Abstracts
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EVIDENCE OF LIPOPEROXYDATION IN SEVERELY HEAD-INJURED PATIENTS

M. Buchetichio; M. Iatromen; D. Bari; N. Nordenin and A. Candi

Numerous recent experimental studies have provided considerable support for the occurrence of free radical and lipoperoxidation reaction in the injured brain. In particular secondary damage and its pathophysiology are a focus of attention.

We have studied 10 patients with severe head injury (GCS < 8), 8 males and 2 females, average age: 35.4 years, ranging from 17 to 62. No patients had surgical mass lesions, shock or hypoxemia. Patients with fever or sepsis were excluded. After the admission, two catheteres were placed percutaneously: one for taking blood samples from the jugular bulb, as described in our previous reports (M. Bochicchio et coll.: Int. Care Med. 14 suppl. 1, 331 1988) and one for taking venous blood from the right atrium.

Samples were taken every 12 hours for 5 days. Thiobarbituric acid reacting material was measured in plasma, and expressed as malonaldehyde (MDA). A group of 6 healthy volunteers have been used for determining the normal values of MDA in venous blood.

Arteriojugular venous oxygen differences (AVD02) were obtained in 7 patients, which provides an indirect estimation of cerebral blood flow (W.D. Obst et al.; J. Neurosurg. 61:241-253, 1984).

Results: There are no significant differences between MDA levels in patient’s venous blood (MDAV) and in the healthy volunteers (MDAN) at T0 (within 2 hours from the trauma): P = 0.785 m.s. Subsequently, MDAV decreases and remains significantly higher compared to MDAN at each time.

Jugular MDA (MDAJ) is always higher than MDAV, and the two variables are closely correlated and described by the equation: MDAJ = 0.68 + 0.44 MDAV

This demonstrates that MDAV proceed from the MDAJ.

The relationships between MDAJ and AVD02 are described by the exponential equation: MDAJ = 0.68 - 0.7 AVD02 + 0.01 AVD02^2 + 0.005 AVD02^3

This gives a confirmation that MDAJ is a good index of secondary damage, because situations of ischemia (wide AVD02) determines high levels of MDAJ, while the lowest MDAJ levels are observed in the normal range of AVD02.

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PLASMA MYELOPEROXIDASE AND VITAMIN E LEVELS IN HEAD INJURY: PRELIMINARY RESULTS

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Activated neutrophils are increasingly implicated in tissue injury. They can release toxic products such as oxygen free radicals and destroy cell membranes by inducing lipoperoxidation. The study was designed to evaluate the neutrophils activation in head injury. Plasma myeloperoxidase (MPO), the best marker of neutrophils activation, and plasma vitamin E (vit. E), a well known antioxidant plasma level, were measured in 8 severe head injured patients (Glasow score < 8) at 6, 12, 18, 24 and 30 hours after trauma. Patients were divided into 2 groups according to their outcome after discharge from the ICU: death (GI; n = 5) and survival (GII; n = 4). In both groups, MPO levels increased immediately after trauma and decreased subsequently. The peak value observed after 6 hours was significantly higher in GI (mean ± SEM = 543 ± 148 ng/ml) Vit. E levels decreased gradually whatever the outcome but remained significantly lower in GI than in GII. This difference could not be explained by modifications in total plasma lipids values observed in both groups during the course of study. The Vit. E log MPO index was significantly lower in the death than in the survival group.

In conclusion, severe head injury is associated with MPO increase and Vit. E decrease. These modifications are more important in GI (death) than in GII (survival). The early increase in MPO and the subsequent decrease in Vit. E suggest neutrophils activation in head trauma. It is not yet well clarified whether these biochemical modifications reflect either the primary brain damage or a pathophysiological pathway leading to secondary neurological lesions.

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BLOOD PRESSURE CONA PROGNOSYS. A BAYESIAN VALIDATION ON THREE HUNDRED CASES (A POLYCENTRIC STUDY)
P. Cugini*, R. Romanelli**, A. Candianni***, A. Giv-va****, R. Arcioni**, G. Cavaliere**, A. Santi- ni****, M.R. Baldi****, L. Palagalli**.

AIM: To validate a prediction model for the prognosis of toxic, or vascular, or traumatic acute coma (AC) based on blood pressure (BP) dynamic monitoring.

HYPOTHESIS: Because of the central nervous regulation, the 24-h patterns may be regarded as potential markers of risk in AC.

BACKGROUND: Previous studies on a small sample have clarified that patients with AC may be discriminated in their fatal or unfatal destiny by the medians of the distribution for the BP 24-h values. These studies gave origin to a model for prognosis, the Blood Pressure Cona Prognosis (BPCP).

SUBJECTS: Three hundred patients with AC were monitored in their BP 24-h patterns.

PROTOCOL: The prognosis model was made "a priori" via the BPCP was compared with the true outcomes.

RESULTS: The prognosis for mortality was confirmed on 3% of cases while the prediction of survival was established on 64% of cases, the sensitivity and specificity being 14% and 94%, respectively.

CONCLUSIONS: The BPCP seems to be a reliable tool for predicting the AC that are unfatal.

ELECTRICAL STIMULATION OF THE GANGLION OF GASSER DURING EXPERIMENTAL VASOSPASM IN PIGS

C. Ori, G. Salar, F. Innocenzi, I. Ido.

It has been shown in cats that the electrical stimulation of the ganglion of Gasser promotes a decrease in cerebrovascular resistance (Lambert et al., J. Neurosurg. 61:307, 1984). Whatever the mechanism involved, it is important to observe the existence of a trigeminal-cerebrovascular system capable of determining cerebral vasodilatation in physiological situations but also in pathological states, when the vasocostruction of the cerebral arteries is excessive (McCulloch, NATO Advanced Research Workshop, 1988).

Experimental vasospasm was induced in Pitman-Moore pigs. CBF was measured in different circumstances by 133Xe intraarterial injections. Under normal condition, the mean CBF value was 58 ml/100g/min. After induction of vasospasm, only the animals in which a decrease of at least 50% of CBF was observed were included in the experimental protocol which consisted in electrical stimulation of the ganglion of Gasser prolonged for three hrs, and repetitive measurements of CBF to assess the possibility of obtaining the reversal of the cerebral vasocostruction.

The electrical stimulation could cause cerebral vasodilatation, which was dramatic in the first hour (CBF 150% toward baseline values); thereafter the decrease in CBF appeared less marked, but the values still ranged within normal values.

The conclusion of our study is that the electrical stimulation of the ganglion of Gasser could represent a useful tool in pathological states characterized by excessive vasocostruction of cerebral arteries.

