uro-radiologic examinations in children: parental perception, sedation acceptance and efficacy
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Purpose: To evaluate the parental perception of the pain and stress of their children during IVP and VCUG and the influence of a sedation protocol. Material and Methods: For 3 months, the parents of 58 children (35 girls, 23 boys, age: 23.3±18.4 months) having either IVP (9) or VCUG (49) were surveyed. A sedation protocol using Midazolam was proposed. Child reactions (tears, cries, agitation) were scored by the parents or the radiologist and compared with those of a previous examination scored in retrospect with the same items by the parents (21 patients). Parental reactions and comments were also recorded. Results: Every parent agreed to the study and the sedation protocol for their child. There was no significant difference between the children reaction scored by the parents or the radiologist (p=.136). Parents reported a highly significant difference (p<.0001) between the first examination without sedation and the second one with it. This was also present in their comments. Every parent reported the information provided about examination and sedation as correct and appropriate, and stated that sedation was mandatory if another examination has to be performed subsequently. Conclusion: Parental evaluation of child’s pain and stress is adequate during IVP and VCUG. Midazolam sedation acceptance rate is high for these examinations. Sedation reduces significantly children pain and stress according to parental perception.
8.02 The importance of post natal follow-up of fetal hyperechoic kidneys

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Fetal hyperechoic kidneys induces complementary investigations in order to establish a diagnosis. The most common etiologies are recessive or dominant polycystic kidney diseases. It has been published that cases in which these diagnosis have been excluded should have a limited neonatal work-up and follow-up is not necessary. The aim of the present study was to determine the optimal follow-up of fetuses with hyperechoic kidneys. We have reviewed the post natal evolution of 10 fetuses with hyperechoic kidneys. We have analysed the US features, the renal function and final diagnosis. The antenatal diagnosis was performed at a mean GA of 33.5 weeks. The post natal follow-up duration was on average of 6.5 years. The renal function was normal in all patients except one. The neonatal US demonstrated persistent hyperechoic kidneys in all newborns, the echogenic pattern changed in 2 children with transitory inversion of the corticomedullar differenciation. Cystic lesions appeared in 6 children between 2 months and 3 years. The final diagnosis was Bardet–Biedl syndrome (n=2), dominant polycystic kidney disease (n=3), tuberous sclerosis (n=1). No precise diagnosis was established till now in the 4 others. These data suggest that long term post natal follow-up is essential in fetuses with hyperechoic kidneys, because of potential late occurrence of characteristic sonographic pattern.

8.03 The High Incidence of Nephrocalcinosis in a Preterm Neonatal Population Receiving Steroids

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Objective: This prospective study was designed to assess the incidence of nephrocalcinosis in very premature infants who were exposed to postnatal steroids. Methods: Subjects were 33 infants, 24 to 28 weeks gestation, and 440-990g in birthweight, ventilated at 7 days of age in > 25% oxygen. They received a course of dexamethasone for chronic lung disease, starting at a median of 11 days and continuing for a median of 42 days. Renal sonography was scheduled on entry into the study, at day 28 and at discharge or corrected gestational age of 36 weeks. Results: Of 33 infants, 9 died and 6 had incomplete data. One infant had nephrocalcinosis at late entrance into the study on day 26 of life. By day 28, nephrocalcinosis was present in 31% of those with complete data. By discharge, or corrected gestational age of 36 weeks, nephrocalcinosis was present in 15 of 18 infants (83%). All infants had at least one course of an aminoglycoside antibiotic during the study. No toxic levels were recorded. Only 4 infants received furosemide more regularly than single doses. One had a 10 day course and no nephrocalcinosis. Conclusions: The incidence of nephrocalcinosis in this group of preterm infants is high. Dexamethasone may be a factor in the development of nephrocalcinosis.

8.04 Ureteric jet Doppler waveform in nocturnal enuresis

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Objective: Having shown that the vesicoureteric jet has mature and immature forms (Leung VYF et al 2002), this study investigated whether there is any increase in frequency of immature vesicoureteric function in children with nocturnal enuresis. Method: 339 normal and 614 children suffering from nocturnal enuresis were studied. 203 enuretic children who wetted four or more times per week had the Doppler waveform of the ureteric jet recorded bilaterally. The urinary bladder wall thickness measured after voiding and standard urodynamic studies were carried out. Results: There was a statistically significant increased in the occurrence of the immature waveform in enuretic children, and particularly in those with a thicker bladder wall than normal (19.2% vs 6.4%, p < 0.01 and 50% vs 23.8%, p < 0.01 respectively). The children with a bilateral monophasic pattern showed significant higher detrusor pressure, less voided urine volume, bladder capacity and night urine volume; they also achieved a smaller bladder volume than expected (all p < 0.05). Conclusion: This study reveals that the discovery of monophasic ureteric jets in older children may be associated with abnormal bladder function at that age.

8.05 Transurethral subureteric injection of autologous chondrocytes for treatment of vesicoureteral reflux: sonographic imaging features

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31 children with grades 2-4 reflux underwent transurethral subureteric injection of autologous chondrocytes harvested from ear cartilage. The purpose of this study was to determine the US imaging features of the urinary tract that are indicative of success or failure of the procedure. Treatment outcome was determined by post-procedure voiding cystography at 3 months and 1 year. US studies performed at 1 month and 1 year after treatment were assessed for the presence, volume, and contour of the subureteric cartilaginous mounds, and for hydroureteronephrosis. Chondrocyte mound volume was compared between early and late US studies and differences in mound volume and contour were compared between patients with and without reflux. Absence of a chondrocyte mound by US had a 100% correlation with treatment failure. Presence of a multilobed mound contour was strongly correlated with ongoing reflux. Mound volume decreased over time and treatment-induced hydroureteronephrosis was rare and self-limited.
8.06 In-vitro comparison of a first and a second generation US contrast media for reflux diagnosis

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The objective of this study was to compare a 1st and a 2nd generation US contrast media, with regards to their physico-chemical properties relevant for contrast-enhanced sonographic diagnosis of vesicoureteral reflux. In an in-vitro experimental set-up the US reflux examination was simulated. The 1st – Levovist – and the 2nd – Sonovue – generation US contrast media were compared. This was carried out in fundamental and harmonic modes, the latter both in tissue and contrast options with low and high mechanical index settings. The in-vitro contrast duration served as the parameter for comparison. Sonovue was tested at 0.25%, 0.5% and 1.0% volume and Levovist at 5%. The mean contrast duration of 5% Levovist was 2.2 min and of 1% Sonovue 7 min. In the harmonic mode the maximum mean was 7.3 min for Sonovue and 1.7 min for Levovist, a 42% and 68% reduction, respectively, in comparison to contrast duration in fundamental mode. A freshly opened vial of Sonovue did not show change in contrast duration when tested up to 4 h later. In the case of Levovist a 50% reduction was observed by 2 h. Sonovue has longer contrast duration at lower concentrations compared to Levovist in-vitro. With Sonovue a significant dose reduction for in-vivo applications is to be expected.

8.07 MR Urography: all in one exame

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MR urography with VIBE 3D sequence can demonstrate in one exam, the anatomy, artery and venous angiography, concentration and excretion of the kidneys. VIBE 3D sequence also can be used to do virtual endoscopy of the urinary tract and renal vascularity. MR imaging was performed in a 1.5T scanner (Magnetom Vision, Siemens), with a phase array body coil. Intra Venous (I.V.) administration of furosemide (0.1 mg/Kg), was performed before examination to promote urinary tract distension. After the I.V. application of a bolus of 0.1 mmol/Kg of gadopentetate dimeglumine DTPA, images were obtained in the arterial, venous and excretory time. The completely approach of kidneys, arteries, veins and urinary tract was successful in all patients with VIBE 3D sequence.

8.08 MR Urography: When is gadolineum contrast material injection needed?

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To evaluate the relative roles of coronal single shot fast spin echo T2 (SSFSE) as a screening test in MR urography, versus dynamic Gadolinium MR urography (Gd-MRU), which requires longer immobilization and generally sedation, in the evaluation of hydroureteronephrosis. We reviewed all MR 16 MR urograms performed in our institution to date, 5 with SSFSE only and 11 with additional Gd-MRU, for ureteral visualization and dilatation. Confirmatory tests (ultrasound, IVP, VCUG, and nephrostogram or lasix renogram) were available for all studies. All 9 dilated ureters were seen with SSFSE. Gd-MRU performed on 8 of these correctly identified 2 as obstructed and 6 as non-obstructed. Of the 22 non-dilated ureters, 1 was seen with SSFSE and 8 with Gd-MRU (p=0.015). Gd-MRU was indispensable for obtaining functional information, such as differential parenchymal volume and response to lasix washout. When only anatomic information is required in significantly dilated systems, a fast screening SSFSE sequence suffices, whereas for demonstration of normality and acquisition of functional data to determine differential renal function and presence of obstruction, Gd-MRU is indispensable.

8.09 Color Doppler ultrasound of the varicocele: study technique, findings, and classification.

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Color Doppler ultrasound (CDUS) technique and findings for varicocele (VA) are poorly defined. The aim of this study was to work up an accurate diagnostic method for VA and a classification correlated with phlebographic’s one. 105 patients with suspected VA were evaluated by B-mode US to assess the testicular volume and the maximal diameter of the scrotal veins and by CDUS of the funicular veins to assess the flow direction and velocity. Examinations were done in upright position, at rest and during the Valsalva maneuver (V). 74 patients with demonstrated VA underwent the spermatic phlebography to perform the sclerotherapy. According to morphological and haemodynamic US findings, VA was classified: subclinical type 1 (2/74) with normal scrotal findings and reflux during the V; type 2 (11/74) with abnormal scrotal findings without reflux; manifest type 3 (61/74) with abnormal scrotal findings and reflux. Compared with phlebography CDUS had a high degree of agreement (sensibility 98%, specificity 85%). Our CDUS technique may provide a simple and sensitive modality for the accurate diagnosis of VA and follow-up after therapy.
8.10 Doppler analysis of the testicular arterial waveform in the prepubescent acute scrotum
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Over a one year period, 137 scrotal ultrasounds were performed in prepubescent males. The gray scale images and the spectral analysis of the testicular artery were reviewed. Resistive indices (RI) of the testicular artery were visually estimated. Contrary to published reports, in 100 percent (137/137) of patients, both systolic and diastolic flow were visualized. Three of the 137 patients had only unilateral arterial flow; all had surgically proven torsion. Ten percent of cases had an RI of 0.25, 87% had an RI of 0.5 and 2% had an RI of 0.75. With technological advances in ultrasound equipment, testicular arterial flow can be reliably obtained in prepubescent children, except in cases of acute testicular torsion. Unlike the adult population, resistive indices of the testicular artery in patients with an acute inflammatory condition are not decreased when compared to the contralateral side. However, color Doppler may be a helpful adjunct in diagnosis when imaging the acute scrotum.

