

Flow-mediated Dilation and Acute Kidney Injury Prediction in Vascular Surgeries

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Background

- ✓ Flow Mediated Dilation (FMD) can be used as a tool to evaluate endothelial dysfunction (ED) and predict cardiovascular events in patients undergoing cardiovascular surgery.
- ✓ FMD is a noninvasive technique used to measure the change in brachial artery diameter after a cuff occlusion during 5 minutes assessed by Doppler ultrasound.
- ✓ Some studies have shown that endothelial dysfunction and abnormal vascular reactivity play a role in the pathophysiology of AKI.

$$FMD (\%) = \frac{\text{peak diameter} - \text{baseline diameter}}{\text{baseline diameter}}$$

Methods

- ✓ We performed a retrospective analysis using a prospective collected cohort including 96 patients submitted to major vascular surgeries.
- ✓ All patients had FMD assessed before surgery.
- ✓ AKI was defined based on KDIGO serum creatinine criterion during the first 7 days.
- ✓ Reference serum creatinine was the last creatinine assessed before the surgery.
- ✓ Cardiovascular events were defined as cardiovascular death, AMI, stroke and troponin elevation.

Objectives

- ✓ We hypothesized that the FMD could be a tool to predict AKI in patients undergoing major vascular surgery.

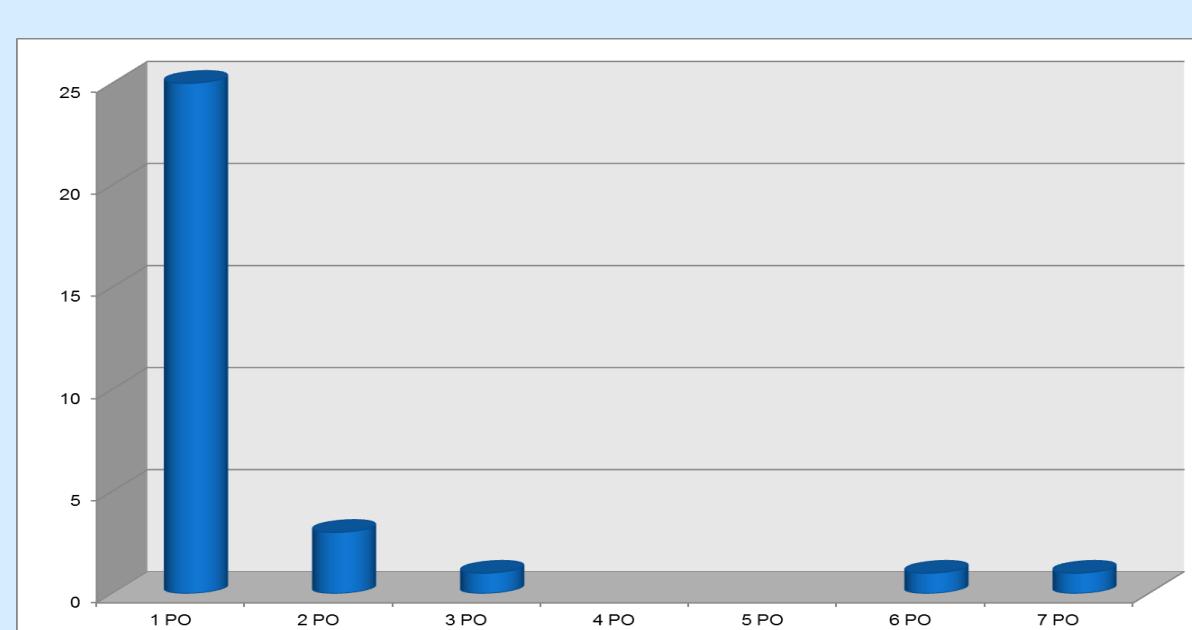
Results

Table 1: Baseline and the perioperative period characteristics

	Total (n=96)	No AKI (n = 65)	AKI (n = 31)	P
Age (years)	66,1 + 9,3	65,6 + 9,3	67,3 + 9,2	0,4
Baseline MDRD (ml/min/1,73m ²)	70,3 + 22,9	72,6 + 23,1	65,6 + 22,1	0,157
Gender (male)	69 (72%)	49 (75%)	20 (65%)	
DM	14 (15%)	7 (11%)	7 (22%)	0,136
Hypertension	91 (95%)	60 (92%)	31 (100%)	0,171
Tabagism	83(86%)	59 (90%)	24 (77%)	0,054
Duration of the surgery	276,9 + 126,3	263,5 + 112,6	305 + 149,2	0,133
Blood transfusion in the surgery	46(48%)	27 (41%)	19 (61%)	0,083
Hemodynamic instability in the surgery	25 (26%)	11 (17%)	14 (45%)	0,006
ICU length of stay (days)	3,65 + 6,6	2,55 + 4,4	5,94 + 9,5	0,02
Cardiovascular events	18 (19%)	11 (17%)	7 (22%)	0,4

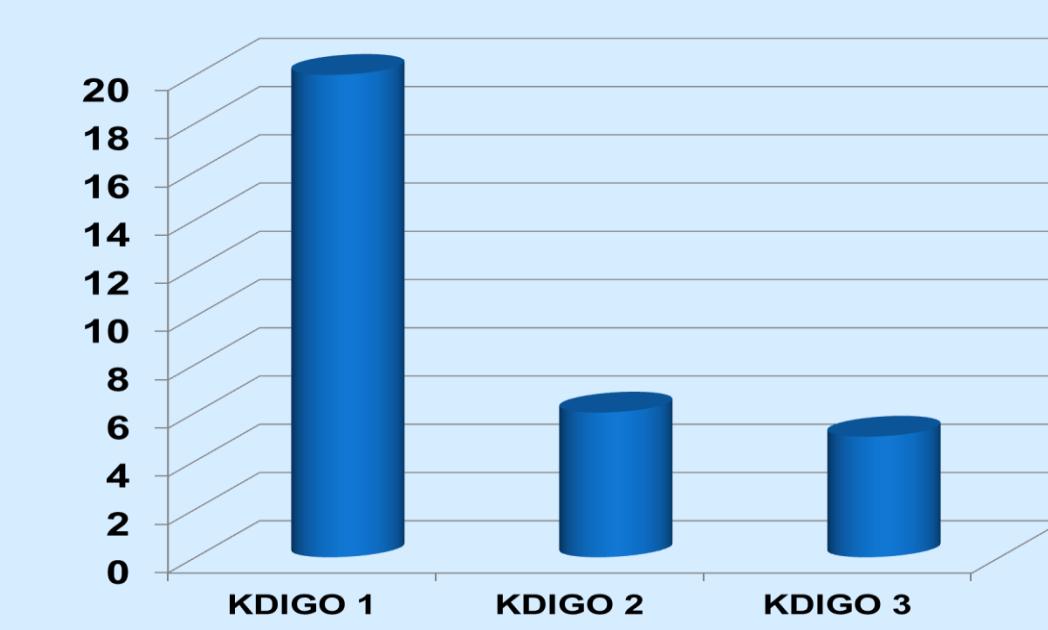
- ✓ 61.5% of the procedures were in the aorta and 26% were lower limb revascularization.
- ✓ 65% were open surgeries and 35% were endovascular procedures.
- ✓ AKI was associated with hemodynamic instability and blood transfusion.
- ✓ AKI patients had a longer ICU length of stay compared to non-AKI patients