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A NEW APPROACH FOR MEASUREMENT OF "ADDITIVE RESISTANCE" IN MECHANICALLY VENTILATED PATIENTS WITH RESPIRATORY FAILURE.
R.A. De Blasi, C. Monti, P. Orfai, M. Antonelli, M. Buci, E. Quaglia, F. Nicolli.
The resistances play a crucial role impeding the weaning and therefore must be carefully measured. We utilized a probe conventionally used in neurosurgery for recording intracranial pressures. This is a very thin fiberoptic probe (1mm diameter) able to measure "in situ" the airway pressures of the patient. Three COPD patients with ARF, admitted to our ICU were studied. The airway flow has been evaluated by means of the transducers of the SERVO 900 C ventilator. The Expiratory tidal volume has been obtained by an integration of the signal. The airway pressures have been contemporary measured by a 2mm cannula, placed at mouth piece level and connected to a PSS Statham transducer and by the fiberoptic probe (CAMINO) placed 1cm above the carina. The pressure curves were continuously recorded for 5 min using a Kontron Poligraph MOD.304. The airway resistances have been calculated utilizing the peak pressure values (Pmax), the sudden pressure fall (P1) and the inspiratory plateau (P2). The flow were measured during steady state conditions. Our results showed a good correspondence between the two recording systems used in terms of reliability of pressures. Moreover we could measure the resistances of the endotracheal tubes "in vivo" at different flow rates. We believe that this opportunity can be useful for the evaluation of the respiratory fatigue during the weaning.
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6
CONTROLLED HYPOTHERMIA AND CO2 PRODUCTION: AN EXPERIMENTAL STUDY FOR RESPIRATORY SUPPORT.
S. Faenza, S. Barocciini, G. Grillone, F. Petrini and G. Martellini.
In adult respiratory distress syndrome (ARDS) the most important strategy seems to be the low frequency positive pressure ventilation (LPPV) in order to avoid pulmonary barotraumas (Kolobow Anesthesiology, 46,138-41, 1977). In such conditions PaCO2 rises and needs an extracorporeal removal (ECO2-R) (Gattinoni L., JMA 236(7):881-8, 1986). The aim of our study is to analyze if hypothermia can be used to decrease the CO2 production.
The experimental trial was made on 6 healthy pig (35-45 Kg) connected to an extracorporeal circuit of a thermal exchanger. During the preparatory phase and adequate ventilation was maintained. In each animal arterial pressure, cardiac frequency and central temperature was monitored. The experimental phase I begin with a 60% of LPPV at normal temperature (36.7±0.8°C). The phase II used the cooling period with normal ventilation: the extracorporeal flow was about 12-13% of the theoretical volumen of the animal and was suspended when central temperature reached 30±1.2°C (±0.7°C 6±0.7°C). At that moment a phase III, with 60% of LPPV in hypothermia, started. Hemogasanalysis samplings were carried out every 10' during phase I and phase III. The results show a decrease of the PaCO2 absolute value during hypothermia of 19.8±12 mmHg at 60'. This system seems to be efficient to allow a ECO2-R flow reduction and can find an application in emergency care.
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EVALUATION OF GAS EXCHANGE WITH DIFFERENT MODES OF VENTILATION IN PATIENTS WITH ACUTE RESPIRATORY FAILURE J. Aeassigilou, I. Telci, P. Effen, T. Denkel and K. Akpir.
Different modes of ventilation were used in patients with acute respiratory failure (ARF) and their effects on gas exchange, intrapulmonary pressures, cardiac output (CO) and pulmonary blood flow were investigated. 20 patients with poli trauma with PaO2/FiO2<100 were included in the study. Patients were ventilated with Siemens Servo Ventilator 900C. Volume controlled (VC) mode (M1) was used first with I:E 1:2 and PEEP (8.97±2.10 mmHg). Pressure controlled ventilation (PCV) was performed thereafter with I:E ratio of 2:1(M2), 3:1 (M3) and a PEEP of 5 cmHg. In all modes of ventilation arterial and mixed venous blood gas analysis, (PaP) and mean (MAP) airway pressures, pulmonary blood flow, CO and other cardiovascular parameters were measured. During the measurements FiO2 was 1.
The PaO2 values were 153.87±39.08 (mean±sd) (M1), 173.73±51.01 (M2), 194.07±27.85 (M3) and 203.80±44.29 (M4) mmHg. The comparison of these values showed significant difference except between M3 and M1. The PaCO2 values were 46.36±12.52 (M1), 33.15±14.12 (M2), 31.66±4.73 (M3) and 34.47±6.27 (M4) mmHg. The PaCO2 was significantly higher in M1 compared to all of the other modes. The PaO2 values were 19.07±6.84 (M1), 23.09±3.50 (M2), 23.62±4.49 (M3) and 28.55±3.85 (M4) mmHg. Significance was found between all modes excluding M2 and M3. The CO values were 9.50±2.95 (M1), 9.60±2.68 (M2), 11.97±3.50 (M3) and 9.36±2.63 (M4) L/min. In our study PCV with I:E 2:1 and 3:1 provide better oxygenation with lower PEEP and minimal increases in MAP. Therefore these modes can be used in haemodynamically stabilised patients.
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THE EFFECT OF PRESSURE CONTROLLED INVERSE RATIO VENTILATION ON VA/Q DISTRIBUTION IN ARDS.
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Recent studies on patients with severe respiratory failure have suggested pressure controlled inverse ratio ventilation (PC-IRV) to be superior to volume controlled ventilation with conventional inspiratory-expiratory ratio (I:E) ratio (VC-CR) (H.S. Thrattart et al., CHEST, 1986, 94, 4: 755-762).
Five patients were studied. They all had respiratory failure with diffuse pulmonary infiltrates on chest X-ray, arterial hypoxemia, pulmonary artery capillary wedge pressures less than 10 cm H2O, and decreased thoracic compliance. Ventilation perfusion distributions were measured by the inert gas technique, during VC-CRV, I:E ratio 1:2 and again after 30 minutes ventilation with PC-IRV, 1:E ratio 2:1. Minute ventilation, tidal volume and measured end-expiratory pressure were set to be equal during the two ventilation modes. During PC-IRV peak airway pressure decreased, 35±6 to 27±4 cm H2O, and preset PEEP was reduced, 12±4 to 8±5 H2O. Deadspace decreased from 41±4 to 37±6 and there was a small decrease in PaCO2, 9.1±0.5 to 4.7±0.2 KPa. Shunt and PaO2 were unchanged. The position and dispersion of the main body of perfusion distribution were unchanged. Similar but more pronounced results including an improvement of oxygenation has been reported in studies with a longer observation of the patients on PC-IRV (Thrattart et al.).
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HEMODYNAMIC EFFECTS OF ENOXIMONE IN PEDIATRIC AND ADULT PATIENTS WITH SEVERE HEART FAILURE REFRACtORY TO CONVENTIONAL TREATMENT
R. Fiocchi, P. Ferrazzi, R. Eyres, F. Mampini, A. Gamba, L. Parentan

