Levosimendan pretreatment improves systemic hemodynamics and metabolism during acute hypoxia in dogs
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**Background and Goals:** Impairment of patency of airways by blood and sputum in patients with Pulmonary Contusion (PC) reduces regional lung ventilation with increase of lung dyslectasis and intrapulmonary shunt. It creates conditions for infection. The most effective strategy of maintenance of patency of airways and prevention of atelectasis is the Fiberoptic bronchoscopy (FOBr) [1]. The purpose of our research was estimation of the role of early FOBr in prevention of nosocomial pneumonia (NP) in patient with PC.

**Material and Methods:** 158 patients with PC were observed. We used early FOBr (in first 3 days) in 82 patients. In 32 patients FOBr was done in deferred term (more than 3 days). The analysis of incidence of NP was done. Statistical analysis included Chi-square test, Kaplan&Meier method and Cox’s F-Test, p-value less than 0.05 was considered to indicate statistical significance.

**Results:** Total rate of NP was 14.6% (23 pts); 9.6% (15 pts) in early FOBr group and 46.9% (15 pts) in deferred FOBr group (p < 0.001 by Chi-square test).

In order to exclude the influence of differences in terms of hospitalization we used Kaplan&Meier method and Cox’s F-Test to estimate the differences in NP incidence. Results of Kaplan&Meier method are shown in the picture.

The result of Cox’s F-Test confirmed differences in incidence rate of NP in patients with PC. F = 8.98, p = 0.00002.

**Conclusion(s):** Deferred in comparison with Early Fiberoptic bronchoscopy may be the risk factor of NP in patients with PC.

**Reference:**

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**12AP1-6**

Chaotic variation of tidal volumes adds further benefit to the open lung approach in experimental acute lung injury

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**Background and Goal of Study:** Biological systems seems to benefit from chaotic variability. We tested if chaotic variation of tidal volumes (noisy ventilation) adds further benefit to a lung protective ventilatory strategy aimed at keeping the lungs open after a recruitment maneuver (open lung approach) in experimental acute lung injury.

**Materials and Methods:** Acute lung injury was induced in 12 pigs by repetitive saline lung lavage. Following injury, animals were randomly assigned to a standard lung protective therapy with (n = 6) or without (n = 6) administration of chaotic variable tidal volumes (mean Vt = 6 ml/kg). Gas exchange, lung mechanics and hemodynamics were assessed. After 6h, animals were killed and lung damage was evaluated histologically. Gas exchange and lung mechanics were tested with univariate analysis of variance, histological results were tested by means of the Mann-Whitney-U-Test.

**Results and Discussions:** Groups were comparable at baseline and after injury. Variables of gas exchange (PaO\(_2\)/FiO\(_2\), PaCO\(_2\), SvO\(_2\)) remained stable as peak and mean airway pressures did not differ significantly between groups. Mean lung elanotropic index (AEI) was significantly reduced in the group with propofol (p < 0.05). Histological analysis of diffuse alveolar damage showed a trend toward better lung protection with-propofol administration (p = 0.08), and less inflammatory infiltration was observed in lung ventilated lungs (p < 0.05).

**Conclusion(s):** Chaotic variation of tidal volumes adds further benefit to protective ventilation according to the open lung approach.

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**12AP1-7**

Levosimendan pretreatment improves systemic hemodynamics and metabolism during acute hypoxia in dogs

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**Background & Goal of Study:** Levosimendan (LEVO) improves regional tissue oxygenation under physiological, normoxic conditions, as we demonstrated recently [1]. It is unclear, however, if LEVO exerts beneficial effects also under pathological, hypoxic conditions, particularly in respect to systemic hemodynamics and metabolism. Thus we studied the effects of LEVO pretreatment during acute hypoxia on systemic hemodynamics and metabolism.

**Materials & Methods:** Chronically instrumented dogs (bodyweight ~30 kg, n = 10 experiments) were anesthetized (sevoflurane, 1.5 MAC) and mechanically ventilated (FiO\(_2\) = 0.3; etCO\(_2\) = 35.0 mmHg). The animals were randomized to undergo hypoxia (FiO\(_2\) = 0.1 for 15 min) with or without LEVO pretreatment [1]. To assess systemic hemodynamics we measured cardiac output (CO), stroke volume (SV) and the inotropy marker dP/dTmax. To assess systemic metabolism, we measured O\(_2\)-consumption (V\(_{\text{O}}\text{2}\), DeltatracII) and arterial lactate levels. Data are mean ± sem.

