Postoperative FGF23 is an early biomarker of AKI development and AKI severity stratification, as well as strong predictor of short-term AKI function outcome

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Figure 1. FGF23 dynamics during five postoperative days in postoperative AKI cases after major abdominal and vascular surgery

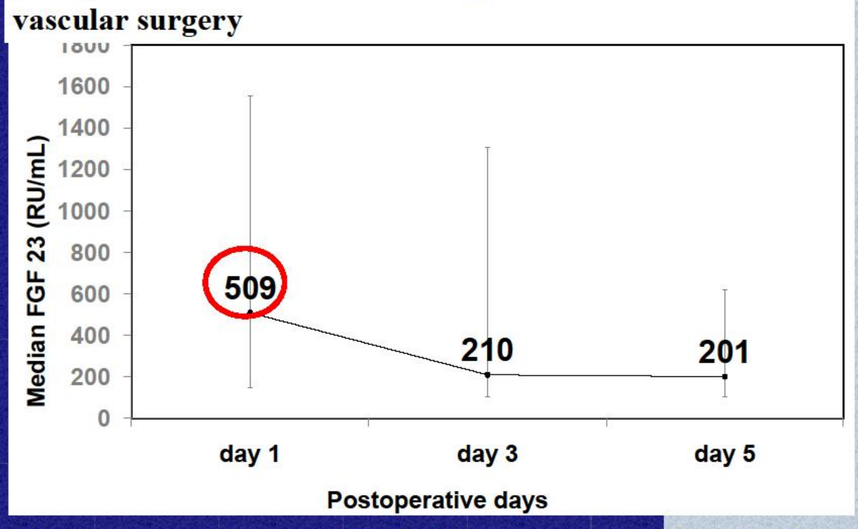


Table 1. Prognostic role of FGF23 levels measured on the first postoperative day on the short-term renal function outcome
***OR+=positive odds ratio**

	7th day AKI outcome		14th day AKI outcome	
	Sensitivity %	*OR+	Sensitivity %	*OR+
Youden J index	FGF 23 63,5 RU/ml ROC AUC 0,71 (95% CI 0,57-0,85); p<0,05		FGF 23 857 RU/ml ROC AUC 0,71 (95 % CI 0,57-0,85) p<0,05	
RIFLE criteria	87	1,07	85	0,96
FGF 23	65	1,89	65	1,68
RIFLE sensitivity	*FGF 23 138,4 RU/ml*		*FGF 23 138,5 RU/ml*	
RIFLE criteria	87	1,07	85%	0,96
FGF23	87	1,15	85%	1,01
RIFLE specificity	*FGF 23 127 RU/ml*		*FGF 23 132 RU/ml*	
RIFLE criteria	18	*1,07*	11	*0,96*
FGF23	18	*1,07*	11	*0,96*

Table 2. Prognostic role of FGF23 levels measured on the third postoperative day on the short-term renal function outcome
***OR+=positive odds ratio**

	7th day AKI outcome		14th day AKI outcome	
	Sensitivity %	*OR+	Sensitivity %	*OR+
Youden J index	FGF 23 359 RU/ml ROC AUC 0,81 (95% CI 0,72-0,9); p<0,05		FGF 23 363,5 RU/ml ROC AUC0,69 (95% CI 0,55-0,83); p<0,05	
RIFLE criteria	86	3,09	78	1,92
FGF 23	78	3,29	63	1,51
RIFLE sensitivity	*FGF 23 160,5 RU/ml*		*FGF 23 159,5 RU/ml*	
RIFLE criteria	86	3,09	78	1,92
FGF23	86	1,85	78	1,26
RIFLE specificity	*FGF 23 402 RU/ml*		*FGF 23 614 RU/ml*	
RIFLE criteria	72	3,09	60	1,92
FGF23	72	2,68	55	1,43