8.11 MR Urography and the evaluation of hydronephrosis in children
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Objective: To evaluate MR urography in the evaluation of hydronephrosis in children. Materials and Methods: We have studied 100 children using a dynamic contrast enhanced MR urography protocol. They were 63 boys and 37 girls (age range 1 moth to 17 years; mean 4 years). In addition to anatomic images, differential renal function and renal transit times were calculated. Results: There were 26 children with UPJ obstruction, 14 with UVJ obstruction, 35 with dilated but not obstructed systems, 13 with duplex systems, 5 multicystic dysplastic kidneys, 1 small scarred kidney, 2 with pyelonephritis, and 9 children who had normal MR urography. The split renal function as calculated by both renal scintigraphy and MR urography were compared and the correlation coefficient was excellent (r=0.96). Renal transit times were divided into three categories: less than 4 minutes was considered non-obstructive, greater than 8 minutes was considered obstructive and between 4 and 8 minutes considered equivocal. Conclusion: MR urography provides excellent anatomic and functional imaging in a single test that does not use ionizing radiation. MR urography should replace renal scintigraphy in the evaluation of urinary tract disorders in the near future.

9.01 Adenoid volume and snoring in children: an MRI approach
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Objective: To assess the relationship between adenoid enlargement, a major contributor to upper airway compromise, and snoring, a manifestation of impaired biomechanics of the pharynx. Material/Methods: A retrospective review of MR images of the upper airway is undertaken in a group of 11 children, 7 mths to 8 yrs of age, without known ENT disorder, who during a brain MRI study under sedation developed snoring without abnormal oxymetry (O2 sat to 98%). A comparative group includes 11 age-matched non-snoring children examined in similar conditions. Analysis of T1-weighted SE images in sagittal and axial planes of the pharynx region is done by linear and surface measurements and volumetric estimation of the adenoid tissues. Adenoid size and adenoid/nasopharynx ratio are also calculated on a midline sagittal scan and on conventional lateral radiographs of the nasopharynx. Results: On sagittal images, the average calibre of patent nasopharynx is 3.8mm in snorers versus 6.3mm in controls. The adenoid/nasopharynx ratio is 0.61 versus 0.43; the intrinsic adenoid volume is 9.8cm3 versus 3.6cm3. Conclusion: MRI assessment of adenoid hypertrophy can be performed quantitatively in patients with snoring and upper airway obstruction syndromes, as an adjunct to dynamic cine-MR.

9.02 Causes of persistent obstructive sleep apnea despite previous tonsillectomy and adenoidectomy in children with trisomy 21 as depicted on MR cine studies
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Purpose: To review the causes of persistent obstructive sleep apnea (OSA) despite previous tonsillectomy and adenoidectomy (T&A) in children with Trisomy 21, as depicted on cine MR studies. Methods: MR evaluation was performed under sedation and included: fast gradient echo cine images in the sagittal midline plane and axial plane at the level of the base of the tongue; axial sagittal and axial T1-weighted spin echo images, and axial T2-weighted FSEIR images. Imaging parameters reviewed included diagnoses made, frequency of recurrence and diameter of tonsillar tissue, tongue morphology, and pattern of airway collapse on the axial cine images. Results: N = 19 (mean age 9.7 years, range 4 – 19 years, 13 male, 6 female). Diagnoses included recurrent and enlarged adenoid tonsils 13, glossoptosis 11, pharyngeal collapse 6, prominent lingual tonsils contributing to obstruction at base of tongue 13. 12 patients had gross macroGLOSSIA, 6 had lack of the normal median sulcus, and had fatty infiltration of the tongue. 16 children had some degree of residual/recurrent adenoid tissue (mean 12.6 mm, range 4.7 – 25 mm). Conclusions: There are a number of different causes of obstruction in children with trisomy 21 and persistent OSA despite previous T&A.
9.03 Postnatal imaging and follow-up of prenatally-detected lung lesions
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Objective: To present the postnatal imaging features and evolution of pulmonary malformations detected by prenatal imaging. Material and Methods: The study includes 16 patients with echogenic lung lesions detected on prenatal US (MRI in 4 cases). 14 lesions were monitored for 6 months to 10 years. Results: At birth, chest X-rays were normal in 9/14 patients. CT showed a solid mass in 2, air-filled cysts with some solid components in 5, air-filled cysts alone in 6, and emphysema-like changes in 3. Lesions were located in the right lung base in 7, in the left lung base in 8, and in the juxtaphrenic region in 1. Systemic feeding arteries were identified in 8 cases by CT and MRI. On follow-up, one solid lesion showed nearly complete involution at 5 years. Enlargement of cystic components occurred in 2 cases. One cystic lesion became emphysema-like. The remaining lesions showed no changes. Conclusions: Cystic sequestrations, CAM and bronchial atresia overlap their imaging features. Complete involution of the lesion was seen only in one case (solid type). None of the cystic or emphysema-like lesions decreased in size. The evolution of some multicystic lesions to an emphysema-like type lends support to the hypothesis that bronchial atresia is the primary defect in the pathogenesis of congenital adenomatoid malformations.

9.04 The radiology of partial liquid ventilation
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Liquid ventilation refers to the technique of ventilating patients after the administration of perfluorocarbon (PFC) into the lungs. The aim is to improve gas exchange and it has mainly been used in severely ill, (particularly neonatal patients with surfactant deficiency or congenital diaphragmatic hernia and hypoplastic lungs), who have failed to improve with extracorporeal membrane oxygenation (ECMO). Though for obvious reasons there have been no blinded trials in these very sick patients it appears to improve outcome. We wish to present a pictorial review of the variety of appearances of the chest radiograph of children undergoing partial liquid ventilation. In particular we wish to emphasise the unique change in pulmonary contrast due to the high density of the liquid PFC medium. This has afforded a unique insight into the physiology of the lung when consolidated due to disease and ECMO. Additionally the pulmonary appearances are so unique as to potentially cause reporting pitfalls to the unwary radiologist.

9.05 Air-trapping in b-Thalassemia Major: association with pulmonary function and iron overload
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Objectives: We describe and quantify the morphological features of the lung in b-Thalassemia Major (TM) patients using HRCT, and determine the association between HRCT findings, pulmonary function tests (PFT) and iron overload. Materials/Methods: Forty-one patients were prospectively evaluated with HRCT (in full inspiration and expiration) and PFT. Presence of focal bronchial and parenchymal lesions and air trapping were recorded. A semi-quantitative air trapping score (ATS) was used to divide the patients into ATS- (ATS 0-3) and ATS+ (ATS>3) for statistical analysis. Iron overload was estimated by signal intensity ratio of the liver to paraspinous muscle (SIR) using MRI. Results: Air trapping (ATS+) was the predominant HRCT finding (10 patients, 24.4%). None had interstitial lung disease although 11 patients (26.8%) had restrictive spirometry pattern. Multiple logistic regression showed that FEF25%-75%, but not SIR, was significantly associated with ATS (p=0.019, AOR=0.86, R2=41.8%). Multivariate analysis showed ATS did not have significant influence on lung function indices (p = 0.104). Conclusion: Air trapping, an early feature of small airway disease, is found in TM. This is associated with FEF 25%-75% but not hepatic iron overload.

9.06 Fast MRI evaluation of cardiovascular anatomy with Steady-State Free Precession acquisitions in children
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Objective: To establish the utility of fast magnetic resonance imaging (MRI) to demonstrate cardiovascular morphology. Patients and Methods: In 40 patients (age, 6 days – 18 years) undergoing cardiac MRI, we performed non-gated steady-state free precession (SSFP) acquisitions of the chest in three orthogonal planes in less than two minutes. Depiction of cardiovascular anatomy was assessed using a segmental approach. Findings were compared to echocardiography, all available information from various imaging procedures served as a reference standard. Results: Overall, SSFP sequences allowed definition of the viscerocoeval situs, anatomy, size and connections of pulmonary and systemic vessels as well as cardiac chambers in 37/40 patients. When compared to echocardiography, MRI was superior in defining situs and depicting abnormalities of the aorta, pulmonary arteries, and systemic veins. Various abnormalities of the chest wall, pleurae and parenchymal organs were seen only on MRI, but abnormalities of cardiac valves and septal defects were not evident. Conclusion: Non-gated SSFP MRI is accurate in evaluation of cardiovascular anatomy and can complement shortcomings of echocardiography. It may be used as a quick screening tool giving a complete morphologic overview, or can serve as an excellent guide for a detailed cardiac MRI study saving scanning time.
9.07 Cardiac MR imaging following Norwood stage 1 operation for hypoplastic left heart syndrome
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Hypoplastic left heart syndrome is a form of congenital heart disease that consists of hypoplasia of the left heart structures and ascending aorta. Blood supply to the aorta in the foetus and neonate is via the arterial duct. Untreated the syndrome is universally fatal, and the Norwood three stage procedure has been proposed to treat these children. We have performed cardiac MR in 20 infants under general anaesthetic following the Norwood stage 1 operation. Informed consent was obtained for all subjects. Imaging was performed on a Philips Gyroscan Intera. MR imaging included balanced FFE volume (axial) and cine images (ascending aorta, 4 chamber and short axis ventricular volumes), ‘black-blood’ TSE images, phase contrast flow images and 3D Gadolinium MRA. Cardiac MR defined the patency of the new aorta (created from the pulmonary artery and a patch), the old/new aorta anastomosis, and the modified Blalock-Taussig supplying the pulmonary vasculature. Systemic venous and branch pulmonary artery anatomy were visualised, with a view to the stage 2 procedure (bi-directional Glenn). Ventricular function was quantified. Overall, cardiac MR provided anatomical and functional information for optimal medical treatment (e.g. poor ventricular function) and surgical planning of both the stage 2 procedure and any stage 1 revisions (e.g. narrowed new aorta).

9.08 Optimal slice thickness in low-dose multi-slice-CT (MSCT) of the chest in children.
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The aim of this study was to determine optimal slice thickness of axial and multiplanar reconstruction (MPR) in low-dose MSCT of the chest in children. We retrospectively analyzed 97 MSCT examinations of 86 children (age range: 1 day to 11.2 years, mean: 3.6 years; median: 2.2 years). All children were scanned with a four-row-MSCT-scanner (Volume Zoom Siemens, Erlangen). The scan parameters ranged from 80 kVp, 15 mAs to 120 kVp, 50 mAs (collimation: 4x1 mm; table-feed: 8 mm). Images were reconstructed with different slice thickness ranging from 1 mm to 3 mm and different kernels. Image noise was measured in three homogenous areas (liver, muscle, thymus). Image quality was assessed by two radiologists, using a 5-point scale. Image noise and subjective image quality corresponded to the slice thickness of the reconstruction. This relationship was stronger for the mediastinum than for the lung. Image noise increased significantly with smaller body diameter and smaller FOV (p<0.01). MPRs were ranked better than axial images if thin slices were used for reconstruction. We conclude, that reconstruction of 3 mm slices results in low image noise and good image quality. For high-quality MPRs, thinner slices (e.g., 1.25 mm) are recommended.