Figure 1: Day of AKI diagnosis during follow up period



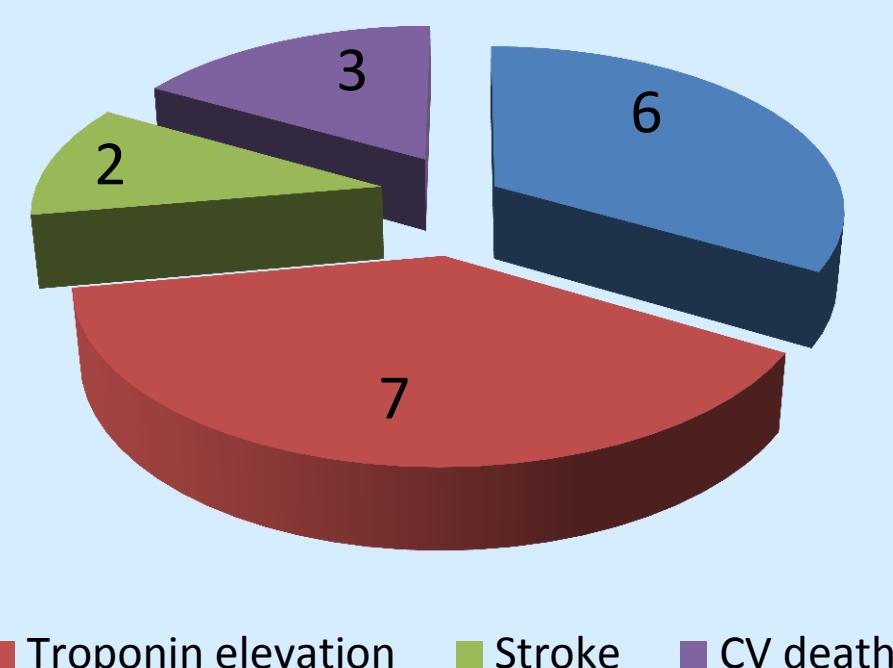
The majority of patients reached AKI criteria within 24 hours after surgery

Figure 2: AKI severity by KDIGO classification



Most AKI episodes were classified as KDIGO 1 (64%)

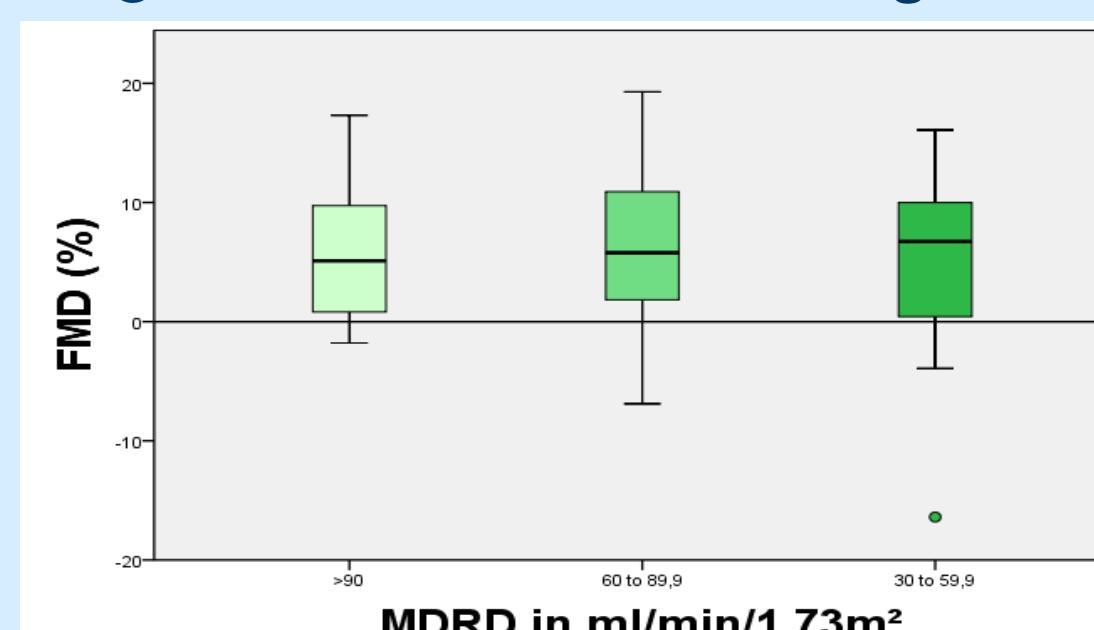
Figure 3: Stratification of Cardiovascular Events



