

## **Delay in detection and treatment of perioperative anemia in hip fracture surgery and its impact on postoperative outcomes**

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### Background

Elderly patients with hip fractures are at high risk for perioperative anemia as a result of fracture- and surgery-related blood loss. The detection of anemia is dependent on intermittent blood samples and therefore might be delayed, potentially leading to a significant delay in transfusion. This study aimed to investigate the possible delay in perioperative anemia detection, accumulated perioperative anemia-associated burden, peripheral perfusion, and their association with patient outcomes in elderly patients with hip fracture.

### Methods

Elderly patients with acute hip fracture scheduled for surgery were enrolled in this prospective study from August 2016 to December 2016. All patients were monitored continuously for hemoglobin concentration (SpHb) and perfusion index (PI) with the Radical-7® Pulse CO-Oximeter® and Rainbow® R1 Adhesive Multi-parameter Sensors (Masimo Corp., Irvine, CA, US) from 12 h presurgery to 24 h postsurgery.

### Results

Fifty-one patients were enrolled, and 41 were included in the final analyses. Mean delay in the detection of low Hb (<10 g/dL) using intermittent blood samples, when compared with SpHb, was 1.07 h (standard deviation,  $\pm 2.84$  h). Median perioperative cumulated time with low SpHb (<10 g/dL for at least one min) was 25 min (interquartile range [IQR]: 21–690). There was a significant association between perioperative time with low SpHb and the occurrence of postoperative delirium (median cumulated time with low SpHb: 162 min in patients with delirium vs 22 min in patients without delirium,  $P = 0.034$ ) and a nonsignificant trend for an association between perioperative time with low SpHb and 90-day mortality or medical complications (median cumulated time with low SpHb: 119 min for patients with mortality or severe complication vs 22 min for patients without mortality or severe complication,  $P = 0.104$ ). PI values during the perioperative period were not significantly associated with patient outcomes. Cumulated time with low PI (<0.5) preoperatively (but not perioperatively) was significantly associated with the occurrence of postoperative delirium ( $P = 0.047$ ).

### Conclusions

This study showed a delay in transfusion threshold detection, and the presence of significant associations between low SpHb or time with low SpHb and postoperative outcomes.