9.R1 The continuous enigma of the unilateral opaque lung in childhood – The value of spiral chest CT
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Objective: We assessed the accuracy of contrast enhanced spiral chest CT scan to differentiate tumoral from non-tumoral pathologies in the pediatric opaque unilateral hemithorax. Materials and methods: Our retrospective study included 16 patients, aged between one month and 17 years (10 males and 6 females) assessed between the years 2000 and June, 2002, because of unilateral white lung. They all had spiral enhanced chest CT scans. We evaluated the capacity of CT scan to distinguish amongst tumoral, inflammatory, congenital and post-obstructive causes. Results: Correct CT interpretations were made in all patients. Tumoral masses included chest wall Askin or PNET tumors in two patients; lung tumors, alveolar cell sarcomas (1) and two mediastinal tumors (neuroblastoma and lymphoma). Five patients had inflammatory diseases – four pleuropneumonia and one emphysema. CT drainage was performed in all patients. Two had post-obstructive and one had agenesis or hypogenetic lung. Three patients suffered from generalized hypotonia related to syndromes. Conclusion: In childhood a chest X-ray with a unilateral white lung is a common presentation. Spiral CT established a quick and correct diagnosis and enabled prompt treatment.

SCIENTIFIC EXHIBITS NEURORADIOLOGY

P. 1.01 Walker-Warburg syndrome: clinical and radiological features
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A full term baby girl was diagnosed with Walker-Warburg syndrome immediately after birth. This is a rare complicated congenital syndrome with distinct clinical and radiological features. Family history revealed previous babies with similar condition. The clinical features, family pedigree, and the radiological manifestations are presented in a poster format.
P. 1.02 The baby with the Oddly Shaped Head – recognizing craniosynostosis on the skull radiograph and CT

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Introduction: The oddly shaped head is a common presenting feature in babies. This has multiple aetiologies. Some are positional and self-correcting. The role of the radiologist is to identify those that are due to craniosynostosis that benefit from early recognition and surgical correction. Methods: We reviewed skull radiographs and 3D CT studies of babies presenting to our hospital for investigation of the oddly shaped head since 1997. We selected those images for presentation that illustrate the range of radiographic and CT findings in craniosynostosis and compare these with the radiographic findings in positional deformity of the skull. Results: We will demonstrate the sutural changes that can be seen in craniosynostosis and the characteristic secondary changes in calvarial shape and facial anomalies that are seen with each type of premature sutural closure. We will also show the corresponding findings on 3D CT. Conclusion: The plain skull radiograph is diagnostic in craniosynostosis. Premature closure of each suture is associated with characteristic radiographic findings. CT with 3D reconstructions complement these findings and aid the surgeon in defining the deformities and the correction needed.

P. 1.03 Subacute Sclerosing Panencephalitis: MRS findings in two patients

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Subacute sclerosing panencephalitis (SSPE) is a progressive, fatal encephalitis caused by persistent defective measles virus in the central nervous system. The diagnosis is based upon characteristic clinical manifestations, the presence of characteristic periodic EEG discharges, and demonstration of elevated antibody titre against measles in the plasma and cerebrospinal fluid. There has been no correlation between the clinical status and the conventional MRI findings. We performed single voxel magnetic resonance spectroscopy (MRS) in two SSPE patients with white matter lesions on conventional MRI. N-acetyl aspartate (NAA) and creatine concentrations were decreased and cholin concentration was increased within white matter lesions compared to the normal white matter. NAA signal is a sign of neuronal destruction. Therefore, changes in NAA resonances could be explained with neuronal destruction in SSPE. As choline-containing compounds are in accordance with the destruction of membranes, we thought that elevated choline/ creatin ratio could be related to inflammation or demyelination in SSPE. The lactate and inositol signals were normal in both of our patients. In conclusion, MRS is a complementary method in the evaluation of SSPE patients and could provide more information about neuronal loss in SSPE and the differential diagnosis as well.

P. 1.04 Topographic imaging of orbital pathology in children

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Objective: To describe a spectrum of orbital pathologies in children observed on CT, MRI and DSA based on a topographic classification. Material and Methods: Thirty-seven children aged between three months and 16 years underwent imaging by CT, MRI (1.5T) and DSA for various orbital pathologies. Results: In our series of thirty-seven children we describe orbital pathologies at specific anatomical levels. The topographic classification corresponds to the following compartments: eye ball (n=8), orbital nerve (n=6), muscles (n=5), bone and dura (n=6), soft tissue (n=2), lacrimal gland (n=3) and the vascular compartment (n=7). At each level, congenital, traumatic, infectious, inflammatory, vascular and tumoral etiologies are discussed. Conclusion: Knowledge of orbital pathologies based on a topographic approach in children simplifies interpretation and contributes to a precise diagnosis.

P. 1.05 Proton MR spectroscopy of the human fetal brain

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Purpose: To demonstrate the efficiency of H MR spectroscopy of the human fetal brain. Material and Methods: Spectra were acquired on a 1.5 T MR device (Symphony Maestro) with PRESS sequences including short and long echo-time. A combination of body phased array and spinal coils was used to receive the signal whereas the standard body coil was used for the RF excitation. The volume of interest (VOI) was of 20x15x15 (4.5 ml) and located within the cerebral hemisphere (at the level of the centrum semi ovale whenever possible). The gestational age ranged from 27 to 39 weeks including normal and pathologic brains. Results: There is a tendency in increase of NAA/Cho, NAA/Cr and NAA/Inositol in the normal brains. Analysis of the pathologic brains showed increased levels of creatine and myo-inositol in hypoxic cases, suggesting white matter gliosis. A case of mild ventriculomegaly with ependymal cysts showed very low level of creatine and NAA of unknown origin. Cases of mild ventriculomegaly showed spectra similar to normal controls at the same gestational age, suggesting an underlying normal brain associated to the ventricular dilatation. Conclusion: Fetal brain MRS is becoming a tool in the evaluation of the brain maturation and development. The definition of normal spectra at different gestational ages is necessary.
P. 1.06 Does asymptomatic Primitive Septal Agenesis (PSA) exist?
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**Purpose:** To study and correlate the MRI patterns of PSA with clinical data, to help the prenatal counselling. **Patients and Methods:** Retrospective double blind review of brain MRI in 34 patients presenting with PSA, over a 14-year period. (mean=5y). Chiasm and optic nerves not evaluated. Posthydrocephalus septal agenesis or incomplete data excluded. Clinical data correlated to MRI patterns. **Results:** MRI: 82.5% associated lesions (28/34): 12 neuronal migration disorders, 9 holoprosencephalies (HP), 8 pituitary stalk interruptions; 17.5% (6/34) PAS isolated. Clinically, 70% motor dysfunction, 65% mental retardation, 21% blindness and 24% endocrinological abnormalities, 6% completely asymptomatic, (2/34 infants younger than 2 years at last follow-up); 1 scoliosis. Patients with bilateral cortical anomalies and HP (even if mild) had the worst neurological prognosis. Nevertheless, a severe motor impairment was present without evidence of hemispheric anomaly in 12% of patients (4/34). Interestingly, the frontal lobes were involved in 90% of cortical anomalies and HP, supporting the malformative etiology of PSA. **Conclusion:** PSA appears rarely isolated with a wide range of associated brain anomalies; moreover, PSA is symptomatic in 94% of the series and severe psychomotor impairment may occur in isolated forms.

P. 1.07 Cerebral trombosis in a child affected by ulcerative colitis - Case report
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Last April a 1 year-old boy was hospitalized at Meyer Children's Hospital in Florence. He presented epilepsy and bloody diarrhea. A brain TC and MRI angiography showed a venous trombosis. Because of worsening of abdominal sintomatology an abdominal MRI was performed. MRI images showed a disappearance of colon haustatures and a thickening of intestinal wall with an important contrast enhancement. Ulcerative colitis was hypothesized and a colonoscopy confirmed the clinical diagnosis. A genetic study has shown a homozigous point mutation (C-T) at codon 677 on cromosome 1. This mutation is related with a reduced level of haematic folic acid and increased level of omocisteine. The latter is supposed to be responsible of venous and arterious trombosis. We are acquainted by literature with a relationship between ulcerative colitis and this homozigous mutation.

P. 1.08 Phonological decoding in dyslexic children: activation pattern in fMRI
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**Purpose:** The aim of our study is to understand the neural network involved in phonological decoding in dyslexic patients (DS) with functional MRI. **Material and methods:** We evaluated 19 right-handed subjects (11 DS and 8 controls). During classical fMRI procedure, phonological processing was tested using 3 tasks (auditory-phonemic discrimination (APD), phonemic identification (PI) and rhyme judgement (RJ)). **Results:** fMRI was reliably obtained in 18 subjects. Whatever the test, control subjects exhibited left activation while DS showed bilateral larger activation. During APD, DS patients had bilateral posterior temporal, inferior prefrontal and insular activation, in contrast to the predominant left activation in controls. During IP, activation was still bilateral in the inferior prefrontal, anterior insular and occipital cortices. Controls showed bilateral occipital and insular activation but left prefrontal activation. For RJ, DS showed bilateral prefrontal, superior parietal and anterior insular activation in contrast to the left prefrontal activation in controls. **Discussion:** This different neural network in DS could be correlated with a longer response time and could revealed an involvement of attention load and working memory.

P. 1.09 Bobble head doll syndrome: diagnosis and follow-up by means of MR
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Bobble head doll syndrome (BHDS) is a rare syndrome characterized by rhythmic and voluntary tremor of the head, which decreases while resting and disappears while sleeping. The anatomic abnormality is represented by cystic dilation of the third ventricle associated with stenosis of the cerebral aqueduct. A 3-year old male child was examined for tremor of his left upper limb, initially interpreted as a behavioural disorder; no signs of cerebral hypertension were associated. The MR examination without sedation showed the characteristic lesions of the syndrome; after a peritoneal ventricle by-pass, the almost complete disappearance of head and limb tremors was observed. A follow-up carried out after seven months from the operation showed clearly decreased dilation of the third and lateral ventricles. BHDS is a rare kinetic disorder in children susceptible of surgical treatment; the absence of endocranial hypertension and non-specificity of symptoms generally lead to a delayed diagnosis and unsatisfactory post-operative evolution. Early recognition of the anatomico-pathological picture is therefore indispensable for correct diagnosis and optimal treatment.
P. 1.10 Multiple sclerosis in pediatric age: clinical-radiological review in a decade

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Objective: Review of the incidence in the last eleven years in pediatric multiple sclerosis pointing on MRI findings.