AMI Troponin elevation Stroke CV death

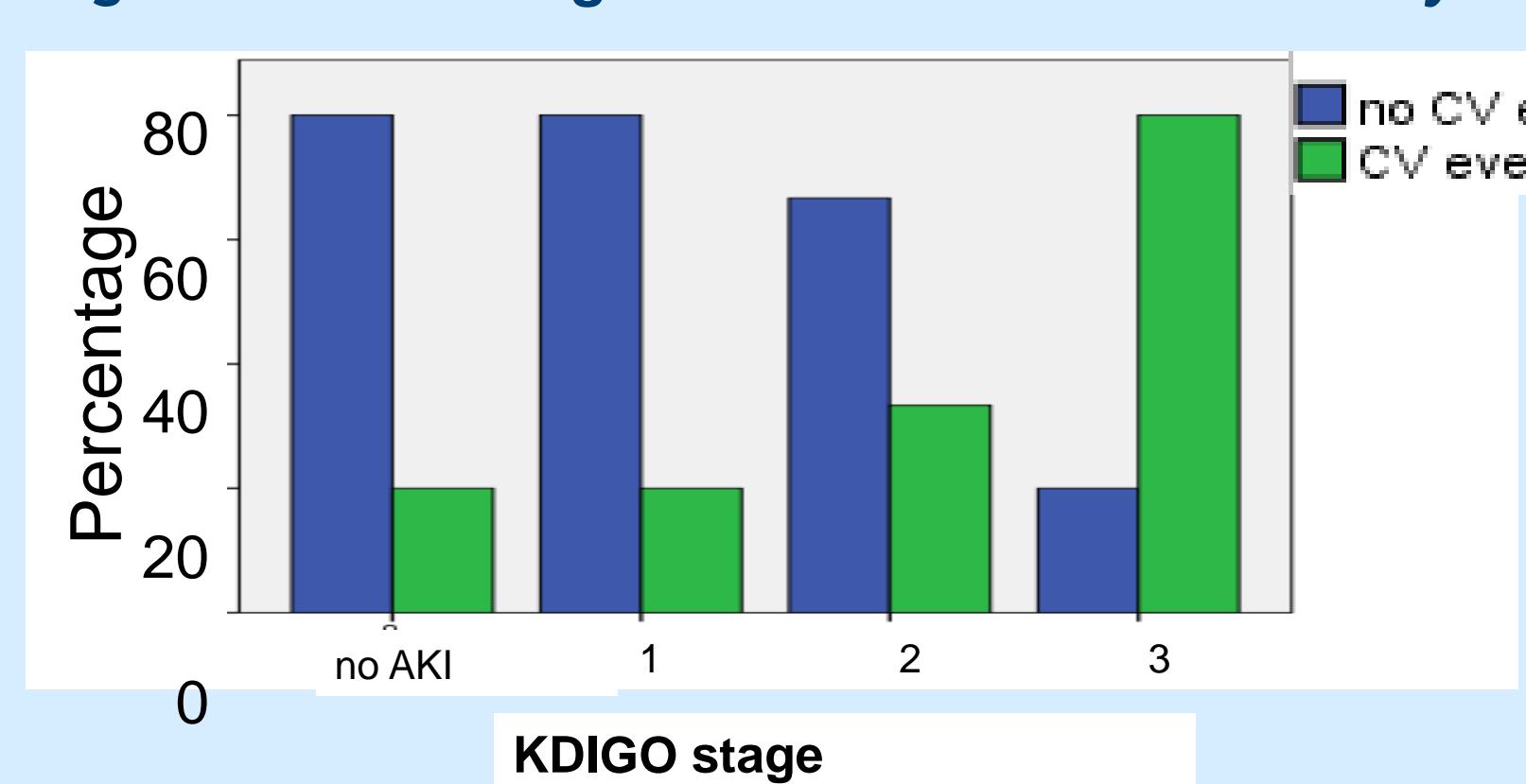
- ✓ Of the 96 patients, 18 had cardiovascular events during the follow-up period
- ✓ The most frequent CV event was troponin elevation (39%) and AMI (33%)