ENOXIMONE is a phosphodiesterase inhibitor with both inotropic and vasodilator properties. These pharmacologic activities are potentially useful in ICU in addition to conventional drugs such as dopamine, dobutamine, adrenaline and sodium nitroprusside. The aim of this study was to evaluate whether ENOXIMONE might be an useful drug in addition to standard inotropic and vasodilator therapy in both the pediatric and adult age groups. ENOXIMONE was administered as an intravenous bolus of 1 mg/kg followed by the continuous infusion of 5 ykg/min to 9 patients aged 21 days to 61 years. Treatment was continued for a period ranging from 36 hours to 8 days. Patients were suffering from severe acute heart failure leading to low-output syndrome resulting from cardiac surgery in six; acute cardiac rejection in one, an acute myocarditis in one, and, in one, end stage dilative cardiomyopathy. ENOXIMONE produced hemodynamic improvement in all patients as reflected by an increase in cardiac output from 3.1±0.5 L/min to 3.6±1 L/min (in 4 patients), a decrease in mean pulmonary artery wedge pressure from 15±2 to 14±2 mHg; an increase in peripheral perfusion manifest by a decrease in metabolic acidsosis and by the appearance of peripheral pulses. An improved renal function was observed in four oligo-anuric patients. Eight patients survived the critical phase. A 21 day-old neonate previously treated with phenoxymamine displayed an irreversible hypotensive picture with good peripheral perfusion possibly related to the drug.

It is concluded that intravenous ENOXIMONE produces early hemodynamic improvement in patients with severe heart failure refractory to standard inotropic and vasodilator therapy. The clinical results suggest caution in its use associated with other vasodilators, in neonates and children. The drug might be a useful addition in ICU to dopamine; dobutamine and sodium nitroprusside.

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EFFECT OF NITROGLYCERIN INFUSION ON EFFECTIVE PULMONARY CAPILLARY PRESSURE (EPCP) IN PATIENTS RECOVERING FROM AORTIC SURGERY.
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Signs of interstitial pulmonary oedema are observed on chest radiographs in patients recovering from major aortic surgery even in the absence of major heart or respiratory disease. They usually resolve within the first day after surgery unless the supportive cardiovascular therapy increases the pulmonary filtration pressure. We took advantage of the cardiovascular monitoring of such patients by a Swan-Ganz catheter in order to measure the effects of current therapies on EPCP (F. Grimbert, Eur. Resp. J. 1988, 1: 297). We estimated EPCP using a computerized analysis of the pressure time profiles obtained during a pulmonary arterial occlusion by the Swan-Ganz catheter balloon. Immediately after arterial occlusion, the fast emptying of the uncompliant arterial compartment is reflected by an exponential with a small time constant. Then occurs the slow emptying of the compliant capillary compartment which is reflected by a second exponential with a large time constant before reaching the level of Pcwp. An estimation of EPCP from the arterial occlusion pressure time profile (EPCPa) was obtained from the backward extrapolation of the slow exponential to the time of complete occlusion.

An apnea lasting 10 seconds was necessary to record a reliable pulmonary arterial pressure time profile. An average of 8 profiles were recorded for each study case. The values (m±SD) in 4 patients under mechanical ventilation (in the peroperative period) were: PAP: 18±8 torr, Pcvp: 6.8±6.5 torr, EPCP: 11.6±6 torr, capillary-venous (total resistance ratio (Rev/Rv): 41±12%. The coefficient of variation (SD/m) within each steady state was 13 ±% for EPCPa and 14.5 ±% for Rev/Rv.

A 15 µg/min nitroglycerin infusion resulted in a decrease of 4.6±1.8 torr in PAP and of 1.8±1.9 torr in Pcvp. The decrease in EPCP (3.4±1.8 torr) was less than expected from the calculation of EPCP using the ratio of Ga5 to Rev/Rv since Ga5 was increased by 39% of the initial blood volume. In the same way MAP and heartrate returned back to preanaesthesia values. These parameters remained constant until the end of the trial (3 hrs).

We conclude therefore that hypertonic-hyperoncotic solutions are an excellent alternative therapeutic concept for restoring circulating blood volume due to hypovolemia.

References: 1) Velasco, I.T et al (1980) Am. J. Physiol. 239 H664, 2) Massmer, K.; (1968) Am. J. Physiol. 17, 295.

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HYPERTONIC - HYPERONCOTIC SOLUTIONS - AN ALTERNATIVE CONCEPT FOR FLUID RESUSCITATION W. Krogl, H. Ringhofer-Szalkay, S. Ursinus, K. Fallmann, W. F. List

The primary goal in fluid resuscitation for hypovolemia is to restore circulating blood volume as rapid as and as effective as possible. Hypertonic-hyperoncotic solutions (HHS) seem to be a new promising way for a variety of indications due to rapid intravascular fluid shifts.

Six sheep were used after bleeding to a MAP of 40 mmHg. After a period of 45 min, hypertonic-hyperoncotic solution (NaCl 7.2% plus Dextran 70 and/or HES 200/0.5 10%) was given. The amount of applied fluid was 1/10 of blood loss (4ml/kg bw). To estimate the volume expanding effect of the HHS the mechanical oscillator technique was used, by determination of blood- and plasma density precise calculations of transcapillary fluid shifts can be obtained.

Immediately after the end of the infusion, blood volume increased by 39 % of the initial blood volume. In the same way MAP and heart rate returned back to preanaesthesia values. These parameters remained constant until the end of the trial (3 hrs).

We conclude therefore that hypertonic-hyperoncotic solutions are an excellent alternative therapeutic concept for restoring circulating blood volume due to hypovolemia.

References: 1) Valacchi, S.T et al (1980) Am. J. Physiol. 239 H664, 2) Massmer, K.; (1968) Anesthesiolist 17, 295.

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MODIFICATIONS OF SERUM MYOGLOBIN AFTER REVASCULARIZATION FOR ACUTE ISCHEMIA OF THE LIMBS.
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The acute ischemia of the limbs produces early functional and morphological modifications of the muscular cells linked to the anaerobic metabolism which are followed by the release of enzymes, potassium and myoglobin. The reperfusion of an ischemic tissue causes the release of these metabolites and is followed by the Revascularization syndrome. More recent studies identified a new biochemical injury in the revascularization phase, linked probably to an oxidative stress, with the aim of studying this phenomenon we evaluated the modifications of plasma myoglobin in 25 patients submitted to balloon endectomy for acute ischemia. Blood samples were drawn from the femoral vein of the ischemic limb at the beginning of the operation and 5 minutes after declamping. Systemic samples were drawn before the revascularization and respectively 5,10,30,60,180 minutes after the declamping. The patients were classified in 3 groups in relation to the severity of the ischemia. In all of the patients the myoglobin level was very high even at the beginning of the operation. In the group of moderate ischemia the level was about one hundred times the normal range. In severe ischemia mean basal value was about 600 times normal and this value was higher in those who were subsequently affected by renal failure. An important consideration must be made regarding the trend of myoglobin: in moderate ischemia this is constant, while in severe ischemia the myoglobin level increased 20-50 minutes after the revascularization. This phenomenon cannot be linked to a release, but more probably to a further damage subsequent to the revascularization. The evaluation of glutathione and enzymes performed in some of these patients, support the hypothesis of oxidant stress.