Material/Method: Retrospective study in 7 pediatric patients, with localization of the lesions, morphology, pseudotumoral lesions, corpus callosum alteration, atrophy, gadolinium enhancement, differential diagnosis, number of MR studies, radiological evolution.

Results: 1 boy, 6 girls; 6/12 years, median age (3-13 yrs); clinical debut are also reported. Neuroimaging detected 60% infratentorial lesions; 100% deep plaques, 40% cortico-subcortical; 90% nodular-ovoid plaques, 25% diffuse white matter alteration; 1 corpus callosum demyelination; 1 pseudotumoral presentation (Schilder disease), 1 tumefactive plaque; 20% with atrophy; 10% central and anular enhancement, the rest with homogeneous and variable enhancement.

Conclusions: MR is the best neuroimaging study for assessment and follow-up in multiple sclerosis, and is now included in the new classifications for the diagnosis.

P. 1.11 Ulegyria: MRI findings

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The term “ulegyria” describes the result of a hypoxic-ischemic injury affecting the cortex and the white matter in full-term newborns. It describes a characteristic cortical pattern in which the deep portions of the gyri are more affected than the superficial, creating the so-called “mushroom gyri”. The underlying white matter undergoes tissue loss and gliosis. We describe the MRI findings of 5 patients (aged between 6 months and 12 years) with clinical history of perinatal hypoxia/anoxia, presenting with mental delay, early onset epilepsy and cerebral palsy. MRI revealed severe tissue loss in the depths of the sulci of the affected gyri in contrast with their apex, which remained practically unaffected. The adjacent subcortical white matter was atrophic and gliotic in all cases. Ex vacuo ventricular dilatation was present in 4 cases. The lesions were bilateral and symmetrical in 3 cases involving the parietal and parieto-occipital regions. In the 2 unilateral cases the affected areas had parietal and fronto-parietal distribution. In conclusion, the neuro-radiological findings of ulegyria are specific and easily recognized with MRI, when cortical atrophy and underlying white matter gliosis are present, permitting the differential diagnosis from polymicrogyria and periventricular leucomalacia.

P. 1.12 Rare brain tumours in children. Correlation between appearance on MRI and tumour histopathology.

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Purpose of this study was to evaluate and correlate different MR imaging patterns with histological subtypes of rare brain paediatric tumours. The study group was 10 children. 10T multiplanar spin echo T2-weighted and pre and post contrast T1-weighted MR images were correlated with the neuropathological findings.

Supratentorial tumours were: two subtypes of germ cell tumour (one mature and one immature teratoma), two embryonal tumours (one medulloepithelioma and one malignant anaplastic ependymoma), one desmoplastic ganglioglioma, one case of meningioangiomatosis, one ventricular meningioma and one dysembryoplastic neuroepithelial tumour (DNET). Infratentorial tumors were: two atypical rhabdoid/teratoid tumours. A neuroradiological-neuropathological correlation was performed. Histopathology established the final diagnosis based on the neoplasm’s morphological and immunophenotypic features.

P. 1.13 Neuroradiological patterns and biochemical correlation in Leigh syndrome

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Leigh syndrome occur as a result of a partial or totally defective enzymatic complex in the mitochondrial respiratory chain, causing a blockage in cellular energy and consequent tissue damage. The aim of this study is to establish a connection between the sites of the encephalic lesions and the type of enzymatic deficiencies.

Material/Methods: 32 patients with Leigh syndrome were studied between January 1994 and June 2002. The symptoms comprehended feeding difficulties, respiratory problems, psychomotor retardation, progressive hypertonia, ocular disease and convulsions. All the children underwent clinical neurological examination, lactate and pyruvate tests and also muscular biopsy of the femoral quadriceps.

Results: Our sample was divided into 4 sub-groups, according to the neuroradiological pattern that predominated: Group 1; the classical forms that involved the deep grey matter, in particular the basal ganglia (22); Group 2: the leukodystrophic forms that affected only the white matter (3); Group 3: mixed forms that not only involved the deep grey matter but also the white matter and cerebellum (5); Group 4; non specific or silent forms (2).

Conclusions: Enzymatic and molecular studies demonstrated that the deficiency occurred most frequently in complex I of respiratory chain (COX) which is commonly associated with lesions of the basal ganglia.
P. 1.14 Brain MRI of neonatal rare metabolic diseases
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The MRI diagnosis of metabolic diseases which affect the newborn brain is challenging and there are few reports about brain imaging anomalies in these cases. In particular, the evaluation of white matter abnormalities can be difficult because of the variable MRI signal associated with the process of myelination. We retrospectively evaluated the MRI studies of neonates affected by rare metabolic diseases, in order to identify the structures mainly involved and to highlight the MRI features suggesting a metabolic disorder. The MRI examinations were performed on a 1.5T unit in 5 infants aged 1-7 months. Our cases included Krabbe Disease, Infantile Sialic Acid Storage Disease (ISSD), Fumarase Deficiency (FD), Maple Syrup Urine Disease (MSUD) and Pelizaeus Merzbacher Disease (PM). Definitive diagnosis was made based on laboratory tests and clinical follow-up. In all the cases we noted a constant involvement of white matter, in particular as abnormalities of the normal myelination process. This involvement ranged from a completely absence of myelinated white matter (i.e. in the connal PM disease) to a slight reduction of myelination (i.e. FD). Anterior optic pathways and corpus callosum involvement were present in 2 out of 5 patients. Although non-specific, the presence of these MRI patterns has to suggest the possibility of a metabolic failure.

P. 1.15 US measurement of the subarachnoid space in infants: what is normal?
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In order to define the normal width of the subarachnoid space, 200 healthy infants were examined by ultrasound. A linear 9MHz probe was used. The measurements were obtained via the anterior fontanelle on coronal sections. Cortex-inner tabula and cortex-falx widths at the level of the third ventricle were recorded. Infants were grouped according to age (1-3 months, 3-6 months, 7-9 months, 10-12 months). The results are given in a table according to age as well as comparing the measurements to head circumference, body height and weight. Knowing the range of normals aids in differentiating the normal from pathologically dilated subarachnoid space, and we believe these tables will be practicle to use in the cranial US examination of infants.

P. 2.01 Magnetic Resonance Imaging T2 relaxation time reflects disease activity in children with juvenile dermatomyositis
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Purpose: The study aims to quantify the MRI T2 Relaxation Time (T2RT) and correlate with markers of disease activity in children with Juvenile Dermatomyositis (JDM) compared with healthy children. M+M: 40 children, (age 4-15yrs, median age = 9 yrs), with active JDM (n=10), inactive JDM (n=10) and controls (n=20) were assessed for disease activity using validated measures. Following routine MRI imaging of thigh muscles, Carr-Purcell-Meiboom-Gill T2 Map sequences were used to quantify T2RT. Regions of interest were analysed avoiding blood vessels and fat. Results: Children with clinically active disease had significantly higher T2RT than both the inactive JDM and control groups (p=0.05). T2RT values correlated with validated clinical parameters of muscle strength/function (p=0.05). Conclusion: Absolute values representing active from inactive JDM have not yet been delineated. MRI T2RT has the potential for quantitative assessment of disease activity and discerns active from inactive JDM showing good correlation with clinical measures.

P. 2.02 MR imaging of the late sequelae after neonatal septic hip
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Aim: To describe the hip residual deformity of the bony and cartilage structures in the toddlers and older children as the sequelae after neonatal septic arthritis. Patients and Methods: Radiographs and MR images of 19 hips were obtained from 16 patients (aged 7 mo – 7 years; mean, 3.5 years) after neonatal osteomyelitis of the femoral proximal metaphysis and/or hip septic arthritis. Results: The following abnormalities were demonstrated on MR images of 19 hips: 1. Size and shape of cartilaginous femoral head and ossific nucleus: normal head (n=3), enlarged (n=4), diminished and irregular head (n=9), complete loss of the head (n=1) 2. Acetabular coverage of the head: adequate (n=7), lateral dislocation (n=7), subluxation (n=2), luxation (n=2) 3. Femoral neck: normal (n=5), short and wide neck (n=7), pronounced deformity - varus or valgus alignment (n=7) 4. Relative trochanter overgrowth (n=11) 5. Acetabulum – cartilaginous and bony parts: normal (n=10), dysplasia (n=9), defects of acetabular roof (n=5) 6. Capital femoral physis: normal, well visualized (n=5), non-visualized (n=4), physis deterioration without bony bridges (n=4), metaphyseal-epiphysseal bridges (n=6). MR imaging adds important for management informations regarding physeal and surrounding cartilage damage.
P. 2.03 Musculoskeletal TB in children - a pictorial essay
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Tuberculosis (TB) is the leading cause of death worldwide attributed to a single infectious agent. Children are often infected due to exposure to an adult infected with TB. Musculoskeletal TB (MSTB) constitutes 1% to 3% of extrapulmonary cases and is rare in children. MSTB most commonly involves the spine with the joints and bones less frequently involved. This pictorial essay will illustrate a wide range of MSTB manifestations in children, as well as complications such as cord compression, subligamentous and soft tissue spread. Modalities such as plain radiographs, bone scintigraphy, CT and MRI will be demonstrated. Interventional techniques will also be shown. Familiarity with the imaging features of MSTB in children is important as this may enable a more rapid diagnosis to be made, thereby preventing a delay in diagnosis with its consequent complications.

P. 2.04 Bone Densitometry in children; beware of the pitfalls
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In recent years bone development, and therefore bone densitometry, in children has gained interest. In their 2000 consensus report on osteoporosis the NIH stated ‘It is important to acknowledge a common misperception that osteoporosis is always the result of bone loss. Bone loss commonly occurs as men and women age; however, an individual who does not reach optimal (i.e., peak) bone mass during childhood and adolescence may develop osteoporosis without the occurrence of accelerated bone loss’. Additionally, therapies aimed to treat disturbances in bone development and growth have been introduced. As children, by virtue of growth change in shape and volume, they pose a unique problem for those involved in the field of bone densitometry. One must bear in mind that all bone densitometry techniques, have exclusively been developed and validated for an adult population. Especially planar techniques, such as Dual Energy X-ray Absorptiometry, and Quantitative Ultra Sonography show a substantial influence of bone size on measurements. This makes interpretation of results of these techniques difficult in a clinical setting. We give an overview of the available techniques and discuss the specific problems that can be expected when these techniques are used in children.