Figure 2

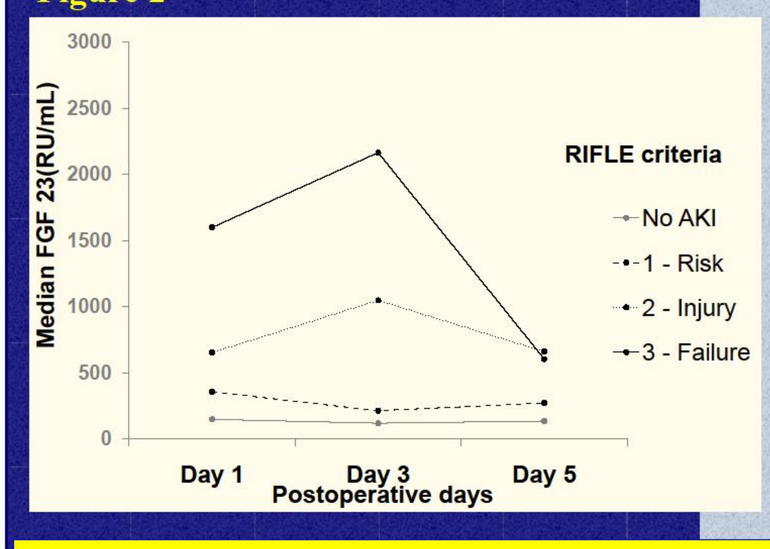


Figure 3

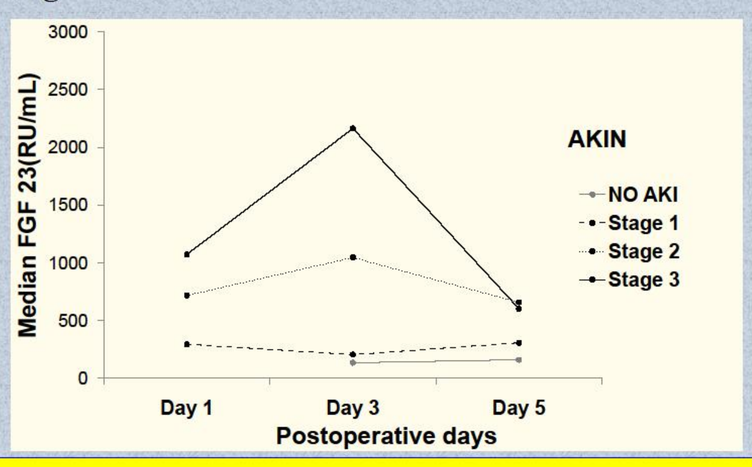
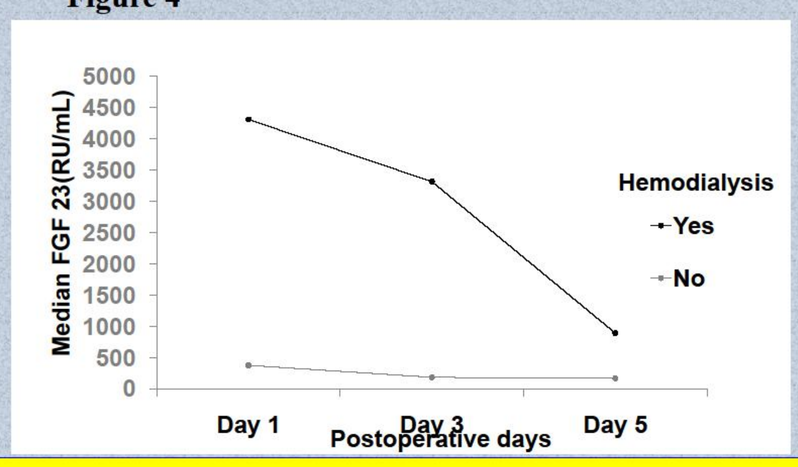


Figure 4



Introduction

The aim of our study was to investigate whether **postoperative FGF23 is a good clinical indicator** for in time, early dialysis initiation and **early prognostic predictor of postoperative AKI progression** in cases submitted to major general and vascular surgery. Since, mineral disturbances of serum and urinary calcim and phosphate levels in AKI are still a mystery we also investigated their trends in our study.

Materials and methods

The main outcomes

- FGF23 dynamics in AKI
- FGF23 prognostic role in the short-term AKI function outcome
- correlation with serum and urinary creatinine, calcium and phosphate levels.

The secondary outcomes

- correlation between measured FGF23
- preoperative comorbidities (cardiovascular, diabetes mellitus II, COPD)
- major postoperative complications (peritonitis, intraabdominal sepsis, septic shock, multiorgan failure and pulmonary complications)
- CVVHD/F
- length of the ICU and post-ICU hospital stay
- SAPS II score
- hospital and 6-months mortality.

In the end, we compared the results with the current golden standards RIFLE and AKIN criteria.

Results

✓FGF23 levels ***were significantly elevated in the AKI cases*** opposed to no AKI cases during five days measurements according to RIFLE and AKIN criteria (p<0,05).
✓***The highest FGF23 levels were measured on the first postoperative day*** in all AKI cases (p<0,001)(**Figure 1**).
✓ FGF23 levels on the ***first and especially the third postoperative day*** showed a ***good sensitivity for severity stratification of AKI*** according to both RIFLE and AKIN criteria (p<0,05)(**Figure 2,3**).
✓FGF23 levels on the ***first postoperative day were good predictor of AKI function outcome*** same as RIFLE criteria (ROC AUC 0.71;95% CI 0.57-0.85; p<0.05)(**Table 1**).
✓On the third postoperative day RIFLE criteria were superior in AKI function outcome prediction in comparison to FGF23 and AKIN criteria (ROC AUC 0.81;95% CI 0.71-0.9;p<0.05)(**Table 2**).
✓***AKI cases submitted to CVVHD/F(12.4%) had significantly higher FGF23 levels*** in all time points of measurement (p<0,001) (**Figure 4**). Thus, FGF23 levels of ***1168 RU/ml*** were set as the ***optimal cut-off point for CVVHD/F initiation*** (ROC AUC 0,86; 95% CI 0.784-0.934; p<0,001).
✓We found ***correlation*** between FGF23 and ***SAPS II score, length of the ICU stay, and serum creatinine levels***.
✓***Hospital (21.5%) and 6-months (26.45%) non-survivors had significantly higher FGF23 levels*** than the same survivors (p<0,05). FGF23 levels as well as RIFLE and AKIN criteria stongly correlated with MOF (p<0,001).
✓***Preoperative presence of diabetes mellitus II and COPD,*** and postoperative development of ***sepsis*** strongly ***correlated with FGF23 levels*** measured on the third postoperative day (p<0,05).
✓Correlation between preoperative comorbidities and postoperative major complications with RIFLE and AKIN criteria was irrelevant in all time points of measurement (p>0,05).
✓***Hypocalcemia and normophosphatemia*** were main mineral disturbances in our AKI cases (p<0.05). FGF23 levels correlated with them in variant ways.

Conclusion

Our time-specific study demonstrated that FGF23 is a ***good, novel, early postoperative AKI biomarker*** with an excellent ***sensitivity for severe AKI stages***. It is also an ***early prognostic indicator of short-term postoperative AKI function outcome***, same as RIFLE criteria. Also, it is ***a good predictor of postoperative clinical course in AKI cases*** after major abdominal and vascular surgery

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