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ASSISTED CIRCULATION WITH INTERMITTENT ABDOMINAL COMPRESSION AFTER THE FONTAN PROCEDURE

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The Fontan procedure provides a direct connection between systemic venous return and the pulmonary arteries and accomplishes physiologic correction of complex congenital heart diseases. This study was designed to study the hemodynamic effects of intermittent abdominal compression (IAC) for the treatment of the right heart failure syndrome associated with high right atrial pressure following ventricular exclusion.

Eight patients, ages 5 to 32 years, within 6 hours following the Fontan procedure underwent IAC, which was accomplished by inflation with a ventilator of a reservoir bag beneath a tight cloth wrap on the abdomen. The IAC system was applied for 1 hour and between two control periods. Systemic arterial, right and left atrial pressures and urine output were monitored continuously. Cardiac output was determined by dye-dilution curves from left atrium to femoral artery. Net fluid balance was calculated hourly. No attempt was made to coordinate inflation of the IAC system with the respiratory ventilator. IAC significantly increased right atrial pressure, left atrial pressure and urine output, without affecting mean arterial pressure, cardiac output, systemic and pulmonary vascular resistance, pulmonary driving pressure or lung compliance. The requirement for volume infusion decreased dramatically after one hour.

Assisted venous circulation after the Fontan procedure can be obtained with IAC and great benefit can be derived from the limitation of fluid administration. Cardiac output, however, is not improved by this device.

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DIC IN CRITICALLY ILL PATIENTS: OUR EXPERIENCE WITH THOSE HAVING UNDERGONE TAH IMPLANTS.

J. Szefner, E Vaissier, M. Arock, C. Munaretto, I. Gandy’bakch, A. and C. Cabrol.

We have performed 33 TAH implantations as a bridge to transplantation. Average age was 38,30 ± 11,84. Mean support time was 17,45 ±12,55 days; 20 patients died from multi-organ failure and sepsis, 13 were transplanted. The tests and their interpretation criteria (*) were used to set up a personalized treatment for patients with signs of the pathological complications that ensue after a TAH implant. Valuable prognostic information was also obtained in this way. Two groups were studied and treated based on 22 haemostasis parameters; those who had post-op DIC (n=19) and those without (n=14). In the group with associated DIC, bleeding was >300 ml/hr in 58% of cases and in 63,3% CPB time was >3hrs. In comparison, only 15% of the patients without an associated DIC had significant bleeding and none had CPB >3hrs. Transplantation was successful in 75% of patients without a septic DIC (n=16), in comparison with 25% who developed a septic DIC (n=17). The tests therefore confirm that the most part post-operative bleeding is correlated to DIC (85%). With early diagnosis and an appropriate treatment it was possible to avoid bleeding in 42% of DIC cases. Patients who developed a septic DIC had a higher mortality rate, as did those who developed a post-operative DIC. In the group where bleeding was already underway, no thromboembolic complications arose, and there was no iatrogenic bleeding. (*) "Coagulation et coeur artificial" J.L. Bellen, J. Szefner, C. Cabrol. Ed.Masson. Paris 1989.
A non transplantable human heart, owing to serological reason (viral hepatitis) was preserved during 24 h by simple storage at 4°C after an initial flush of one liter of St. Thomas Hospital solution. After 3, 6, 12 or 24 h of cold ischemia tissue samples were frozen in liquid nitrogen and cardiac metabolites were measured by liquid chromatographic methods.

| Time  | ATP | ADP | AMP | CP | LA | EC | Glucose/Glycogen |
|-------|-----|-----|-----|----|----|----|-----------------|
| 3h    | 5.9 | 1.0 | 1.4 | 0.7 | 8.7 | 0.7 | 10.5 34.5       |
| 6h    | 4.3 | 1.3 | 0.5 | 0.2 | 6.5 | 0.26 | 12.0 35.7       |
| 12h   | 2.7 | 2.3 | 1.7 | 0.2 | 6.7 | 5.28 | 29.5 37.5       |
| 24h   | 1.4 | 1.0 | 1.6 | 0.6 | 4.0 | 0.47 | 28.0 29.8       |

"A" = ATP+ADP+AMP
"B" = ATP+0.5ADP/ATP+ADP+AMP

The results showed a progressive rise in HR related to an increase of total catecholamines. The catecholamines (epinephrine and norepinephrine) were measured by the HPLC method.

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The study was approved by the local ethics committee, and all patients gave written informed consent.

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The various treatments introduced during the last 20 years have not reduced the mortality rate from acute hepatic failure (AHF) due to fulminant hepatitis and it remains 80% or more (Bernau J. et al. Semin. Liver Dis. 1986/6).

The unfavourable prognosis of this disease and the increasing success of liver transplantation (OLT) has encouraged transplant units to consider this technique as a means of treating AHF (Pichlmayr R., Ringe B. et al. Transpl. Proc. 1987/15. Bismuth R. et al. Ann. Int. Med. 1987/107).

5 OLT were done patients with AHF post infection with hepatitis B virus.

CASE 1: AHF in 19.M. 2 degree level coma from 3 days. OLT with compatible graft. Regained consciousness in 1st day. No major complications. Alive after 16 mo.

CASE 2: AHF in 22.f. at 11° mo. pregnancy. 2 degree level coma from 2 days. OLT in emergency with poor graft quality graft. Regained consciousness in 1st day. Acute rejection in 3rd day. No liver available. Died in 6th day.

CASE 3: AHF in 32.f. 2 degree level coma from 1 day. OLT with incompatible and reduced size graft. Regained consciousness in 1st day. Operated on 15th day for reconstruction of biliary tract. No others complications. Alive after 4 mo.

CASE 4: AHF in 21.M. 4 degree level coma from 2 days. OLT with incompatible graft. Regained consciousness in 2nd day Acute rejection in 8th day. ROLT with compatible graft. No further complications. Alive after 3 mo.

In conclusion we can affirm that OLT is a real resolving therapy in fulminant hepatitis also with advanced neurological disorders.

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CONTINUOUS MONITORING OF $\mathrm{SV0}_2$: AN EARLY INDEX OF THE HEMODYNAMIC AND METABOLIC CHANGES DURING THE MAIN PHASES OF OLT.