P. 2.05 US-guided intraarticular corticosteroid injection of the subtalar joint in children with Juvenile Idiopathic Arthritis (JIA): preliminary results
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Difficulties with blind corticosteroid injection of the subtalar joint are commonly encountered in children with JIA. The aim of this study is to assess the value of ultrasound (US)-guided technique as compared with blind technique in the injection of the subtalar joint. Consecutive patients with JIA who have clinical signs of active arthritis and intra-articular fluid or synovial proliferation in the subtalar joint detected at US have received either a blinded injection or a US-guided injection with free-hand technique using a high resolution (15-2MHz) US probe. Patients were assessed at 24 hours, 2 months and 6 months of follow-up to compare the level of clinical response and the frequency of complications between the two treatment groups. To date, 12 patients have been enrolled in the study: 5 received a US-guided injection, whereas 7 were injected blindly. In all cases, the puncture was performed with the same 22-gauge needle type. The amount of aspirated fluid was greater in the group of patients who underwent US-guided treatment due to a more accurate intraarticular needle placement. The preliminary results indicate that the intraarticular corticosteroid injection of the subtalar joint in children with JIA is more accurate and successful when per-formed under US guidance.

P. 2.06 Shoulder infections in infants and children: sonographic findings and differential diagnosis
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Objectives: To illustrate the application and utility of sonography in the diagnosis and management of infectious processes of the shoulder in infants and children. Patients and methods: Technique and the sonographic appearance of infectious conditions at different age groups will be reviewed. Results: Additional conditions simulating this sonographic appearance such as congenital anomalies, trauma, inflammatory processes and soft tissue masses will be presented, with complementary findings on other modalities. Conclusions: Sonography is a readily available, non-invasive and efficient technique for the evaluation of shoulder infections in infants and children; plain film radiography and MR are contribution for differential diagnosis and follow-up.
P. 2.07 Skeletal injuries in sexual abuse
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Objective: Sexual abuse is often associated with physical abuse, the most common injuries being bruising and other soft tissue injuries, but fractures occur in 5% of sexually abused children. The fractures described to date have formed part of the spectrum of injuries in these children and have not been specifically related to the abusive act. Material/Methods: Three children with pelvic or femoral shaft injuries in association with sexual abuse. Results: A 3-year-old girl with extensive soft tissue injuries to the arms, legs and perineum also sustained fractures of both pubic rami and the sacral side of the right sacro-iliac joint. A 5-month-old girl with a vaginal tear was shown to have subperiosteal new bone formation along the shaft of the left femur. A 5-year-old girl presented with an acute abdomen and pneumoperitoneum due to a ruptured rectum following sexual abuse. She had old healed fractures of both pubic rami with disruption of the symphysis pubis. Conclusions: Although the finding of a perineal injury in a young child may be significant enough for the diagnosis of abuse, additional skeletal injuries revealed by radiography will assist in confirmation of that diagnosis and may be more common than hitherto suspected.

P. 2.08 Reliability of the Sauvegrain and Nahum method to assess the bone age in a contemporary population
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Background: The Sauvegrain and Nahum method is used in our departments to assess the bone age in complement to the Greulich and Pyle atlas in children between 9 to 15 years of age. Objective: To evaluate the reliability of this method in a contemporary population. Material and methods: Elbow radiographs performed for acute trauma of 75 patients (38 girls, 37 boys) aged from 8 years 11 months to 15 years 3 months were analysed by three radiologists. The inclusion in the study group required the absence of chronic disease and previous trauma and the parental consent. Results: There was no statistically significant difference between the three observers (p=0.9). The differences between the bone age (BA) and the chronological age (CA) were 6 ± 11 months (p<0.002) for the study group, 4.5 ± 10 months (p<0.02) for the female group and 7 ± 12 months for the male group. There was a good correlation between BA and CA: BA=0.87 CA+1.1 (year). Conclusion: The Sauvegrain and Nahum seems to overestimate the chronological age in a contemporary population. Further studies on larger samples are mandatory to confirm our results.

P. 2.09 Imaging techniques in the diagnosis of paediatric torticollis
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Torticollis is a deformation characterized by a permanent lateral rotatory deviation of the head. It may be acute or chronic, acquired or congenital. Objective: to evaluate the usefulness of imaging technique in the various forms of infantile torticollis. Material/Methods: Forty-six children between 10 days and 16 years old suffering from torticollis were studied over a period of 10 years. All underwent radiographic examination, 15 ultrasonography, 18 CT, 15 MR with contrast agent and 4 subjects with rotatory atlantoaxial subluxation also underwent CT with the head controlateral to the affected side. Results: The following pathologies emerged: 15 cases of congenital myogenic torticollis, 9 of congenital abnormalities, 5 of Grisel syndrome, 5 of cerebello-medullary neoplasia, 4 of calcific discopathy, 6 of bone neoplasia and 2 cases of ocular disease. Conclusions: Ultrasonography proved to be fundamental in the diagnosis of the congenital muscular forms whereas 3D CT images were more precise in the bone abnormalities, proving to be more reliable than conventional radiology in the alterations of C0-C2 tract. MR with contrast agent proved to be a valid aid in identifying the causes of Grisel syndrome.

P. 3.01 Diagnostic imaging and critical review of CCAM (Congenital Cystic Adenomatoid Malformation)
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Purpose: The value of postnatal diagnostic imaging in children who have been diagnosed a pulmonary cystic mass prenatally, highly suggestive for CCAM, has been evaluated. In the past CCAM was always identified postnataally, while, at present, the diagnosis is almost always done by prenatal ultrasound. CCAM is a rare congenital developmental pulmonary malformation. The pathological finding is characterized by cystic lesions of different size. Materials/Methods: In our recent experience we performed postnatal chest X-ray and CT in the three different types of CCAM, according to Stocker classification, differentiating CCAM from other thoracic masses. CCAM type 1 is compared and differentiated by congenital diaphragmatic hernia, CCAM type 2 and type 3 are differentiated by thoracic neuroblastoma and CCAM type 3 are differentiated by pulmonary sequestration. Results: CCAM type 1 can always be differentiated by congenital diaphragmatic hernia, while thoracic neuroblastoma cannot be differentiated by CCAM 2 and 3. At last, CCAM 3 can almost always be differentiated by pulmonary sequestration. Conclusions: Nowadays the diagnosis is made by prenatal ultrasonography and the purpose of postnatal chest x-ray and CT are useful tools to confirm the presence of a pulmonary mass, to determine its location and size, necessary for surgery planning, to characterize it and make a differential diagnosis.
**P. 3.02 Assessment of air trapping in expiratory HRCT of childhood asthma patients in remission: comparison with pulmonary function tests**

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**Objective:** To evaluate the lung air trapping with expiratory HRCT in childhood asthma patients in remission and compare with pulmonary function tests. **Materials and Methods:** Forty-seven asthma broniale patients in remission, which have normal or mild pulmonary function test abnormalities were evaluated if they have air trapping areas or not in expirium HRCT. Five HRCT scans of whole lung which were obtained in inspiration and expiration were evaluated with semi-quantitative grid method. The patients divided in three groups according to their air-trapping score (0,1,2). The densitometric analysis was performed in the normal and air-trapping regions. **Results:** Twenty-five out of 47 patients have air-trapping regions, whereas 22 patients have not. Fourteen out of 25 patients with air-trapping, have some abnormalities in their pulmonary function tests. The half of the patients with no air-trapping have some pulmonary function test abnormalities. **Conclusion:** In childhood asthma patients in remission, air-trapping cannot be predicted from pulmonary function tests. Expiratory HRCT can be used as a complementary test for monitoring air trapping of asthma broniale patients in remission. This technique improves direct follow-up of air trapping and helps in modifying treatment regimes.

**P. 3.04 Chronic interstitial lung in 9 years girl with misinterpreted obstructive bronchiolitis in infancies**

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A case report of a 9 years old white girl with uneventful clinical history except for an “obstructive bronchiolitis” in infancy. **Materials:** Chest X-ray performed at admission showed patterns of hyperlucency and patchy opacities. HRCT (inspire, expire) showed severe mosaic perfusion, peribronchial thickening and peripheral densities. Asymmetric size of the pulmonary arteries was also evident. Clinically, she had poor functional tests; interstitial hypercellularity was present on biopsy. **Results:** herein we show the value of a good HRCT in the diagnosis of restrictive and obstructive lung disease, and its agreement with histopathology.

**P. 3.03 Role of fetal Magnetic Resonance Imaging in a case of Congenital High Airway Obstruction Syndrome (CHAOS)**

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The ability to diagnose potentially lethal prenatal but reversible anomalies can help to planning fetal or intrapartum surgery. Prenatal ultrasound of a 20 weeks aged fetus showed enlarged hyperechogenic lungs, inverted diaphragms and ascites. Prenatal MRI at 22 weeks gestation revealed enlarged lungs with homogeneous T2 hyperintensity, ascites and a fluid-filled upper airway with a focal interruption of lower larynx lumen, suggesting the diagnosis of CHAOS. The fetus was delivered by cesarean section with Ex-utero Intrapartum Treatment (EXIT): while on placental support, laryngoscopy confirmed laryngeal atresia and a tracheostomy was performed. Laryngeal atresia is a rare congenital cause of airway obstruction that leads to death within a few minutes after birth. The diagnosis rely on echographic evidence of indirect signs: bilaterally enlarged hyperechogenic lungs, inverted diaphragm, fetal ascites and hydrops. Mycrocystic Cystic Adenomatoid Malformation can have similar US and MRI appearance, but bilateral CAM is extremely rare. Fetal MRI can help in directly demonstrate the obstruction. If the diagnosis is made prenatally, EXIT procedure may be life-saving.

**P. 3.05 Pulmonary capillary hemangiomas in an infant, case report**

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Pulmonary capillary hemangiomas are extremely rare in infants. A case report of a one month old male with initial symptoms of cyanotic lips, skin hemangiomas, and Beckwith-Wiedmann syndrome is presented. The chest exam shows a well defined homogeneous mass in the base of the right upper lobe. CT chest with contrast reveals a large right upper lobe rounded opacification containing several minute air collections. There are also several smaller bilateral lower lobe nodules. CT high resolution chest without contrast shows the same findings. The mass is resected with pathological diagnosis. Pulmonary capillary hemangiomas are a rare cause of pulmonary nodules, solid masses, or cystic lesions of childhood. Pulmonary capillary hemangiomas are also associated with primary or idiopathic pediatric pulmonary hypertension. A review of the literature and radiographic findings are described.
Our aim is to show utility of 3-D Multiplanar reconstruction of bronchial tree evaluation by low-dose multidetector CT in order to get useful planning for follow-up and FK treatment of Cystic Fibrosis patients. "Virtual bronchoigraphy" is a new noninvasive technique that provides a real picture of bronchial tree and may substitute the traditional bronchography, less tolerated by patients. This practice would give an excellent bronchial overview for a better approach to not physician therapists.