Figure 4: FMD and CKD stages based on estimated GFR



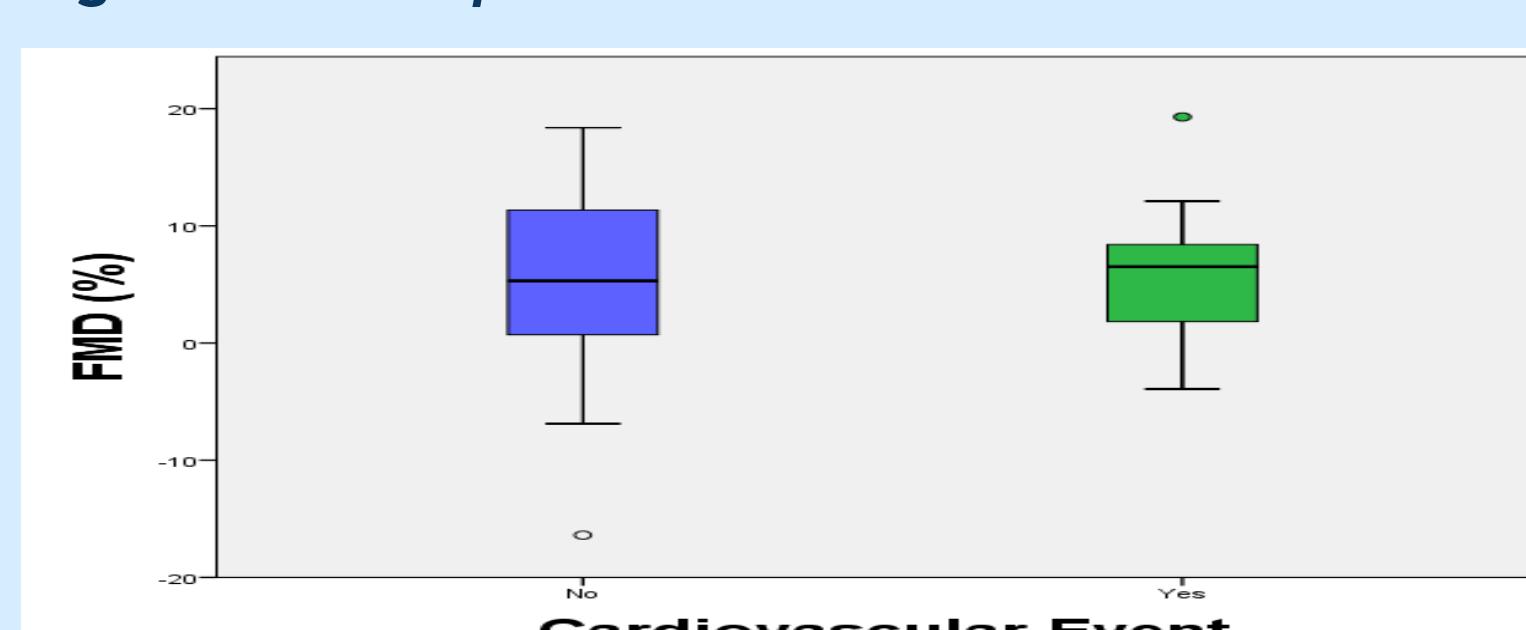
- ✓ 19.1% of the patients had MDRD > 90, 43.6% were classified as CKD stage II and 37.2% were CKD stage III based on the eGFR.
- ✓ There was no association between FMD and different stages of CKD.