Maintenance of balanced hemodynamic and tissue oxygenation are important goals in the management of the patients undergoing OLT. $\mathrm{SV0}_2$ and $\mathrm{VO}_2$ are the sum of different indices (CO,$\mathrm{Hb}$,$\mathrm{SaO}_2$,$\mathrm{SVR}$). Using these parameters, it is possible to collect data only intermettently, and often there is a certain delay between diagnosis and treatment. Continuous $\mathrm{SV0}_2$ monitoring was applied on 38 OLT for 33 patients. The study included 25 patients. $\mathrm{SV0}_2$ was obtained displaying the values. CO,$\mathrm{Hb}$,$\mathrm{SaO}_2$,$\mathrm{SVR}$ were measured at basal time (t0), preanhepatic phase (t1), anhepatic period (t2) and reperfusion (t3). $\mathrm{SV0}_2$ (t0: 82.3±4.5; t1: 84.6±4.7; t3: 88.5±5.3; t3: 81.8±6.3) was correlated to CO (p<0.05). The correlation between $\mathrm{SV0}_2$ and the hemodynamic indices, was significant in the patients with AC (alcoholic cirrhosis) and PNC (post necrotic cirrhosis) with r=0.680. During all phases these patients showed changes in cardiovascular profile if compared to the other groups: CO decreased 15% in AC and PNC, $\mathrm{SV0}_2$ decreased 16.5% in AC and 14.1% in PNC.

$\mathrm{VO}_2$ was calculated at same times. Analyzed data (ml/m²/min) are presented as means: (t0: 112.2±23.6; t1: 108±37.5; t2: 92.2±42.6; t3: 116.7±40) and correlated with $\mathrm{SV0}_2$ and $\mathrm{VO}_2$. This correlation was significant (p<0.001) and showed the same trend, but in opposite direction (N. Franceschelli et al.: Congress of Hepato-Pancreato-Biliary Surgery Bologna 1988). The continuous monitoring of $\mathrm{SV0}_2$ in our opinion, is necessary to detect early hemodynamic changes in patients undergoing OLT.

Istituto di Anestesiologia e Rianimazione dell’Università di Bologna [Italy]. Direttore: Prof. G. Martinelli

USE OF UW SOLUTION IN LIVER TRANSPLANTATION: ONE YEAR CLINICAL RESULTS

M. Morino, F. Kerioggi, R. Adam, H. Bismuth

Until recently the mainstay of liver graft preservation was cold storage in Collins solution, which provides good graft function when the preservation time is 8 hours or less. A new solution, UW, has been described allowing preservation times up to 20 hours thanks to the presence of lactobionate and raffinose, impermeant substances which suppress hypothermia induced cellular swelling. From April 1988 to March 1989 we performed 131 orthotopic liver transplants (OLT) using the UW solution for flushing and storage of the harvested livers. In order to study the effects of prolonged ischaemia patients were divided in 4 groups according to the length of preservation. 45(35.8%) emergency procedures were excluded. Mean preservation time was 10h±9min. (ranging from 4h to 23h). No correlation was found between liver function tests (serum bilirubin, SGOT, SGPT, prothrombin time, daily bile output) in the 10 postoperative days and length of preservation. However early histology of the graft at revascularization revealed more severe lesions (hepatocytes necrosis) when preservation time exceeded 12 hours. 3 primary non function (PNF) (3.2%) were observed (preservation time 13,14 and 15 hours). 30 days mortality was 2.2% (1 peroperative, 1 sepsis). Metabolism was normal (KCl, KNa, 2 rejections). This series confirms that UW solution allows extension of safe preservation times in liver grafting. This implies substantial benefits: liver transplantation will become a "semi- elective" procedure, the timing of the donor's and recipient's operations will be less critical, the recipient could be chosen following anatomical and eventually histological (cross-match) patterns of the graft.

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"NUTRITIONAL ASPECTS IN LIVER TRANSPLANTATION. ENDOCRINE AND METABOLIC EVALUATIONS."

A. Russo, L. Laurenzi, F. Pellegrino, R.A. De Blasi, G. Battisti, G. Pugliesi

The present study deals the effective energy requirement of patients undergone to liver transplantation and the hormonal metabolic setting of the post-operative period. The first point was investigated in 4 patients by indirect calorimetry and HARTZ R metabolic monitor which, from serial determinations of O₂ consumption and CO₂ production, along with the daily measured urinary nitrogen, allows the calculation of Respiratory Quotient (R.Q.), Total Energy Expenditure (T.E.E.) and of the relative quantities of glicids, proteins and lipids actually utilized. The second point was studied in 8 patients by the determination of Glucagon plasma levels and a series of intermediate metabolism products including glicerol, lactate 3-hydroxibutyrate, NEFA and alanine; daily losses of urinary urea nitrogen were also measured. The indirect calorimetry study demonstrated in all the patients considered a Respiratory Quotient close to the lipid utilization (R.Q. between 0.7 and 0.8), for the first seven days after surgery. The metabolic study showed tendentially high values of glucagon plasma levels; high lactate, glyceral and NEFA levels, while alanine and D-30H butyrate levels were found in the normal range. Complexive evidence from these two investigation methods show that in our patients we never met the energy requirement of the post-operative period, therefore forcing the metabolism to endogenous lipid mobilization and oxidation.
LIVER GRAFT DYSFUNCTION: IS THE RELATIONSHIP BETWEEN BLOOD GLUCOSE TO OXYGEN CONSUMPTION USEFUL?
N. Steltzer, M. Hiesmayr, J. Karner

Poorly functioning grafts do not maintain adequate production of coagulation factors, blood glucose utilization (S.V. Mallet Anesth. Analg. 68:182, 1989), thermogenesis and oxygen uptake (H. Steltzer, Anesthesiology 69: A174, 1988). This study addresses the value of a "metabolic index" based on neohepatic glucose decrease and oxygen consumption increase as an early predictor of allograft metabolic onset.

Methods: 70 patients were separated into 3 groups: A (primary non function (n=9)), B (survival < 1 year (n=27)), C (survival > 1 year (n=34)). The metabolic index was calculated as blood glucose divided by oxygen consumption index. The mean (SEM) of all neohepatic measurements were analyzed by two way analysis of variance.

Results: The blood sugar levels were significantly decreased in the group C 2 43.7 (7.7) mg% compared with group A 317 (16) mg% (p<0.0001). The metabolic index was in group A 4.0 (0.23) in group B 3.4 (0.31) and in the surviving group C 2.9 (0.14) (p<0.005).

Conclusions: In contrast to earlier reports (MJ Shapiro Hepatic transplantation-perioperative management, Frazier NY 1986) the very early graft dysfunction is characterized by a blood sugar increase together with a slight decrease in oxygen consumption index. The combined use of these parameters in a metabolic index allows a good prediction of early graft function.

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PREVENTION OF POSTISCHAEMIC LIVER CELL INJURY BY IRON CHELATION

H. Gnar*, D. Z. Németh, G. Picorelli, J. Sávino, M. Agarew

The harmful consequences of liver temporary ischemia (TISCH) and subsequent reperfusion (RPF) on liver function are often related to injury at the cellular level. Lipid peroxidation (LP) of membrane, which is mainly initiated by oxygen free radicals species is probably the critical factor that precedes irreversible cell injury and is facilitated by the presence of metal catalysts such as iron. In this study we examined the effect of iron chelation in rat liver after TISCH with or without RPF.

