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EDITORIAL

Risk Stratification in Patients Hospitalized With Infective Endocarditis Undergoing Cardiac Surgery: How Sharp Are We?

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Editorial referring to the article: Analysis of the SHARPEN Score in the Prediction of In-Hospital Mortality of Patients With Infective Endocarditis Undergoing Cardiac Surgery

Infective endocarditis (IE) is an infrequent yet life-threatening and disabling condition,[1] with an estimated incidence between 3 and 12 cases per 100,000 subjects per year.[2,3] Recent epidemiological studies have suggested a rising trend in the incidence of IE,[3] potentially attributable to factors such as an aging population and a growing group of susceptible patients with congenital heart disease, intracardiac prosthesis or devices, and chronic renal failure on dialysis. Limited information is available concerning Brazil's temporal trends on IE incidence and clinical outcomes. The primary source of evidence regarding the IE scenario in Brazil stems from single or multicenter observational studies.[4-7] Analyzing available data, it appears that IE predominantly affects younger male patients in Brazil. The most prevalent microbial culprits are *Staphylococcus*, followed by *Enterococcus* and *Streptococcus* species; rheumatic heart disease is an important underlying heart condition as well.[7]

The diverse clinical spectrum of IE, coupled with the substantial risk of complications and the limited availability of randomized clinical trials on IE, justify that it continues to be a prognostic challenge. Despite the unquestionable diagnostic and therapeutic advances in the management of IE in recent decades, its prognosis is still marked by high rates of complications and significant in-hospital mortality. In developed countries, IE is associated with mortality rates of approximately 20%,[1,8,9] whereas in low- and middle-income countries, the mortality of IE ranges from 15% to 30%.[10] The predominant focus in studies on IE has been the evaluation of clinical factors that may influence the course of the disease. In one of these studies, a machine learning-based analysis identified peripheral stigmata, nosocomial IE, the absence of vegetation, and surgery in the presence of neurologic complications as characteristics associated with higher in-hospital mortality.[4]

Surgical intervention also plays a crucial role in IE,[10] with Europe exhibiting higher rates when compared to the global average. In the recent EURO-ENDO (European IE)[8] registry, approximately half of the patients underwent surgery. In numerous retrospective studies involving patients with IE across diverse clinical conditions, surgery has proven to independently predict survival.[10,11] Once there is a recommendation for surgical treatment of complicated IE, risk stratification is crucial, and should consider the patient's clinical condition, comorbidities, and surgical risk. Both American and European guidelines advise that decisions regarding the indication and timing of surgical intervention for IE should be the responsibility of a multidisciplinary endocarditis team, consisting of specialists in infectious diseases, cardiology, imaging, and heart surgery. Numerous observational studies have revealed that the implementation of such multidisciplinary care teams for IE cases is linked to lower in-hospital and one-year mortality rates.[12,13]

Various risk models have been developed to predict the operative risk of surgery specifically in IE (Table 1). However, all operative risk models face limitations

Keywords

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due to inherent biases in patient selection for surgical treatment and no single score has proven to be ideal to identify patients with IE at greater risk for in-hospital mortality. In 2015, a mortality prediction score, named the SHARPEN score, was formulated.[14] This score identified seven easily obtainable parameters independently linked to in-hospital mortality – systolic blood pressure, heart failure, age, renal function, pneumonia, high peak C-reactive protein, and non-intravenous drug abuse. In contrast with other scoring systems, the SHARPEN score includes clinical variables that are readily obtained, which could facilitate its use in clinical practice.

In the current journal, Lech et al.[15] conducted a descriptive and retrospective study on patients hospitalized with IE undergoing heart surgery at *Hospital de Clínicas de Porto Alegre (HCPA)*, in Brazil between 2007 and 2016. Only patients with definitive IE, diagnosed according to the modified Duke criteria, were included. The authors aimed to evaluate the SHARPEN score as a predictor of in-hospital mortality in a surgical IE population and assess its non-inferiority in comparison to other traditional and IE-specific surgical scores. A total of 105 hospitalizations of 101 patients was included, and the authors described the main clinical characteristics, including comorbidities, main complications, and indications for surgery, as well as microbiological findings and characteristics of the procedure.

Previously, the SHARPEN score was applied to a Brazilian population by Alves et al.[16] Notably, in this study as well as in the original validation study,[14] both medical and surgical patients were included, representing a distinctly different and lower-risk population. Therefore, the analyzed population showed a lower incidence of comorbidities, namely prosthetic valves and lower rates of IE complications, which is reflected by a lower mortality rate. In comparison to both the original cohort[14] and the study conducted by Alves et al.,[16] in the patient cohort examined by Lech et al.,[15] this specific score showed a lower level of accuracy. This finding implies that the score might be less precise when applied to a higher-risk population, limiting its relevance in clinical practice.

Moreover, none of the applied scores demonstrated a significantly superior discriminative power, with the area under the curve (AUC-ROC) deemed reasonable at best ($0.7 < \text{AUC-ROC} \leq 0.8$), achieving a maximum accuracy of 75.2%. The SHARPEN score did not differ significantly from the other assessed scores.

Regardless of the limitations pointed out by the authors, we consider that this is an important study, as it seeks to compare different prognostic tools and provide a broader perspective on the management of IE, specifically those undergoing heart surgery. There is a pressing need for a simple, better tailored and more accurate score in patients with IE in order to guide therapeutic approaches and establish prognoses. However, one must bear in mind that all retrospective analyses may include a significant burden of selection bias in the decision to operate on a patient.

To make our view *sharper* in terms of disease and prognosis, further studies are needed. To date, the "one

Table 1 – Comparison of IE specific risk scores in surgical cohorts.

Risk score	Year	Country	Derivation cohort	Endpoints	AUC
STS-IE[17]	2011	United States of America	19,543 cases	Operative mortality and a composite of mortality and major morbidity within 30 days	0.76
PALSUSE[18]	2014	Spain	437 cases of IE at 26 centers	In-hospital mortality	0.84
RISK-E[19]	2017	Spain	671 cases of IE at 3 centers	In-hospital mortality	0.82
AEPEI[20]	2017	Italy and France	361 cases of IE in 8 centers	In-hospital mortality	0.78
EndoSCORE[21]	2018	Italy	2715 cases of IE at 26 centers	30-day mortality	0.85

AUC: area under the curve; IE: infective endocarditis; AEPEI: Association pour l'Etude et la Prévention de l'Endocadite Infectieuse; EndoSCORE: endocarditis score; PALSUSE: prothetic valve, age ³70, large intra-cardiac destruction, Staphylococcus spp, urgent surgery, sex, euroscore >10; STS-IE: Society of thoracic surgeons-infective endocarditis; RISK-E: risk-endocarditis score.

size fits all" approach is probably not the best option for the stratification of these patients. IE is a complex and challenging disease, and an individualized, multidisciplinary, and experienced approach, particularly in high volume centers, is crucial to deliver the best care to these patients.

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