Tracheobronchial rupture, a very uncommon (< 1%) and serious complication of blunt or penetrating chest, neck or facial trauma; may be recognized in the early phase, according to the site and the extent of the lesion, from dyspnea, tachypnea and other indirect signs like mediastinal or subcutaneous emphysema and pneumothorax, often refractory to adequate drainage, revealed at chest radiographs or CT. Typical is the "fallen or drop lung sign", with a collapse of the lung toward the lateral chest wall, in a dependent position hanging on the hilum by the vascular attachments. Endotracheal tube abnormalities (overdistention of the cuff or extraluminal projection of the tip) can be of diagnostic importance, but the absence of clinical or radiological signs does not exclude the tracheobronchial wall defect, so bronchoscopy is finally essential to confirm the injury. The treatment is conservative, in absence of respiratory compromise, or consists of re-establishing continuity by surgical repair. In our case we present a rare rupture of a mainstream bronchus following blunt facial trauma and inhalation of a fractured tooth.

Introduction: Congenital short pancreas (CSP) is a rare pancreatic anomaly that may be associated with polysplenia or asplenia. Chronic or recurrent pancreatitis in patients with CSP has been reported in the literature, but only in adults. We have diagnosed CSP in a pediatric patient who has had recurrent pancreatitis. Case Report Summary: A 14-year-old Caucasian girl presented with abdominal pain, recurrent over a period of months. Her diagnostic workup included elevated serum amylase and lipase levels, the latter in the 500-1000 IU/l range. Endoscopic retrograde cholangiopancreatography (ERCP) demonstrated a single ductal papilla with a short duct of Wirsung suggestive of pancreas divisum. Magnetic resonance cholangiopancreatography (MRCP) demonstrated a short pancreas with a faintly evident pancreatic duct, multiple spleens, and abdominal situs solitus. Abdominal computed tomographic (CT) examination confirmed CSP and other findings. Conclusions: 1. CSP with polysplenia in children may be associated with recurrent pancreatitis, 2. ERCP, although a strong diagnostic tool, cannot yield distinguishing findings between CSP and pancreas divisum. 3. In children with chronic or recurrent pancreatitis, MRCP and/or helical CT must be used to examine for pancreatic splenic, and abdominal situs anomalies.
P. 4.03 Prenatal MRI of the fetal gastrointestinal anomalies on balanced FFE sequence

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Fetal MRI is generally imaged with SSFSE or HASTE sequence. We tried to use balanced fast field echo (b-FFE) sequence in order to reduce the duration time and the effects of artifact. **Objective:** To demonstrate efficacy of MRI of the fetuses with gastrointestinal (GI) anomalies using b-FFE. **Materials and Methods:** From March to December 2002, 69 fetuses underwent prenatal MRI at National Children’s Medical Centre. Of these, 9 cases were diagnosed to have GI anomalies. Retrospective review of MRI of these 9 cases including congenital diaphragmatic hernia (CDH) (3), esophageal hiatal hernia (1), gastrochisis (1), meconium peritonitis (2), omphalocele (1), and imperforate anus (1) were performed. MRI findings were collated with clinical findings. All images were obtained with a 1.5T MR unit using b-FFE during maternal free breath. **Result:** All MRI diagnoses were accurate in details and correlated with postnatal findings. Herniated organs into the thorax with or without hernia sac in CDH cases, perforation of hernia into the umbilical cord with meconium peritonitis, and complex anomalies of bladder exstrophy were well recognized. **Conclusion:** Balanced-FFE sequence can demonstrate the stable signal and good contrast image without the blurring, and this will be one of successful methods of prenatal MRI.

P. 4.04 Duodeno-Renal fistula

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**Objective:** Describe two children with fistulous connections between the right kidney and duodenum. **Materials and Methods:** A 5 year old, previously healthy boy (A) and 13 year old boy (B) with Werdnig-Hoffman disease, scoliosis repair and prior lithotripsy for bladder calculi to duodenal fistulae for bladder calculi did multiple imaging studies followed by placement of renal drainage catheters, in A for pyohydronephrosis and linear proximal ureteral stone and in B for a subcapsular renal abscess. **Results:** Catheter contrast injection demonstrated persistent duodenal fistulae to the right renal pelvis in (A) and the renal abscess in B. Both children underwent surgical closure of the fistula and right nephrectomy. In A, history of an asymptomatic toothpick ingestion 18 months previously was obtained. This apparently perforated the duodenum, migrated into the right renal pelvis, became encrusted with calcium and caused obstruction and secondary infection of the kidney. In B, the subcapsular abscess was thought to be secondary to reverberating shock waves from the prior lithotripsy. Several small right renal stones were present but no hydronephrosis. **Conclusion:** The duodenum and right kidney are in close anatomic proximity. These two cases demonstrate that fistulization can occur in either direction, related to a migrating foreign body and/or chronic inflammatory process.

P. 4.05 Hepatic flexure volvulus in a child

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A case of hepatic flexure volvulus, in a 10-year-old girl with trisomy 13, mental retardation and spastic tetraparesis, is presented. Volvulus, due to common ileo-colic mesentery abnormality, involved the ascending colon and terminal ileum as well. Abdominal films showed a left side positioned, grossly distended ascending colon, as well as a dilated redundant hepatic flexure. Diagnosis was made by a bowel enema, which revealed the twisted segment of the proximal transverse colon.

P. 4.06 Diagnostic difficulties in a 14 months-old baby with abdominal tuberculosis

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**Case report:** A case of a severe pulmonary and abdominal form of tuberculosis is reported. The 14 months-old baby girl was admitted because of diarrhea, abdominal pain, bowel distention and mild respiratory symptoms. Chest X-Ray showed right perihilar patchy infiltration which was thought to be pneumonia. Abdominal US showed fluid filled bowel loops but there was no sign of intussusception or other surgical disease. Series of stool cultures were normal. Celiac disease, cystic fibrosis has not proved and in spite of a complex therapy there was no improvement in the clinical state of the baby. Repeated US examination revealed bowel-wall thickening, ascites, hepatomegaly with tiny hypoechoic areas in the spleen and retroperitoneal, mesenteric lymph nodes conglomerates which contained small anechoic cystic-like lesions. Unenhanced CT scan demonstrated calcification in lymph nodes (tuberculosis?). Pulmonary lesion was developing – disseminated small nodules, ARDS – while clinical status of baby turned worse. Laboratory test confirmed tuberculosis but anti-tuberculosis therapy was ineffective and two months later we lost the child. **Conclusion:** Atypical form of tuberculosis in children are rare. They sometimes appear like abdominal masses of enlarged lymph nodes. Diagnosis of this type is difficult and can be achieved only by considering the clinical and the radiological findings.
P. 4.07 Emergency department ultrasound of the abdomen: contribution of the radiologist in the era of CT
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Objective: To investigate the value of radiologist performing abdominal ultrasound (US) requested from emergency department (ED) in the era of extensive use of CT. Materials and Methods: A total of 221 patients from ED were evaluated by abdominal US. Of these, there were 72 patients suspected to have acute appendicitis (37 boys and 35 girls with mean ages of 10 years and 5 months). Among these 72 patients, 10 patients had more than one US as a follow up examination. CT was indicated in 3 patients. For each case, imaging findings on the report were compared with the final diagnoses. In addition, utility of CT and MRI were investigated. Results: The initial US had a sensitivity of 74%, specificity of 100%, and accuracy of 93%. There were 5 patients with false negative diagnosis of acute appendicitis at the time of initial US. Of these 5 patients, additional US (2 patients), additional US and CT (2 patients), and CT (1 patient) were performed. These additional examinations clearly showed evidence of acute appendicitis and its complication before surgical intervention. Conclusion: US of the abdomen is a reliable tool not only for establishing diagnosis but for selecting the candidate for further imaging study such as follow up ultrasound, CT or MRI.

P. 4.08 Acute enteritis as atypical onset of infectious mononucleosis: diagnosis by color-Doppler-US
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Purpose: to describe color-Doppler-US findings of the bowel in patients with clinical symptoms of gastro-enteritis as atypical onset of Epstein-Barr Virus (EBV) infection. M&M: We retrospectively reviewed the clinical and imaging records of 6 patients (4 M, 2 F, 4-12 years) admitted at our Institution for gastro-enteritis. In all patients the diagnosis of Infectious Mononucleosis was made by the presence of a high titer of specific IgM against EBV in the serum. Results: All patients showed numerous enlarged lymphnodes (diameter: 10-25 mm) around the superior mesenteric artery and the celiac axis in a “muff’s shape”. Multiple enlarged mesenteric lymphnodes were also present in the mesentery, next to the ileal and jejunal wall. All lymphnodes were ovoid or rounded, hypoechoic, with smooth margins and showed, at color-Doppler, a normal vascular pedicle at lymphnodal hilum. The small bowel wall and colonic wall had normal thickness and pericolonic lymphnodes were normal in all patients. In one case a mild peritoneal effusion was present. Spleen was enlarged in 2 patients and was normal in the other 4. Conclusions: enlargement of mesenteric and celiac lymphnodes at US examination in young patients with acute enteritis can be related to an atypical onset EBV infection.

P. 5.01 Dynamic gadolinium-DTPA enhanced MR urography for assessment of drainage in grossly hydronephrotic kidneys: a comparison with diuretic MAG 3 renography
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Objective: To evaluate the use of dynamic gadolinium DTPA-enhanced MR urography (Gd-MRU) for assessment of drainage in grossly dilated hydronephrotic kidneys. Material/methods: Nine renal units in eight children (mean age 4.3 years) with gross hydronephrosis were studied. The examination consisted of a dynamic T1-weighted sequence with continuous imaging of 30 minutes after Gd-DTPA administration. Time-intensity curve of each kidney was produced. Drainage was diagnosed either by time-intensity curves and/or direct visualization of contrast within the ureter. The results were compared with that of diuresis MAG3 renography. Antegrade pyelograms served as the gold standard in cases of discrepancies. Results: Gd-MRU demonstrated drainage in 4 systems which were diagnosed to be either obstructive or inconclusive by MAG3. Antegrade pyelograms confirmed the above Gd-MRU findings. Conclusions: dynamic Gd-MRU is a useful and probably a more superior imaging method than diuresis MAG3 renography in distinguishing obstructive from non-obstructive dilated systems, particularly in cases with gross hydronephrosis and impaired renal function.