Liver TISCH was induced by cross-clamping the hilar pedicule for 30 minutes in groups of rats with or without treatment with the iron chelating agent desferrioxamine (DFR). The groups included 8 animals each were divided as follow: control (TISCH alone), TISCH with subsequent RPF, DFR preceded by DFR 60 mg/kg, and RPF preceded by 20,40, or 60 mg/kg or DFR. The drug was given IV 5 min before either TISCH or RPF. Malondialdehyde (MDA), a product of LP and histology of liver tissue samples were used as markers of hepatocellular damage. MDA (nmol/kg liver tissue) was highest (4.76±1.19) following TISCH without RPF and less pronounced (2.57±0.34) after RPF. Both levels, were significantly higher (p<0.05), than basal values (1.76±0.21). At 60 mg/kg, DFR treatment reduced MDA to basal or even lower levels both after TISCH or RPF (1.98±0.06 and 1.38±0.00, respectively) with a corresponding improvement in histopathology. Lower DFR doses were less protective.

The data suggest, that liver ischemia is associated with oxygen free radicals formation. LP is apparently iron catalyzed and can be significantly reduced by iron chelation.

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ORGAN PROCUREMENT IN A GENERAL HOSPITAL: TRANSPLANT COORDINATION TEAM.
M. Menahilch and C. Cuhner

The results obtained in organ procurement for transplant after the creation of a transplant coordination team in our hospital and area of influence have been studied. The working method was based on: 1- Form of detection (list of emergency admissions, prompt notification by ICU staff, detection during clinical practice, coordinator’s visit to other hospitals). 2- Quality control through the list of hospital deaths (overall deaths, potential donors, brain death). 3- Study of the intervals of time employed in the process detection-extraction. 4- Analysis of the results obtained (number of organs and tissue valid for transplant).

In the period 1985-1988, from a population of 1.750.000 inhabitants, we detected 159 patients legally diagnosed as brain death, 96 males and 62 females aged between 3 and 67 years, (mean age +/- SD of 34 +/- 17 years). In 75 cases death was due to natural causes and in 83 to violent causes. The etiology of death was: Head injury 75 cases (21%), Cardiovascular disease 42 cases (9%), Accidents 11 cases (7%) and others causes 7 cases (2%). Organs were removed from a total of 121 donors, while in the remaining 37 cases no extraction was performed due to: lack of Family consent 20 (10%) and clinical contraindications 17 (10%). In total 94 organs were obtained: 236 kidneys (47 PMP), 21 Hearts, 11 livers, 11 pancreas and 2 lungs, which compared to the previous period 1981-1984 in which 99 organs were obtained (86 kidneys and 23 pancreas) shows a considerable increase, which supports the utility of the methods employed.

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"EFFECTS OF HEAT-MOISTURE EXCHANGERS ON RESPIRATORY MECHANICAL CONDITIONS OF COPD PATIENTS DURING MECHANICAL VENTILATION."
G. Conti, M. Rocca, R.A. De Blasi, P. Pelaia, P. Nizzi.

The use of the H.M.E. is becoming diffuse also in I.C.U. patients submitted to long term mechanical ventilation. The H.M.E. are simple, useful and cheap but few data are available for what concern their effects on respiratory flow, auto peep and dynamic hyperinflation of COPD patients during CMV. The aim of this study was to analyze the possible effects of H.M.E. on intrinsic peep (telescory lung clamping) and FRC (Passive Spirogram) in COPD ventilated in CMV mode (V. 10 ml Kg; RR 12; I:E 1:1; ZEEP).

Our determinations were performed in basal conditions (no HME), after 60' and after 12 hours of R.V. with three HME (PALL EDITH, ENGSTROM EDITH, HYGROBAC DAR) in random sequence. Auto peep changed from 7.28±2 0.06 (BASAL) to 7.91±1.6 (DAR), 8.51±1.7 (PALL), 7.91±1.6 (EDITH) (P=ns.) while FRC changed from 352±17.1 (BASAL) to 416±134 (DAR), 436±100 (PALL), 420±135 (EDITH) (P=ns.). The results observed after 12 hours of usage were also statistically not significant, both for auto peep and FRC.

In conclusion this study has not evidenced significant modifications in auto peep and FRC values of COPD patients in ARF, related to the use of H.M.E.

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Clindamycin in treatment of severe infections in immunocompromised dialysed, transplanted and neutropenic patients

V. Krčmery jr., M. Suchánková, J. Mardelák, S. Špánik, I. Koza, A. Kovář, M. Bodnárová, A. Prochotský, J. Paškan

In 40 critically ill patients with sepsis was administered clindamycin with amikacin. All patients were immunocompromised: 12 of them were undergoing haemodialysis or kidney transplantation, 8 were neutropenic with osteoarthritis, 10 had malignant disease and 20 of them were undergoing severe surgical intervention because of peritonitis or perforative gastrointestinal malignant disease. From immunological parameters were investigated 10 parameters of cellular and humoral immunity. Decreased activity of fagocytic activity, immunoglobulins and lymphocyte count could be in these patients evaluated. Most of patients were treated on intensive-care unit. Clindamycin in dose 2400 - 4800 mg and amikacin in dosage according to renal function and dialysis program was IV administered with 86% oxygenation/FCO2 oxygen for 10-21 days. In etiology specially high number of S. aureus, anaerobic bacteria /Clostridium, Peptostreptococci/, and Enterobacteriaceae was present, in 8 cases etiology was unclear also after microbiological investigation. Clindamycin with Amikacin, and sometimes with Penicillin or Ampicillin as double- or tricombination is according to our results the most effective therapeutical treatment of critically ill patients with immunosuppression.

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Clinical studies on the dependence of tissue-P02 in skeletal muscle on hemodynamic/metabolic parameters in septic patients

G. Singhart, G. Netzer and Andrea Garzarek

In septic patients fluid resuscitation as well as pharmacotherapy aim to improve the hemodynamics and to increase both oxygen availability (\(\text{O}_2\)) and oxygen uptake (\(\text{O}_2\))

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\(\text{O}_2\) and \(\text{O}_2\) relationship \(\text{g} \text{vs} \text{O}_2\) (\(\text{Rsp}=0.845; \text{p} < 0.05\)).

From the 12 patients studied 56 corresponding measurements values and \(\text{O}_2\)-values was performed by the correlation coefficient \(r\) or by the rank correlation of Spearman \((\text{Rsp})\). Statistical significance was set with \(\text{p}<0.05\).

