ROLE OF THE MACHINE LEARNING-DERIVED HYPOTENSION INDEX (HPI) TO CONTAIN INTRAOPERATIVE HYPOTENSION DURING TRANSCATHETER EDGE TO EDGE REPAIR PROCEDURES

Ospedale Generale Regionale F.Miulli, Acquaviva delle Fonti; Policlinico Universitario Agostino Gemelli, Roma

Introduction: Percutaneous endovascular valvular interventions can result in profound hemodynamic instability, elevated burden of intraoperative hypotension (IOH) and related postoperative complications: ischemic stroke, acute kidney injury and increased mortality. Machine learning (ML), a branch of Artificial intelligence (AI), can analyze large volumes of data, find associations and allowing predictive rather than reactive interventions. The Hypotension Prediction Index (HPI), a ML derived algorithm, provides a unitless number from 0 to 100, that increases accordingly to the risk of developing a hypotensive event (mean arterial pressure - MAP - < 65 mmHg for more than 1 minute) in the following minutes. The aim of this study is to describe IOH in patients undergoing percutaneous valve repair under general anesthesia treated according to an HPI-based hemodynamic guidance (fig. 1).

Methods: Eligible adult patients undergoing transcatheter valve repair procedures (MitraclipTM, TriClipTM) were included in the study. When HPI value exceeded 85, a proactive individualized treatment protocol to prevent hypotension was provided according to the following modalities (fig. 2). Primary outcome measure was TWA-MAP (time weighted average mean arterial pressure) under the threshold of 65 mmHg. Secondary outcomes were number of patients with at least one hypotensive event, number of events per patient, depth and duration of hypotensive events and area under MAP threshold of 65 mmHg (AUT-MAP < 65).

Results: Twenty-five consecutive patients were prospectively enrolled and treated. During an average monitoring time per patient of 187 ± 31 minutes, the global burden of hypotension, measured as TWA-MAP < 65 mmHg, was 0.12 [0.02, 0.8] mmHg. Two thirds of the patients (16/25) experienced hypotensive events, with a median number of hypotensive events of 1 [0, 3.25] per patient and about 11% of the time spent < 65 mmHg. Each event lasted 4 [1.7, 8.6] minutes with a MAP of 59 [56, 62] mmHg, leading to a total AUT-MAP < 65 mmHg of 20.3 [3.5, 142.2] mmHg x minutes. The majority of hypotensive events occurred after induction of general anesthesia, while hypotension was rare during the procedure (fig. 3).

Conclusions: HPI algorithm provides accurate and continuous prediction of impending IOH before its occurrence. Machine learning models, as in the case of HPI, could facilitate the physicians to treat IOH which is a potentially modifiable risk factor for major postoperative complications.