P. 5.02 Magnetic Resonance imaging-Genitography in pediatrics
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Objective: Opaque genitography represents the gold standard examination in the exploration of urogenital malformations in children (urogenital sinus, cloacal anomaly, sexual ambiguity). The aim of this study was to evaluate the accuracy of magnetic resonance imaging in assessment of these malformations. Material and methods: A retrospective review of 4 cases of urogenital malformations, aged from 6 month to 7 years old and explored with T2 weighted MRI sequences in sagital, coronal and axial planes. Results: Results obtained were compared to surgical data and to opaque genitography in some cases. In all cases MRI successfully predicted the malformation by evaluating the anatomy of the uterus and vagina and visualizes their relations-ship with the bladder and rectum. Conclusion: MRI-genitography appears to be the examination of choice prior to surgical correction in the exploration of children urogenital malformation, thanks to his multiplanar capability and modality that is not dependant on ionizing radiation or intravenous contrast agent.
P. 5.03 MR urography in children with upper urinary tract anomalies

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Objective: To emphasize the role of MR urography in children with upper urinary tract anomalies. Material and methods: MR urography was performed in 31 children aged 40 days to 16 years in whom urinary tract dilatation, dysplasia, agenesis, ectopia, and multicystic disease were detected by ultrasonography, intravenous urography or voiding cystourethrography. Results: Findings were ureteropelvic junction obstruction (n=16), hydroureteronephrosis (n=5), ectopic kidney (n=2), primary megaureter (n=2), double collecting system (n=2), dysplastic changes (n=2), multicystic dysplastic kidney (n=1). MR urography was normal in 1 patient with an initial diagnosis of ectopic ureter. Conclusion: MR urography provides invaluable morphological and functional information of the urinary tract in children.

P. 5.05 Magnetic Resonance Pyelography (MRP) experience with an open low gradient power system

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MRP is considered the gold standard procedure to image the upper urinary tract dilatations as well as no functioning systems. The aim of this study is to evaluate the reliability of the MRP using an open MR unit with a low gradient power system (0.2 Tesla). We present two cases undergone to full urological imaging evaluation: a 26 months old girl with right duplex system and ectopic vulvar ureter and a 7 days old boy with left ureterocecle and omolateral megaureter in ectopic dysplastic kidney. No anaesthesia or sedation were required for the MR investigation. The MR sequence protocol started with a T2 weighted sequence in the coronal plane and a T1 and TIRM sequence oriented in axial planes without contrast material injection, and completed with variable section thickness MRP sequence. MRP using an open low gradient power system provided a reliable non-invasive imaging of the dilated, poor functioning upper urinary tract with a superior anatomical and clinical assessment compared to traditional radiological investigations.

P. 5.04 Fetal MR imaging of urinary tract abnormalities

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Fetal MRI is an important complementary study to ultrasound in fetuses with suspected urinary tract abnormalities noted on obstetric sonography. Seventeen fetuses with suspected urinary tract abnormalities were referred to MR. The pathologies included multicystic dysplastic kidney (MCDK), various cystic diseases of the kidneys, abnormal position of the kidneys. Findings were correlated with obstetric sonography and postnatal follow up. The important role of fetal MR included evaluation of the extent of the parenchymal disease and tissue delineation of the affected and non-affected kidney. Early delineation of these pathologies is important in guiding management, prognosis and in parental counselling.

P. 5.06 Vesico-ureteral reflux in children assessed in ultrasound with echo enhancement–own experience

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Objective: Based on own experience we show advantages and disadvantages of sonocystography with comparison to fluoroscopic micturating cystourethrography. Material/method: 70 children aged from 2 months to 10 years, were diagnosed for VUR. Sonocystography (ultrasoundography with microbubbles containing contrast medium - Levovist, administered intravesically), and cystourethrography were made in the same sessions. Ringer’s solution was used as a solvent for Levovist, instead of normal saline. In most children we used Midazolam for sedation. Reflux was diagnosed when microbubbles appeared in the ureter or pelvicalyceal system. Results: Reflux was detected in 32 children (6 children had double site reflux). I-IV grades of reflux were identified. Sedated children had no problem with micturition and they better tolerate the exam. In statistic data, sonocystography had a sensitivity of 93.5%, a specificity 91.3%, an accuracy 92% compare to cystourethrogram. Conclusion: Sonocystography is a realiable method for detecting vesicoureteral reflux in children.
**SCIENTIFIC EXHIBITS CARDIOVASCULAR/INTERVENT.**

**P. 6.01 Lymphangioma sclerosis with OK-432**  
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**Objective:** Three children with four lymphangiomas which had OK-432 sclerosis as primary therapy. Preprocedure imaging consisted of ultrasound and MRI or CT. US was most useful in defining macro- and micro-cystic components, and accessibility of the lymphangioma to sclerosis, and MRI in defining extent and relation to vessels and airway, of lesions located in the neck and upper arm. One macrocystic lesion had intraläsional haemorrhage on MRI. The technique employed was that described by S.Ogita, using 0.1mg OK-432 diluted to 10ml with normal saline. Performed under general anaesthesia with US and fluoroscopic guidance, the lesions were initially aspirated, non-ionic iodinated water-soluble contrast injected to determine volume and exclude run-off, reaspirated, then OK-432 instilled. The haemorrhagic lesion had converted from a macro- to microcystic lesion. Contrast introduction was reassuring in defining its new limits. The patients developed low-grade fevers, swelling and induration of the lymphangioma during the first 10 days, prior to partial or complete shrinkage. Skin wrinkling but no scarring occurred after almost 100% reduction in one lesion. Whilst not without some morbidity, this technique is well tolerated by the patient and parents alike, and is a useful first-line and frequently definitive therapy in the management of lymphangioma.

**P. 6.02 Minimally invasive occlusion of recurrent Tracheo-Esophageal Fistulae (TEF)**  
P. Chait, V. Forte, J. Friedberg, S. Ein, F. Kreichman, B. Connolly, M. Temple, P. John, J. Amaral  
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**Objective:** To describe the treatment of recurrent fistulae in patients with TEF post-primary surgical repair. Methods: Six patients under 1 year of age presented with recurrent TEF which were treated with combined bronchoscopy and fluoroscopy-guided catheter placement through the fistulae into the esophagus. Trauma was induced in the fistulae with a combination of wire manipulation, suction and electocautery. The fistulae were then embolised with hystocryl mixed with lipiodol. The procedure was visualized under fluoroscopy and direct video imaging.

**P. 6.03 Central venous line-related thrombosis in children: association with Central Venous Line (CVL) location and insertion technique**  
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**Objective:** To assess whether the CVL location and insertion technique are associated with increased thrombosis. Methods: Multi-center prospective study of 85 patients with acute lymphoblastic leukemia who had CVLs placed. Outcome assessment for thrombosis included venography U/S and MRI. Results: Of the 85 patients, 29 (34%) had evidence of thrombosis. Left-sided CVLs and percutaneous subclavian CVLs had a significantly increased incidence of thrombosis. Conclusion: For CVL placement in the upper system, the right jugular approach, percutaneously, is associated with the least thrombosis.
P. 6.04 Renal Angiography (RA) & Percutaneous Transluminal Angioplasty (PTA) in hypertensive children

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RA is frequently negative in children investigated for renovascular hypertension (RVH) and the effects of PTA are uncertain. Objectives: To evaluate the safety and efficacy of RA & PTA in children. Material/Methods: A retrospective review of pts referred for RA (1991-2002). Results: 71 hypertensive pts underwent RA (n = 93 angiograms). Onset of RVH occurred at 1d to 17y (mean 9y). 9 pts had renal transplants. On initial RA, 20/71 had lateralizing renal vein renins, yet 12/20 had normal RA. RA in 17 patients (4 post renal transplant) showed 22 stenoses (12 main, 6 branch & 4 transplant renal arteries). All 17 pts with abnormal RA had PTA, 15 of whom were included in the study (PTA x1, n=1; PTA x2, n=2; PTA x3, n=1; total = 19 PTAs). Of the 19 PTAs, 89% were successful at the time of discharge (11% failed). At 3-6 months post-PTA, 42% were successful, 32% failed, & data unavailable in 26%. After 1year post-PTA, 42% were successful, 42% failed & data unavailable in 16%. There were 14 minor complications and no deaths post RA or PTA. Conclusion: In this study, RA was frequently negative. Evaluation of PTA at 6 months predicted sustained success. PTA shows sustained success in under half of patients.

P. 6.06 Interventional radiology treatment in a rare case of pediatric perimedullary fistula

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Objective: to evaluate percutaneous treatment of cervical (C2-C3) perimedullary fistula in paediatric age. Materials and methods: A.M., female, 10 y.o. to our observation for headache and rigor nucalis in acute. MRI examination showed perimedullary vascular malformation in the cervical spine (C2-C3). Angiographic evaluation showed two prevalent vascular branches to the lesion: one originating from the vertebral arteries confluence and the other from the 5th left intercostal artery. Embolization of the dilated vein of the fistula was performed by using a coaxial catheter, 4 GDC spirals and Glubran 70% with 30% Lipiodol. Results: the angiographic control immediately after the procedure showed occlusion of the fistula. One month MRI control: reduction of the perimedullary venous dilation and no flow in the lesion. Conclusions: interventional radiology is the 1st choice procedure in the treatment of vascular fistulas.

P. 6.05 MRI of corrected congenital heart disease

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The most common indications for MRI in the setting of corrected congenital heart disease are: 1.Repaired coarctation: To assess for re-stenosis, functional significance of re-stenosis, aneurysm or pseudoaneurysm formation, collateralization, and the status of the aortic valve and left ventricle. 2.Repaired tetralogy of Fallot: For degree of pulmonary regurgitation, residual VSD, RVOT obstruction, RV size and function, conduit integrity, status of the aortic root, branch pulmonary arteries, and pulmonary veins. 3.Complex two ventricle repair, including transposition of great arteries: To assess for stenosis of venous pathways, baffle leak or stenosis, valvular regurgitation, ventricular size and function, pulmonary artery stenosis after arterial switch, LVOT and RVOT-conduit obstruction after Rastelli procedure. 4.Single ventricle repair and Fontan procedure: To rule out stenosis along the systemic venous return pathway to the pulmonary arteries, assess ventricular size and function. This poster will illustrate the pathogenesis, time course, and prognostic implications of common post-operative complications, their MRI manifestations, and their optimal depiction by careful choice of planes and sequences. Case studies will illustrate how the MRI findings are interpreted in the context of clinical findings, and along with correlated data from echocardiography and catheterization, to arrive at management decisions.