In 6 critically ill patients with sepsis was administered clindamycin and amikacin. All patients were immunocompromised: 12 of them were undergoing haemodialysis or kidney transplantation, 8 were neutropenic with osteoarthritis, 10 had malignant disease and 20 of them were undergoing severe surgical intervention because of sepsis or perforative gastrointestinal malignant disease. From immunological parameters were investigated 10 parameters of cellular and humoral immunity. Decreased activity of fagocytic activity, immunoglobulins and lymphocyte count could be in these patients evaluated. Most of patients were treated on intensive-care unit. Clindamycin in dose 2400 - 4800 mg and amikacin in dosage according to renal function and dialysis program was IV administered with 86% oxygenation/FCO2 oxygen for 10-21 days. In etiology specially high number of S. aureus, anaerobic bacteria /Clostridium, Peptostreptococci/, and Enterobacteriaceae was present, in 8 cases etiology was unclear also after microbiological investigation. Clindamycin with Amikacin, and sometimes with Penicillin or Ampicillin as double- or tricombination is according to our results the most effective therapeutical treatment of critically ill patients with immunosuppression.

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In septic patients fluid resuscitation as well as pharmacotherapy aim to improve the hemodynamics and to increase both oxygen availability (\(\text{O}_2\)) and oxygen uptake (\(\text{O}_2\)). This relationship between (\(\text{O}_2\))\(\text{vs} \text{O}_2\)\(\text{O}_2\) \(\text{Rsp}=0.845; \text{p} < 0.05\). Statistical significance was set with \(\text{p}<0.05\).

A. Goetz, L. SchweiBer, W. Brendel

The results therefore suggest that the early peritoneal lavage into pancreatic lymph and ascites fluid support the hypothesis that the by far highest release of pancreatic enzymes and mediators. The clinical signs of acute pancreatitis are characterized by hemodynamic alterations and by generalized increase of permeability caused by the liberation of pancreatic enzymes and vasoactive mediators. Knowledge about the compartment, in which mediators are released might be helpful in developing new strategies for preventing systemic complications. The aim of our study therefore was to evaluate the significance of the different routes of liberation of mediators, i.e. blood, lymph and ascites fluid.

Pigs were anesthetized and ventilated mechanically. Three experimental groups were studied: a control group (n=9) and two pancreatitis groups, one with edematous pancreatitis induced by 1% fat acid (0.2mg/kg; n=10) and one with hemorrhagic pancreatitis induced by 5% bile-salt into the pancreatic duct (n=10). The pancreas was isolated in situ to enable sampling of pure pancreatic blood, lymph and ascites fluid. Hemodynamic and biochemical measurements were conducted at baseline and then every hour during a 6h-period. Pancreatic killing (\(\text{kk}\)), leukotriene C4 and D4 were determined by radioimmunoassay.

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Free radicals are thought to be abundantly produced in many organs (heart, kidney, pancreas, liver, skin, etc.) following an ischemic-reperfusion phenomenon. However, most of in vivo studies are based on to assess indirect investigative approaches (increase of lipid peroxidation products, decrease of antioxidant defense system, protective effect of substances preventing or scavenging free radicals) and are therefore inconclusive. In vivo, the spin trapping technique with a N-phenyl-N-tert-butylnitrone (PBN) and electron paramagnetic resonance (EPR) method, we directly demonstrated that free radicals generation is well implicated during in vivo ischemia/reperfusion in a rabbit kidney model. After an ischemic period of 50 minutes followed by a reperfusion of 10 minutes (n=5), EPR analysis of lipid residues extracted from blood sample (specifically drawn from the inferior renal vein) revealed the formation of a spectrum consisting of a triplet of doublets with coupling constants $\alpha_1 = 14.75$ G and $\alpha_2 = 2.5$ G. The signal is consistent with a nitroxyl radical adduct resulting from the spin trapping technique with a mixture of oxygen- and carbon-centered lipidic radicals. The signal in the venous effluent is significantly decreased after an ischemic period (15 minutes) (n=5). In addition, control experiments have indicated that the signal was not due to a nonspecific toxic effect of the spin trap itself.

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### 34

**PREVENTION OF ADVERSE HEMODYNAMIC SIDE EFFECTS AFTER HEPARIN/PROTAMINE BY A THROMBOXANE A2 RECEPTOR ANTAGONIST IN PIGS**

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Protamine neutralization of heparin (hep/prot) is often accompanied by severe and even life-threatening hemodynamic side effects including pulmonary hypertension and systemic hypotension. Because prostaglandins may be involved in this process, the authors tested the hypothesis that TXA2 release is the pivotal step for the adverse hemodynamic effects of hep/prot. 21 pigs were anesthetized with etarane and fentanyl. Catheters were placed for hemodynamic monitoring. Two groups were studied: Group 1 (n=10) received heparin (250 IU/kg), followed by protamine (100 mg) after 15 min to neutralize heparin. The animals of the second group (n=11) received a thromboxane receptor antagonist (BM 13.177; 10 mg/kg) intravenously 5 min prior to heparin reversal by protamine. Blood samples were collected and hemodynamic measurements obtained immediately before protamine and 2, 5 and 15 min after protamine infusion. Prostaglandins were measured in arterial and mixed-venous plasma samples by radio-immuno-assays. Pulmonary artery pressure and pulmonary vascular resistance increased significantly in group I after hep/prot. This was accompanied by significant increments in plasma concentrations of the cyclooxygenase products thromboxane B2, 6-keto-PGF1a and prostaglandin E2. In group 2, comparable levels of cyclooxygenase products were observed, but no hemodynamic alterations were detected in the animals pretreated with the TXA2 antagonist.

The results of this study indicate that the adverse effects of hep/prot are mediated by prostaglandins and that TXA2 release is the pivotal step. Since the side-effects of hep/prot were effectively inhibited by a thromboxane receptor antagonist, we conclude, that pretreatment with a thromboxane antagonist might prove useful for preventing the adverse hemodynamic side-effects following protamine reversal of heparin.

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### 36

**"LEUKOCYTES ACTIVATION AND O2 FREE RADICALS PRODUCTION DURING INTERLEUKIN 2 (IL2) THERAPY."**

L. Laurent, W. Rocca, W. Antonelli, G. Conti, C. Matti, G. Bona, A. Zicari

The prominent toxic effect related to IL2 infusion for antineoplastic treatment is vascular leak syndrome (V.L.S.): systemic lesional oedema with multiple organ dysfunction. A similar lesion pattern, mediated by leukocyte activation and O2 free radicals (OFR) production has been observed during ARDS and septic shock. We evaluated in 4 neoplastic patients treated with IL2 (100 Ug. in continuous infusion during the first day, and increasing daily aliquots up to 500 Ug. during the following 5 days) the presence of leukocyte activation with OFR production. The OFR production was evaluated by chemiluminescence in isolated population of PMNs and lymphocytes obtained from peripheral blood before IL2 administration (T0), after 4 days of therapy (T2) and 2 days after the IL2 withdrawal (T3).

PMNs T0: 251±62 mV; T2: 795±183 mV; T3: 825±243 mV (P = 0.01**; P = 0.05*).

Lymph T0: 195±75 mV; T2: 195±75 mV; T3: 1600±528 mV (P = 0.05).

