

POSTER PRESENTATIONS

B23

TITLE: ANALYSIS OF THE INTRAPULMONARY DISTRIBUTION OF VENTILATION AND PO₂ IN PATIENTS AFTER SINGLE-LUNG TRANSPLANTATION: A ³HELIUM-MRI STUDY

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Beyond high-resolution morphological imaging of ventilated airspaces, magnetic resonance imaging (MRI) of the lungs with inhaled laser-polarized ³Helium (³HeMRI) offers a new route to non-invasive regional analysis of ³He-distribution and O₂ partial pressure (PO₂) in the lungs (1,2). In volunteers and patients, we investigated the ability of ³HeMRI to detect large, functionally significant regional differences in the distribution of ventilation and alveolar PO₂.

Patients and Methods: With Ethics Committee approval and informed consent, 8 healthy volunteers (age, 24-43 yr) and 5 patients (48-64 yr) with idiopathic pulmonary fibrosis (IPF) after single lung transplantation (SLTX) underwent conventional pulmonary function tests (PFT) and ³He-MRI (1.5 T-MRI; single-breath inspiration of 200 ml ³He, 28% polarized). Relative signal intensity (SNR) and regional PO₂ (P_RO₂) were determined in 3 representative regions of interest in the periphery of each healthy, grafted, or fibrotic native lung. Data are means ± SD. * = p < .05 vs. healthy volunteers; ° = p < .05 vs. native IPF lung); VC = vital capacity; P_aO₂ = arterial PO₂.

Results:	Healthy volunteers		IPF-SLTX patients	
VC (% predicted)	106 ± 9		68 ± 12 *	
P _a O ₂ (mm Hg)	95 ± 8		81 ± 7 *	
	Right lung	Left lung	IPF lung	Graft
SNR (%)	52 ± 4	48 ± 4	35 ± 1	65 ± 11 °
P _R O ₂ (mm Hg)	117 ± 24	115 ± 17	74 ± 34 *	96 ± 25 °°

Conclusions: The ³He-MRI results determined selectively for each lung are consistent with the conventional PFT findings. The unbalanced distribution of inspired ³He signal in IPF/SLTX patients indicates reduced ventilation of the fibrotic native lung, due to restriction. The patients' subnormal P_RO₂ values are consistent with ventilation-perfusion mismatch (increased in the IPF lungs vs. the grafted lung), which reduces P_aO₂ in this group significantly. ³He-MRI appears to be a promising tool not only for lung imaging, but also for non-invasive regional pulmonary function analysis.

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References:

- 1) J Appl Physiol 87:2043 (1999)
- 2) J Magn Reson 141:207(1999).

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MECHANISMS OF ACUTE POSTOPERATIVE HYPOMAGNESEMIA

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Introduction:

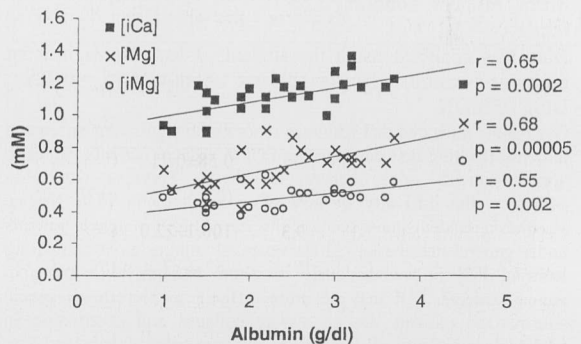
Clinical observations suggest that major surgery or trauma leads to hypomagnesemia. The mechanisms of perioperative decrease of Mg are undetermined, but could include urinary loss, hypoproteinemia, extracellular fluid dilution, or intracellular redistribution. This study was designed to evaluate patients undergoing major abdominal surgery for hypomagnesemia and to investigate possible mechanisms of acute postoperative hypomagnesemia.

Methods:

After institutional approval and informed consent, 16 adult patients with normal renal function undergoing major abdominal surgery were studied. Arterial blood samples were obtained before and after surgery and analyzed for total Mg [Mg] (J&J Vitros Analyzer), ionized Mg [iMg] (AVL 988-4 Electrolyte Analyzer), ionized calcium [iCa], albumin and pH. Urine was collected throughout the case and sent for measurement of [Mg]. Statistical analysis was performed with paired t-test and regression analysis.

Results:

16 patients (8 female, 8 male), age 29-85 (mean 66.5) years were studied. Urine Mg excretion was 1.77-0.06 (mean 0.87) mM, [Mg]*1.85±0.22 vs 1.45±0.25 mM (mean±SD, preop vs postop), [iMg]*0.52±0.07 vs 0.44±0.07 mM, [iCa]*1.15±0.11 vs 1.09±0.11 mM, albumin*2.95±0.69 vs 1.83±0.56 g/dl, [H+] 38.04±4.07 vs 40.68±3.52. * = p < 0.05. The relationship between [iCa], [Mg], [iMg] and albumin for all data points is shown in the figure.



Discussion:

There was a significant drop in [Mg] in the vast majority of our patients. This can only partly be explained by the decrease in albumin, since [iMg] also decreased. Thus, the mechanism is likely also to include intracellular redistribution or dilution of the extracellular compartment with fluids not containing Mg. In several patients postoperative Mg decreased to levels that could be unacceptably low. Since, unlike calcium, there is no known primary regulatory mechanism for Mg, this may suggest a need for intraoperative supplementation of Mg during major abdominal surgery.