

POSTER PRESENTATION

Open Access

Elevation of serum phosphorus, an early biomarker of acute kidney injury after cardiac surgery?

J Ridolfo, M Saour*, G Culas, N Zeroual, G Samarani, P Gaudard, P Colson

From ESICM LIVES 2015

Berlin, Germany. 3-7 October 2015

Introduction

Acute kidney injury (AKI) is common after cardiac surgery and is a strong predictor of morbidity and mortality [1]. Hyperphosphatemia following AKI, by renal excretion defect, has never been studied in this context and could be a simple marker of AKI.

Objectives

The aim of this study was to assess the predictability of serum phosphorus (Ph) for AKI monitoring after cardiac surgery.

Methods

In this retrospective diagnostic validation study of 547 patients admitted in our institute between January 2012 and December 2012, we excluded patients with end stage renal disease (clearance < 15mL / min / 1.73m²) or dialyzed, solitary kidney or nephrectomy, lack of data. Serum creatinine (Cr) and Ph were measured preoperatively and postoperatively specifically (H0, H12, H24, H48, H72). The percentage of maximum elevation of Ph (%EPH = [(maximum - minimum) / minimum] * 100) was calculated. AKI was defined as an increase Cr more than 26.5 mmol / L in 48 hours according to KDIGO criteria [2]. The diagnostic performance of postoperative Ph thresholds were analysed by elaborating area under the receiver operating characteristic curves (AUC-ROC) with sensitivity (Se), specificity (Sp), positive predictive value (PPV), negative predictive value (NPV).

Results

From the 386 patients included, the mean Euroscore II was $4.2 \pm 6.3\%$, SAPS II score, 26.4 ± 10.8 . Among

them, 21.2% developed AKI (grade 1: 13.2%, grade 2: 4.1%, grade 3: 3.1%) and 2.6% required renal replacement therapy (RRT). Patients with AKI had Euroscore II, duration of cardiopulmonary bypass, transfusion needing and mortality higher than those without AKI ($p < 0.001$). The %EPH and the Ph at 48 hours (Ph_{48H}) were significantly higher in AKI patients than in no AKI patients: $81 \pm 79\%$ and 1.47 ± 0.46 mmol/l vs $25 \pm 23\%$ and 0.99 ± 0.2 mmol/L, respectively ($p < 0.001$). A value of Ph_{48H} > 1.19 mmol/L (Se 72% (60-82), Sp 84% (71-92), PPV 84%, NPV 72%) and a %EPH > 49 % (Se 73% (61-81), Sp 83% (76-88), PPV 66%, NPV 86%) were predictive of AKI. In AKI patients, the %EPH and Ph_{48H} significantly increased with the severity of AKI (Table 1). In these patients, a Ph_{48H} < 1.53 mmol/L and a %EPH < 77% predicted the non use of RRT (Se 100% (62-100), Sp 85% (77-91), PPV 35% NPV 100%), respectively (Table 2).

Conclusions

After cardiac surgery, serum phosphorus seems to be a simple, reliable and inexpensive biomarker at bedside for AKI monitoring. A value less than 1.53 mmol/L at 48h may predict the no-initiation of RRT in case of AKI and may guide the clinician to a non-invasive-AKI therapeutic. Obviously, these results should be interpreted with caution regarding the retrospective nature of the study.

Table 1

AKI severity	%EPH	Ph _{48H} (mmol/L)
Grade 1	60 ± 45	1.25 ± 0.4
Grade 2	74 ± 58	1.73 ± 0.4
Grade 3	159 ± 132	1.80 ± 0.5

Arnaud de Villeneuve University Hospital, Department of Anesthesiology and Intensive Care, Montpellier, France

Table 2

	Thresholds	AUC (IC95%)	p value
AKI diagnostic			
Ph _{48H}	1.19 mmol/L	0.813 (0.735-0.890)	< 0.0001
%EPH	49%	0.830 (0.772-0.889)	< 0.0001
RRT requiring			
Ph _{48H}	1.53 mmol/L	0.924 (0.879-0.970)	< 0.0001
%EPH	77%	0.818 (0.683-0.952)	< 0.0001

Published: 1 October 2015

References

1. Lassnigg A, Schmidlin D, Mouhieddine M, Bachmann LM, Druml W, Bauer P, *et al*: Minimal changes of serum creatinine predict prognosis in patients after cardiothoracic surgery: a prospective cohort study. *J Am Soc Nephrol* 2004, **15**:1597-1605.
2. Kidney Disease: Improving Global Outcomes (KDIGO) Acute Kidney Injury Work Group. KDIGO Clinical Practice Guideline for Acute Kidney Injury. *Kidney Inter* 2012, Suppl 2:1-138.

doi:10.1186/2197-425X-3-S1-A465

Cite this article as: Ridolfo *et al*: Elevation of serum phosphorus, an early biomarker of acute kidney injury after cardiac surgery? *Intensive Care Medicine Experimental* 2015 **3**(Suppl 1):A465.

Submit your manuscript to a SpringerOpen® journal and benefit from:

- Convenient online submission
- Rigorous peer review
- Immediate publication on acceptance
- Open access: articles freely available online
- High visibility within the field
- Retaining the copyright to your article

Submit your next manuscript at ► springeropen.com