IL2 mediated OFR production may explain V.L.S., suggesting an interesting pathophysiological mechanism that may be involved in course of ARDS and shock; moreover it is possible to hypothesize that also lymphokines activated killer cells (as the natural killer cells) act with a OFR-mediated mechanism.

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Acute vascular endothelial cell injury from reactive oxygen species occurs secondary to activation of polymorphonuclear leukocytes. Recently, it has been observed that oxygen-mediated endothelial injury occurs via other mechanisms as well. Endothelial cells have a greater rate of non-mitochondrial oxygen consumption than other non-phagocytic cells, with 15% of cellular oxygen consumption being CN- or ascorbic acid resistant. Much of this can be accounted for by the partial reduction of oxygen to O2- and H2O2. We have devised sensitive techniques to assess rates of O2- and H2O2 production by endothelial cells. Intracellular levels of H2O2 are estimated by measuring the rate of ascorbic acid-mediated dismutation of endogenous catalase activity. Cells typically react with H2O2 to form the Compound 1 intermediate, which then reacts with amionoacrolein to irreversibly inactivates catalase. Extracellular release of H2O2 is measured by using a rate measuring the rate of horseradish peroxidase-mediated oxidation of p-hydroxyphenylacetate to a fluorescent product. The extrapolation of release of O2- through cellular anion-bicarbonate channels is measured by quantitating anion-mediated oxidation of NADH. These measurements confirm that endothelial cells are active sources of potentially toxic reactive oxygen species, which can then react at the cell surface or with serum components to inactivate secondary reactions. Endothelial cell injury from oxygen stress in vivo has been quantitated by evaluation of endothelial monolayer permeability. Bovine aortic endothelial monolayers were grown on a micropore filter separating an upper and lower well. The rate of movement of radiolabeled macromolecules of different sizes (59-Co-Hb [4.5 A], 125-I-labeled albumin [6.5 A], 125-I-labeled albumin [6.5 A]) across the monolayer was measured and the permeability coefficient for the monolayer calculated. These techniques were applied to evaluation of direct effects of inflammatory mediators (tumor necrosis factor, interleukin, endotoxin) on endothelial free radical metabolism and cell injury. Increased permeability of endothelial monolayers was detected related to these mediators and this was a more sensitive indicator of injury than release of intracellular substances (Co2+-adenine and lactate dehydrogenase activity).

Based on these observations, we conclude that endothelial cells are key tissue sources of reactive oxygen species, which under conditions of altered metabolic homeostasis, can lead to direct vascular endothelial cell injury and initiation of secondary tissue responses.

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### 38

**INCREASE OF POSTTRAUMATIC FLUID LOSS AS THE MECHANISM OF POTENTIATED LETHALITY IN COMBINED ISCHEMIC-IRRADIATION INJURY**

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One of the basic problems of combined injuries is the syndrome of "potentiated lethality." The real mechanism(s) of this syndrome is still unknown. We supposed that the potentiated lethality in combined ischemic-irradiation injury could be a consequence of enhanced posttraumatic fluid loss or decreased ability of the organism to compensate trauma-induced fluid loss. The aim of this study was to test this hypothesis by determining actual fluid loss and compensation in rats simultaneously subjected to ischemic (tourniquet trauma) and irradiation (10 Gy of X rays) injury. Fluid loss was determined at the time of submaximal postischemic edema formation and compensation was calculated as the difference between "actual" and "apparent" (calculated from changes in hematocrit) fluid loss. The results (Table) indicate that greater rate of mortality in combined injury (100% during 48 h) compared to tourniquet trauma (50% during 48 h) followed by greater increase of hematocrit and actual fluid loss. Compensation of the posttraumatic fluid loss was not affected by irradiation.

| Hematocrit (%) | Actual Compensation fluid loss | (% initial plasma volume) |
|---------------|--------------------------------|--------------------------|
| Control       | 44 (10)                        |                          |
| Tourniquet trauma (T) | 56 (8)                        | 77 ± 15 (8)              |
| Radiation (R)  | 42 (6)                         | 42 ± 13 (6)              |
| T + R          | 67 (6)                         | 86 ± 7 (8)               |

We concluded that increased posttraumatic fluid loss could be in the basis of potentiated lethality in rats subjected to ischemic-irradiation injury. The possible role of oxygen-derived free radicals in pathogenesis of fluid loss will be investigated.

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### 39

**EFFECTS OF AUTOMATIC VENTILATOR ON THE PERIPHERAL CIRCULATION: A LASER-DOPPLER STUDY**

M. Ursicuoli, P. Bolognesi, F. Pignocchino

Intrathoracic pressure variations caused by automatic ventilator rhythmically hamper venous drainage.

The aim of this study is to verify if microcirculatory bed is also involved in this phenomenon.

A Laser-Doppler (Periflux PD2) has been utilized; this device analyzes mean and instantaneous flow in the microcirculation, without invading the tissue, by a 1-cm sampling volume.

Recordings have been performed on 120 automatically ventilated patients:
- intraoperatively on brain,
- extraoperatively on skin.

We have always found a rhythmic variation, synchronous with respiratory rate.

The waveform varies by modulating I/E ratio.

In conclusion, this work demonstrates microcirculation is involved in the hampering of venous drainage, induced by automatic ventilator.

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### 40

**RESPIRATORY PATTERN DURING ACUTE CARBON MONOXIDE POISONING (CMP)**

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In this work we have studied 16 acute ill patients (6 male - 8 female) admitted in ICU for accidental acute carbon monoxide poisoning (CMP); the range of HbCo was 13.2 ± 1.74 g/dl, mean value 29.7 ± 2.74. All patients received O2 in mask (FIO2 = 1) and main respiratory parameters were continuously monitored: Respiratory rate, PaO2, PaCO2, pH, HCO3-, SAT, HbCO% (ABL 300, OSM 3 Radiometer Copenhagen). A statistical evaluation (analysis of variance with Scheffe method) was performed with the data collected every 5 hours' surveillance (points 1-7). In particular we verified the relative hyperventilation during increased HbCO levels. After 5 hours' treatment HbCO fell significantly to 9.01 ± 2.74, while PaCO2 increased from 32.92 ± 1.92 up to 36.10 ± 0.76 after 10 hours (3rd point) sign of an initial hyperventilation, followed by normalization, but we can find that this hyperventilation was inadequate in fact the PaCO2-HbCO% curve shows that 12% of HbCO is not followed by increasing ventilation (PaCO2 = 36 mmHg) and mild hyperventilation is still compatible with high levels of HbCO% (15.01 ± 2.74). Since mean value of HbCO% was not very high, with moderate SNC depression in all patients, we suppose a rising impairment in chemovascular receptors function. In conclusion mild hyperventilation is present in CMP but reflex ventilatory response is inadequate also during O2 therapy, therefore a strict surveillance of minute-ventilation is recommendable.

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