P. 6.07 Prospective evaluation and analysis of vascular complications related to heart catheterization in pediatrics using duplex-sonography

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Objective: Despite introduction of non-invasive diagnostic techniques heart catheterization remains an indispensable tool in pediatric cardiology. The aim of our study was to evaluate prospectively the amount and nature of pediatric vascular complications. Material/Methods: From 2/01 - 10/02 duplex-sonography was performed 1-2 days prior to heart catheterization and within 24 hours after. Pelvic, femoral and popliteal vessels as well were examined and correlated to clinical data. Results: A total amount of 104 duplex-sonographies in 91 children (2/3 less than 6 years old) were performed. In 6 patients (6%) vascular complications were noted: three patients presented with disturbances of arterial flow with impaired perfusion, two patients developed aneurysms and hematoma. In one patient femoral hematoma resulted in compression of V. femoralis communis with impaired blood flow. All complications required no intervention and resolved under drug therapy with heparin. No statistically significant predisposition concerning age was assessed. Conclusion: Vascular complications associated with heart catheterization are rare and mostly resolve spontaneously. Duplex-sonography constitutes the method of choice for diagnosis and follow-up.
P. 7.01 The policy of reduced CT dose in children in Taiwan
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Objective: To survey the reduced CT dose policy in Taiwan. Material & Methods: We selected 30 hospitals in Taiwan to study the reduced dose policy in children in Taiwan. Questionnaires were set to include the following items: Does your hospital apply on reduced CT dose policy? What method do you adapt to? When did you start the policy? What lead you start the policy? What benefit do you think you have got? …And other questions. All questions were taken by phone calls. Results: 21 (70%) hospitals carried out the reduced dose policy. The periods ranged from 3 months to 2 years. 14(66%) hospitals with GE Hi-speed machines provided smart adjustment of mA according to the body thickness. 3 (14%) hospitals adjusted the mA according to the experience of the technicians. 4(19%) hospitals with baby protocol separated from the adult one. 14 directors of department were enlightened on the articles in journals. 7 directors adapted the policy with personal insights. Benefits included reduced chance of cancer on the rest of the patients’ lives, prolonged the lives of CT X-ray tubes and saved money from less consumption of electricity and increased patient outflow rate. Conclusion: The reduced CT dose policy is a current trend and a mark to reflect the quality of health care in the country. We anticipate that all hospitals would adapt the policy of reduced CT dose in the near future.

P. 7.02 Ultrasound of thyroid anomalies in children
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Objectives: to review ultrasound aspects of thyroid anomalies in 40 children, excluding neonatal period. Material and Methods: 40 children, aged 6 to 16, had thyroid ultrasound because of abnormal neck clinical examination or abnormal biological thyroid tests. Results: Focal and generalised anomalies were demonstrated. Focal anomalies are nodules which may be anechoic suggestive of cyst or poorly echoic in colloid cysts. Solid nodules may be adenoma which represent the most frequent benign tumor but malignancy should always be considered. Heterogeneous nodules may be encountered in any etiology. Focal anomalies may also be encountered during follow-up of children who were treated for cancer; this arises difficult questions. Multinodular lesions are usually related to goiter especially in children coming from endemic areas. Diffuse anomalies suggest thyroiditis or metabolic disease ans lead to biological tests. Fine needle aspiration puncture may be helpful in establishing a diagnosis; doubtful lesions have to be operated on because of the increased risk of malignancy in children. Different aspects will be presented with literature review to assess the relative frequency of each different type of lesions. Practical attitude will be discussed.

P. 7.03 Catscratch disease without peripheral nodes: a new case
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The Cat Scratch Disease (CSD) or Bartonellosis, is an acute infection occurring most commonly in children or young adults, who have been scratched or bitten by cats. Usually it presents with a tender regional limphoadenopathy. Systemic CSD with no peripheral nodes, fever and hepatosplenic involvement is being reported with increasing frequency. We describe a case of a 14th boy that came to our observation for fever and slight abdominal pain. At US and CT examinations we found a significant splenomegaly (over 17 cm) with some hypoechoic lesions and a periportal and periaortic lymphoadenopathy. In the suspect of malignancy, at first an US guided fine needle biopsy and then a videolaparoscopic macrobiopsy of one of the pericaval nodes were performed. The diagnosis was made only after serological test (the Indirect Fluorescent Antibody (IFA) test confirmed the presence of specific IgM and IgG). We highlight the usefulness to perform this test in every case of abdominal limphadenopathy to prevent more aggressive examinations.

P. 7.04 Radiologic imaging of iatrogenic complications in newborn infants
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The newborn is invariably subjected to a wide variety of diagnostic and therapeutic procedures by both clinicians and radiologists. Sometimes, these procedures result in complications of varying degrees. It is important to recognize these complications when they do occur. The aim of this poster is to show the radiological features of some complications that we have encountered in our practice. Illustrative cases of complications relating to placement of various life support lines as well as complications associated with neonatal chest physiotherapy will be shown.
P. 7.05 Prenatal imaging of congenital hemangioma

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Background: Due to the progress of prenatal imaging and a better knowledge of the angiomatous lesions of the newborn, some rare anomalies of the soft tissues are now detected in utero. Material and Methods: Five cases of congenital hemangioma were diagnosed during prenatal US. Four MRI were performed. At birth, the prenatal diagnosis was confirmed. Results: The soft tissue tumor was diagnosed by prenatal US at 22 weeks (n=3) and 33 weeks (n=1) and in 1 case on cerebral MRI performed for a non confirmed microphaly at 33 weeks. The lesion was solitary in every cases, localized at the neck (n=2), thorax (n=1), cheek (n=1) and frontal scalp (n=1). The tissular mass was round, with well defined margins, sometimes large (5 cm), homogeneous, hypo or hyperechogenic with a peripheral hypervascularisation on Doppler. One had a macrocalcification. All 4 MRI showed a hypo or intermediate signal on T1 or T2. Evolution: In 1 case, the lesion regressed before birth, leaving a residual pale and discretely wrinkled skin with telangectasia. In the other 4 cases, angiomatous tumor mass was visible at birth, often surrounded by a white halo (n=3), firm, painless and sometimes large (5 cm). These lesions regressed spontaneously within a few months. Conclusions: The congenital hemangioma can be diagnosed by US and MRI in utero. The knowledge of this unique tumor is important because of it’s good prognostic after birth.

P. 7.06 Lymphangiomatosis of the pelvis and the lower leg with segmental skeletal involvement: a rare case of Gorham Stout syndrome.

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Objective: The authors demonstrate a lymphatic vascular symptomatic malformation with rare extensive skeletal involvement. Material and Methods: The case is a young female, 14 years old, with a lymphangiomatosis of the pelvis, external genitalia, inguinal area and left buttock, spreading to the lower leg. The painful malformation unables the girl to walk and forces her using chronic analgesia. A standard X-ray, CT scan and MRI have been performed in the pelvic area. Furthermore, a surgical biopsy of the skeletal area and cutaneous-subcutaneous tissues has been made. Results: All the procedures were positive for extensive lymphangiomatosis with skeletal involvement (iliac bone and lumbar sacral tract L2-L5). It warrants a deep and persistent painful symptomatology. Conclusions: Gorham Stout Syndrome is an extremely rare disease with typical bone loss in such places as part of the pelvis (hempelvis), thighbone, the hand, arm, shoulder, ribs or jaw, often associated with a lymphangiomatous proliferation. Skeletal involvement in lymphatic malformations is very rare. It makes worse the poor possibility to cure this kind of pathology.

P. 7.07 Normal values for pediatric ultrasound: a review of literature

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Objective: An important issue in pediatric ultrasonography is the normal size and aspect of organs under investigation. In the past decades several studies reporting normal values have been reported. In this poster we present the results of our review of normal values for ultrasonography. Materials and methods: Using a Med-line search strategy articles reporting normal values, limited to those publications pertaining to Western subjects under the age of 18 years, for ultrasonography have been retrieved. For each organ a standard measurement method was chosen. Publications, using this method and reporting normal values, ages and number of participants per age group, were used in our study. Results: This poster presents the combined normal values for ultrasonography in children and equivocal findings will be discussed. These normal values will be distributed among Dutch radiologists and residents in radiology, at a nationwide educational meeting regarding pediatric radiology.

P. 7.08 Neuroblastoma in patient with Noonan syndrome

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Noonan syndrome was described by Noonan and Ehmke in 1963 as male Turner syndrome. We report an infant of Noonan syndrome associated with neuroblastoma. Case report: A boy presented webbed neck and overlapping fingers shortly after birth, and was diagnosed as Noonan syndrome. Echocardiography demonstrated an atrial septal defect, and hypertrophic cardiomyopathy at three months of age. CT examination in four months showed bilateral pleural effusion, posterior mediastinal mass, and pulmonary infiltrates. Pleural effusion was confirmed chylothorax. A solid abdominal mass was palpated at the same time. CT scan showed partially calcified enhancing mass in the retroperitoneum. Open biopsy proved the mass as neuroblastoma. Bone scintigram demonstrated skull metastases resulting in stage IVb. We attempted him with decreased dose chemotherapy, as combination of hypertrophic cardiomyopathy and neuroblastoma. But he could not tolerate it, and passed away on the second day of its initial course. Coincidence of Noonan syndrome, and malignancies including pheochromocytoma, malignant schwannoma, leukemia, vaginal rhabdomyosarcoma, and neuroblastoma has been reported recently. Careful evaluation has been required in management of Noonan syndrome.
Objective: To describe the benefits of the newly released 16 slice CT scanner in a pediatric population compared to the existing Multislice CT scanners. Materials and Methods: Between May 2002 and January 2003, 153 children aged 1 day to 13 years (mean 4.5 years) underwent CT scans for a variety of clinical questions. The scans included 97 brain CT’s, 47 CT’s of the neck, chest or abdomen, 14 CT’s of the petrous bone, para-nasal sinuses or orbits, 8 CT’s of bone and joints, 3 CTA, 10 virtual bronchoscopy and one virtual colonoscopy. Results: There were no failed examinations. Doses were at least 15-20% less for the same slice width reconstruction. Sedation rate and sedation length were markedly reduced. Motion artifact was significantly reduced and image quality was therefore consistently good including in non-sedated, uncooperative patients due to the markedly reduced scan length (2.6 seconds for chest CT up to 20 seconds for total body CTA). Bolus injection was reduced up to 50%. Conclusion: The newly released 16 slice CT scan is superior in pediatric use compared to existing Multislice scanners due to lower radiation doses, reduced sedation and markedly improved image quality.

Objective: The pulmonary sling is a rare malformation in which left pulmonary artery arises from the right pulmonary artery, courses around the right main bronchus, passes between trachea and oesophagus, to the left lung. We will present the clinical and radiological findings in two very different cases. Patients and methods: After a normal pregnancy, two term newborns presented an immediate respiratory distress, moderate and severe respectively. Results: The first case had a typical presentation: right lung emphysema, anterior indentation on barium-filled oesophagus, right main bronchus compression at endoscopy, The recovery was excellent after surgical repair. In the second case, the right lung was underaerated. Impossible tracheal intubation suggested severe tracheal stenosis, associated on CT with pulmonary sling. CT provided a complete presurgical evaluation of the ring sling complex, The child died after surgery. Conclusion: The pulmonary sling should be systematically suspected when a neonatal respiratory distress occurs with asymmetric aeration of the lungs. Imaging (chest X-rays, echocardiography, barium swallow, CT, fibroscopy) should carefully evaluate the complete malformation, especially associated tracheal or/and cardiac abnormalities, in order to prepare the surgical repair.