**Results & Discussions:** Hypoxia (FiO\(_2\) = 0.1) reduced arterial PO\(_2\) from ~130 mmHg to ~30 mmHg in both groups, i.e., hypoxia with and without LEVO pretreatment. LEVO pretreatment significantly improved systemic hemodynamics during hypoxia, i.e., CO (104 ± 4 vs 83 ± 5 ml/kg/min), SV (25.2 ± 1.7 vs 19.8 ± 1.2 ml) and dP/dTmax (553 ± 41 vs 377 ± 36 mmHg/sec). Interestingly, LEVO pretreatment prevented an increase in arterial lactate levels during hypoxia (1.8 ± 0.1 to 1.9 ± 0.1 mmol/L), whereas lactate significantly increased in the group without LEVO (1.7 ± 0.1 to 2.1 ± 0.1 mmol/L).

**Conclusion(s):** LEVO pretreatment markedly improved systemic hemodynamics during acute hypoxia, without increasing oxygen consumption. Furthermore, LEVO pre-treatment prevented the increase in arterial lactate levels during acute hypoxia, indicating an optimized O\(_2\)-distribution and/or utilization by LEVO. Thus, if our data apply to the clinical setting, LEVO pretreatment is a promising option to improve systemic hemodynamics without the administration of propofol. The only exception to this response was the leukocyte counts which remained elevated.

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**12AP1-5**

Propofol attenuates pulmonary edema induced by collapse and reventilation in lung rabbits

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**Background and Goal of Study:** To study the effects of propofol on the pulmonary edema caused by collapse-reventilation injuries of the lungs in rabbits.

**Materials and Methods:** There were five groups of animals: (1) the Sham group – normal ventilation (n = 14); (2) the collapse group – the right lung was collapsed (n = 14); (3) the collapse-reventilation group – the right lung was collapsed for 3 hours then reventilated for 3 hours (n = 14); (4) the propofol group – collapse-reventilation for 3 hours with administration of propofol in 5 or 20 mg/kg/hr dosing schedules (n = 28). Mean arterial pressure, heart rate, arterial blood oxygen tension, leukocyte and platelet counts in the peripheral blood were recorded hourly for 6 hours starting at the 0-hour of experimentation.

The wet to dry (W/D) weight ratio of the lung and lung injury score were calculated to assess tissue edema. In addition, the bronchoalveolar lavage fluid (BALF) from both lungs was analyzed for leukocytes, albumin, malondialdehyde (MDA) and interleukin-8 (IL-8) 6 hour after the start of experiment in both lungs.

**Results and Discussions:** There was a global elevation of all parameters in the collapse-reventilation group, namely the W/D weight ratio of the lungs, the lung injury scores, the counts and percentages of leukocytes, and concentrations of albumin, MDA, and IL-8 in BALF. These changes were greater in the fluids from the collapse-reventilated right lung than from the left lung. Significantly, there was a global improvement in these parameters with
increasing VO\textsubscript{2} and furthermore to optimize lactate balance in patients at risk of hypoxia.

Reference:

12AP1-9
Comparative effect of acute hypoxia on contractile and energetic properties of diabetic diaphragm
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Background and Goal of Study: Hypoxia adversely affects respiratory muscle function. In the rat diaphragm, diabetes results in an increase in low (Type I) myosin heavy chain characterized by an aerobic metabolism. Therefore, a different effect of acute hypoxia between diabetic and control rat diaphragm could be hypothesized.

Materials and Methods: In vitro contractile and energetic properties were measured with ventral diaphragm strips obtained from 2 months streptozotocin-induced diabetic (4 mo old, n = 12) and control (4 mo old, n = 12) male Wistar rats submitted to acute hypoxia (Po2 = 6.5 kPa). Data are mean ± SD and comparison between groups was performed using ANOVA.

Results and Discussions: Compared to control animals, diabetic rats were characterized by an increase in active force (100 ± 6 vs 79 ± 10 mN mm\textsuperscript{-1}) associated with an increase in the total number of cross-bridges per sectional area (11.1 ± 1.2 vs 8.5 ± 1.3 10\textsuperscript{10} mm\textsuperscript{-1}). Moreover a decrease in maximal unloaded shortening velocity was observed between diabetic and control rats (6.3 ± 0.9 vs 7.9 ± 1.0 Lmax \textsuperscript{a} s\textsuperscript{-1}). Under hypoxia, diabetic rats were characterized by a slower decrease in active force and a faster recovery in re-oxygenation conditions (Figure).

Conclusion(s): These results suggest that diabetic induced modifications in diaphragm contractility are associated with a better resistance to acute hypoxia.

