When valve needs electrical wires - estimating pacemaker implantation after TAVR

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Funding Acknowledgements: None.

Introduction: Widespread availability and expanded indication of transcatheter aortic valve replacement (TAVR) modified paradigm of aortic stenosis. Despite elevated success rate, there are procedure related complications that need to be considered. One of the most frequent is conduction defects requiring permanent pacemaker (PPM) implantation resulting in prolonged hospital length of stay and hospitalization cost.

Several risk factors for PPM implantation after TAVI have been described, and, recently, the Emory Risk Score (ERS) was developed as a predictive tool for need of new PPM implantation post-TAVI in patients who implated a balloon-expandable valve.

Purpose: Our objective was to evaluate risk factors associated with PPM after TAVR and to validate the ERS in our population after implantation of balloon-expandable but also self-expanding valves.

Methods: Retrospective, observational and single center study involving patients submitted to TAVR between 2018 and 2021. Clinical, ECG data and procedure characteristics were obtained at time of TAVR and during follow-up.

The predictive discrimination of the scoring system for the risk for PPM placement after TAVR was evaluated using ROC curve analysis in SPSS Statistics. To estimate additional predictors of pacemaker implantation we used Cox proportional hazards regression models.

Results: From January 2018 to December 2021, 416 patients were referred to our centre for TAVR. The mean age was $82{,}5 \pm 6{,}1$ years, 55% female. Most frequently implanted valves were Evolut Pro and Sapien 3 ultra in 39,4% and 26,6% of pts, respectively. During follow-up 110pts (26%) needed device implantation (94 % double chamber pacemaker; 6% CRT-P or CRT-D), most frequently due to AV block.

On univariate analysis, QRS width was the only factor that showed a significant correlation with pacemaker implantation (HR 1,018, 95% CI 1,007-1028; p=0.027). We found no other clinical or procedural characteristics to be predictive of PM implantation.

ERS is composed of 4 variables – history of syncope, right complete branch block, QRS width > 140mseg and valve oversizing > 16% - and revealed a good sensitivity and specificity in estimating device implantation. We applied this score to our population and ROC curve analysis showed a significant prediction capacity (AUC 0,761 95% CI 0,699-0,822, p=0,031). This analysis was also performed analysing separately both subgroups of self-expandable valves (Medtronic Evolut and Evolut R) and balloon expandable valves (Edwards Sapiens). ROC curve analysis in both showed a good correlation with events – figure 1.

Conclusion: PM implantation is one of the most common complications following TAVR. In our population, the use of ERS displayed a very positive accuracy in predicting device implantation. Routine use of such tool can select patients at significant higher risk and thus best define patient allocation and resource utilization to reduce number of hospitalization days.
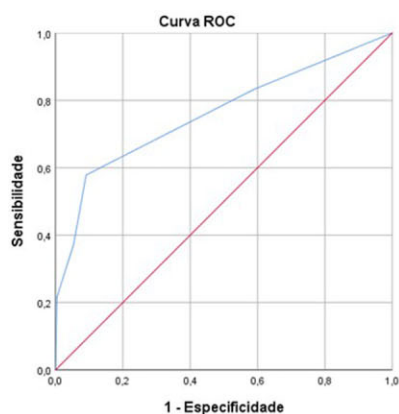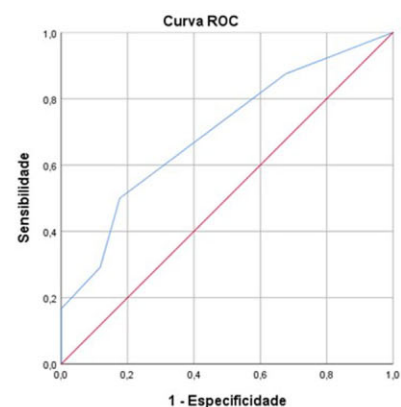

AUC 0,761 (0,699-0,822), p=0,031

Emory score performance in all pts
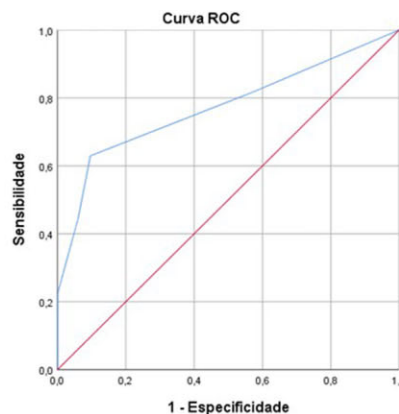
AUC 0,772 (0,654-0,891), p<0,001

Emory score performance in self expandable valves

AUC 0,697 (0,558-0,836), p=0,01

Emory score performance in balloon expandable valves