



Frailty— a strong risk marker in heart surgery?

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In a recent study, Hawkins and co-workers investigated psoas muscle size as a potential marker of clinical outcomes following surgical aortic valve replacement in moderate to high-risk patients (1).

Risk estimation for treatment selection or patient counselling in heart disease

During the last decade, a very large amount of effort has been put into the development and refinement of various cardiovascular risk prediction models (2). The need for robust and accurate risk prediction models is underscored by the repeated finding that such tools yields enhanced risk stratification compared to clinical judgement alone (3). Cardiovascular risk prediction models are also helpful in providing comprehensive information for risk communication and patient counselling. In particular, risk prediction models have a strong potential for clinical utility in the assessment of operative risk (4). Therefore, it comes as no surprise that there exists an abundance of risk scores developed to predict surgical outcomes; mortality, morbidity, complications, intensive care utilization, just to name a few.

Risk models in cardiac surgery

Cardiac surgery as a discipline, have a long history of applying risk scores for operative risk stratification. In Europe, the EuroSCORE model was developed (5) and

later updated and published as the EuroSCORE II model (6). The EuroSCORE model has gained widespread use and was later extensively validated and the performance have been tested in various clinical settings (4,7). In North America, the Society of Thoracic Surgeons (STS) Risk Score (8,9) is mostly used and was recently updated to better reflect temporal changes in patient characteristics, outcomes and evolution of surgical practice. Although there is a general agreement that a thorough assessment of surgical risk is important, there is no consensus regarding which risk prediction model should be used in cardiac surgery. Moreover, none of the most widely used models incorporate the concept of frailty.

Model performance is usually assessed by investigating two properties: discrimination and calibration (10). Discrimination describes how well a model differentiates those patients who are at higher risk of having an event from those who are at lower risk. Calibration tells us how similar the predicted absolute risk is to the observed risk in patients assigned to different risk groups. In other words, calibration describes the precision of absolute risk estimates. Model performance could possibly improve by including additional risk markers (10).

Frailty as a risk marker

What is frailty? According to some authors “It’s hard to define, but you know it when you see it” (11,12). Frailty has been described as a “multidimensional syndrome of the loss

of reserves such as energy, physical ability, cognition, and vulnerability” or defined as “a lack of physiological reserves across multiple organ systems” (13). Recognizing that there is no standardized or objective method to measure frailty, it seems relevant to characterize this concept because the increasing prevalence of elderly patients in the cardiac surgery context. A number of tools has been proposed to address frailty in cardiothoracic surgery: 6-minute walk test, hand grip test, serum albumin or creatine, and scores or index that combine relevant information (e.g., comprehensive geriatric assessment and Edmonton Frail Scale) (13,14). Some of the comprehensive assessments of frailty covers all aspects of the concept, but are cumbersome, time consuming and simply not practical in a clinical setting. A simple, reproducible and reliable measure of frailty would indeed be desirable and could possibly provide a useful addition to current cardiac surgery risk prediction models.

Psoas muscle strength as a measure of frailty

Psoas major core muscle size has been suggested as an indicator of sarcopenia and patient frailty (15). Furthermore, sarcopenia and psoas muscle area has been shown to be an independent predictor of adverse outcomes in various settings, e.g., major surgery including surgical aortic valve replacement and also in transcatheter aortic valve replacement (15-17).

Hawkins and co-workers evaluated the utility of psoas muscle cross-sectional area as a quantitative measure of frailty, and hypothesized that patients with decreased psoas muscle cross-sectional area would have increased risk-adjusted morbidity, mortality, and resource utilization after surgical aortic valve replacement (1).

They included 240 moderate to high risk patients who underwent surgical aortic valve replacement at a single center from 2009 to 2016. Redo aortic valve operations and patients with endocarditis were excluded. Moderate to high risk was defined as an STS predicted risk of mortality greater than 3%. Importantly, a preoperative abdominal computed tomography scan was needed, and the lack of a scan led to the exclusion of 409 out of 649 otherwise eligible patients. They calculated the psoas index as the cross-sectional area of the psoas muscle at the L4 vertebral level normalized to body surface area. The average of three measurements was used for analysis. A subset of patients had psoas measurements by two reviewers, and reproducibility was shown to be high. Sarcopenia was defined as a psoas

index below the 25th sex-specific percentile, and accordingly, 60 patients were categorized as sarcopenic and 180 patients as nonsarcopenic. The two groups had similar baseline characteristics and STS predicted risk of mortality (5.7% vs. 6.0%). The unadjusted mortality at 1-year was 32% in sarcopenic patients compared to 17% in nonsarcopenic patients. Psoas index, as a continuous variable, was associated with 1-year mortality and also with STS major morbidity and length of stay in adjusted analyzes. The authors properly acknowledge some study limitations, most important would be the appreciation that psoas index is not a comprehensive frailty measurement

In summary, the major findings were that that psoas muscle size was a useful measure of sarcopenia and predicted risk-adjusted morbidity, mortality, and resource utilization. Psoas index could thus be considered for inclusion in future risk prediction models, however the clinical utility in cardiac surgery will be conditional on the availability of preoperative abdominal computer tomography scans.

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Footnote

Conflicts of Interest: The author has no conflicts of interest to declare.

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