12AP2-1
High dependency care unit after major cancer surgery: medical and economic impact
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Background and Goal of Study: The intensity of care is part of a better post-surgery rehabilitation (1,2). The aim of this study was to evaluate the impact of the introduction of a high dependency care unit (HDU) for postoperative care on patient outcome and cost.

Materials and Methods: 1506 patients who have undergone major cancer surgery were studied. 753 were hospitalised in the HDU during 2004 and 2005 (After Group). They were compared to a control group (753 patients hospitalised during 2002 and 2003 before the opening of HDU: Before Group) matched on sex, age, type of surgery (LAS – Lower Abdominal Surgery, UAS – Upper Abdominal Surgery, GS – Gynaecological Surgery). Length of hospital stay was defined as number of days between entrance and discharge from the hospital. Data from the analytic accounts of our hospital for the year 2004 were used to estimate the cost.

Results and Discussions: are shown in the table (data are expressed as mean ± SD).

<table>
<thead>
<tr>
<th></th>
<th>Before group</th>
<th>After group</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n = 753</td>
<td>n = 753</td>
<td></td>
</tr>
<tr>
<td>Length of hospital stay, days</td>
<td>15.8 ± 12.2</td>
<td>14.2 ± 9.8</td>
<td>p &lt; 0.0001</td>
</tr>
<tr>
<td>Patients admitted in ICU</td>
<td>96 (12.7%)</td>
<td>41 (5.4%)</td>
<td>p &lt; 0.000001 NS</td>
</tr>
<tr>
<td>Outcome at discharge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td>724 (96.1%)</td>
<td>735 (97.6%)</td>
<td></td>
</tr>
<tr>
<td>Another hospital</td>
<td>17 (2.3%)</td>
<td>11 (1.5%)</td>
<td></td>
</tr>
<tr>
<td>Died</td>
<td>12 (1.6%)</td>
<td>7 (0.9%)</td>
<td></td>
</tr>
</tbody>
</table>

For the patients admitted in HDU, total cost of the hospital stay was reduced by 15.68%.

Conclusion(s): The creation of a HDU was effective to improve the cost of care by decreasing the length of stay and the rate of ICU hospitalisation, without change in patient outcome.

References:

12AP2-3
How frequent and important are iv medication errors in an ICU?
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Background and Goal of Study: Medication safety in ICU practice is of utmost importance (1), but hard data are missing on the prevalence of errors during the infusion process (2). Also there are no proven solutions on guarding and preventing this type of serious errors.

Aim of study: to present data on frequency and nature of iv drug administration errors during daily ICU practice, and study the potential benefit of a guarding system.

Materials and Methods: A 6-bedded ICU unit was equipped with a new infusion pump set which records automatically all infusion administrations. Via its pre-adjustable drug library it also controls infusion pump settings: it warns by overriding the “soft limits”, and intercepts drug administration automatically if “hard limits” are intended to exceed.

All infusion administrations of a study period from 31st Jan to 13th of Sep 2006 were recorded. Each automatic data recordings were downloaded and the events which occurred were analysed in detail according to type, frequency, timing, etc.

Results and Discussions: Total 9864 alerts generated over this period (9,88%), including 64 hard limit alerts (0,91%); nearly 10% of all events were for infusions attempted above hard max. limits, insulin and cordarone had ~68% of them. Analysis of events by day time, by week days and by months of study timeframe revealed typical risky periods, demanding modifications of working conditions. On the other hand our system prevented successfully all of 64 severe medication errors, including e.g.: 7 overdosing of cordarone 10–50 times the max. dose; 3 of vancomycin incl. one of 10 times the max. dose; 1 of morphine 5 times the max. dose; and 5 of dobutamine, one of 5 times the max. dose.

Conclusion: According to our data prevalence of iv medication errors is substantially high at an ICU. As without an automated documentation system far most of errors remain undiscovered and therefore unavoidable, our data probably support the use of intelligent monitoring and warning devices as mandatory for prevention of potential harm of patients(3).

References:

12AP2-4
Weaning from mechanical ventilation: protocol vs physician decision
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Background and Goal of Study: Due to the increased risk of complications associated with prolonged mechanical ventilation (MV), early liberation from the ventilator is important and protocol directed weaning seems to be the answer (1). We decided to evaluate a ventilator weaning protocol in our intensive care unit (ICU) in terms of length of MV, ICU stay and reintubation rate.

Materials and Methods: After Ethical Committee approval, 103 patients starting MV (EVITA IV Dräger) were included over a 6 months period, being