Figure 5: Percentage of cardiovascular events by KDIGO classification



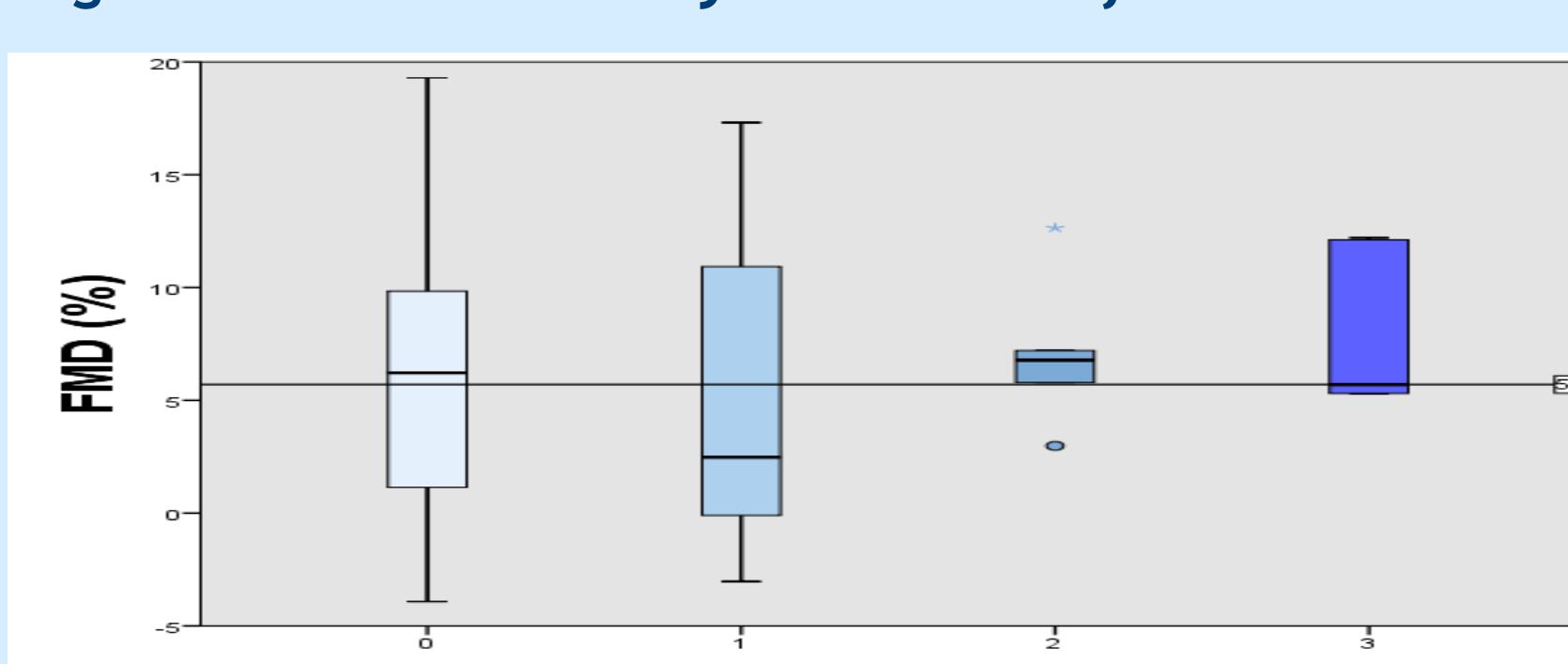
The incidence of cardiovascular events increased with AKI severity stage

Figure 6: Pre-operative FMD levels and Cardiovascular Events



- ✓ We found no difference in FMD values in patients with or without cardiovascular events in the post-operative period

Figure 7: FMD and AKI by KDIGO classification



- ✓ The mean FMD was 5.7% and there was no association with the severity of AKI

Summary and Conclusion

- ✓ In our cohort of patients with established vascular disease, pre-operative FMD could not predict cardiovascular events.
- ✓ FMD could not predict AKI during the first week after surgery.
- ✓ There was no association between FMD and CKD stages
- ✓ Future studies should evaluate the role of FMD as a tool to assess endothelial dysfunction in patients with established vascular disease.
- ✓ The predictive ability of FMD to predict cardiovascular events and AKI needs to be evaluated further.