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CARDIAC RISK ASSESSMENT USING RCRI IN SURGICAL PATIENTS

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Keywords: Preoperative, anesthesia, non-cardiac surgery, cardiac risk, revised cardiac risk index.

Summary

Background and aims: Preanesthetic assessment is an inseparable part of every anesthesiologist practice. There are some tools and tests to anticipate the possible risks and prepare an appropriate anesthesia plan and latest guidelines encourage using them by system. The aim of this study was to investigate preanesthetic evaluation of cardiac risk possibilities based on the patient's laboratory and instrumental tests available on a day of hospitalization and applying Revised Cardiac Risk Index. Materials and Methods: Research was conducted from June 2021 to September 2021 and data was collected from the depersonalized medical documentation of 117 patients, for whom elective surgery was planned in the Hospital of Lithuanian University of Health Sciences Kaunas Clinics (LUHS), Department of Surgery. The gathered data include sex, age, comorbidities, operation type, ASA score, revised cardiac risk index (RCRI) and both laboratory and instrumental tests. These tests involve general and biochemical blood tests, coagulation panels, electrocardiograms (ECG) and others. Results: The study involved 117 patients: 27.4% men and 72.6% women. The analysis of available preoperative laboratory and instrumental tests showed that only 67 patients (57%) had their ECG on a day when operation was scheduled, 64% of them had general and 62% had biochemical blood tests. The most important finding in our research was that 72% of patients who were at increased cardiac risk according to RCRI (2 or more points) had ECG when they came for surgical treatment. Conclusion: Majority of the patients with a higher cardiac risk according to RCRI score present ECG for their preanesthetic evaluation. No significant associations were found between patients ASA, RCRI scores, and preoperative tests.

Introduction

Numerous recent studies show different opinions about preoperative testing and its benefit to the patient. Current guidelines and expert opinion encourage specific testing in selected patients, especially with comorbidities [1]. Number of perioperative risk assessment tools are available for an organized approach by organ system [2]. Revised Cardiac Risk Index (RCRI) is acknowledged to be the most validated clinical risk index [3]. Using RCRI score instead of the other available risk prediction scores when evaluating cardiac risk is a recommended sign of good anesthesia practice [3].

The aim of this study was to investigate cardiac risk based on the patient's laboratory and instrumental tests available on a day of hospitalization and predict it according to RCRI. We share our findings and local experience with patients undergoing non-cardiac surgeries and assessing their cardiac risk using RCRI.

Materials and Methods

After approval from LUHS Bioethics Committee, research was conducted. Data was collected from June 2021 to September 2021 from the depersonalized medical documentation of 117 patients, for whom elective surgery was planned in the Hospital of Lithuanian University of Health Sciences Kaunas Clinics (LUHS), Department of Surgery. Inclusion criteria were: patients older than 18 years old, planned operation, non-cardiac operation. Patients meeting the inclusion criteria were involved in this study. The gathered data include sex, age, comorbidities, operation type, ASA score, revised cardiac risk index (RCRI) and both laboratory and instrumental tests. These tests involve general and biochemical blood tests, coagulation panels, electrocardiograms (ECG) and others. The statistical analysis was carried out using IBM SPSS Statistics software (v. 23.0). Parametric data were analyzed using paired and non-paired t-tests, they were performed at a significance level of $\alpha = 0.05$.

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Results

The study involved 117 patients: 27.4% men and 72.6% women. The average age of the patients was 53 years, the youngest patient being 19 years old and the oldest - 79 years old. The majority of the patients (84.6%) were multimorbid with comorbidities in cardiovascular (49.6%), endocrine system (38.5%), gastrointestinal (14.5%), neurological (13.7%), respiratory system (12%), kidneys and urinary system (4.3%) and oncological (4.3%). 71.8% of them had two or more comorbidities. The mean of the ASA score was 1.97, whereas cardiac risk index mean was 1.12. The analysis of available preoperative laboratory and instrumental tests showed that only 67 patients (57%) had their ECG on a day when operation was scheduled, 64% of them had general and 62% had biochemical blood tests. The most common additional test was the coagulation panel, it was found in 41 patients' medical documentation. The stomach reduction surgery was performed in most cases (n=22), hernia repair takes second place in frequency (n=19). We found that 25 patients had 2 or more cardiac risk index points. 15 individuals were assessed having 2 points, 14 of them had ECG and 11 of them had additional tests on a day of hospitalization. 9 patients were evaluated having 3 RCRI points, but only 3 of them had ECG and additional tests. Only 1 patient was evaluated for 4 RCRI points, he had ECG but no additional tests done. The most important finding in our research was that 72% of patients who were at increased cardiac risk according to RCRI (2 or more points) had ECG when they came for surgical treatment. Unfortunately, no significant correlations were found between ASA or RCRI score and available preoperative tests.

Discussion

According to Canadian Cardiovascular Society guidelines of perioperative cardiac risk assessment and management for patients who undergo non-cardiac surgery, it is recommended to evaluate preoperative cardiac risk in patients who are 45 years or older or 18-44 years with a history of significant cardiovascular disease [3]. Cardiac risk evaluation could include stress testing, cardiac biomarkers or noninvasive risk evaluation tools. The 2014 ACC/AHA Guidelines do not support stress testing for cardiac risk inspection and also recommend monitoring troponin and NT-proBNP post-surgery [4]. An observational study by James et al. suggested that plasma biomarkers like serum creatinine, C-reactive protein and B-type natriuretic peptide may improve risk assessment before the surgery. Moreover, it might be useful in predicting major adverse cardiac events within 28 days after non-cardiac surgery [5]. On the other hand, Canadian guidelines mentioned above suggest measuring cardiac biomarkers before surgery in those patients, who are 65 years or older, or 45-64 years with diagnosed cardiovascular conditions. The standard testing before non-cardiac surgery, which could consist of chest radiography, ECG, usual laboratory testing, is no more advisable for routine screening [6]. European Society of Anaesthesiology remarks that such testing usually does not change perioperative management of the patients and may create unnecessary surgical hold up [6]. In experts opinion, only selected patients with a history of comorbidities should go through a specific testing conducted by perioperative risk assessment.

Various risk scores and risk prediction models could be used for an accurate and reliable preoperative evaluation of the patient. The evaluation itself and selected tools should be approached by the organ system [2]. As used in our research, Revised Cardiac Risk Index, is a suggested measure for clinical practice, when evaluating patients cardiac risk. [3] The RCRI score system, presented in Table 1, using 6 major factors, has become the most validated clinical risk index [3]. Studies demonstrate that patients with at least 3 of the factors have an enhanced possibility for cardiovascular complications during the next 6 months, even if they do not have perioperative cardiac complications [7]. When collecting data for our research and cardiac risk evaluation, we especially checked if the patient had recent ECG available and any additional laboratory tests done. Studies have shown, that adding additional information from test results like eGFR and ECG changes or cardiac markers could improve the reliability and prediction ability of the RCRI [6].

A systematic review from 24 studies presented, that RCRI showed a moderate discrimination in predicting major cardiac complications in perioperative period [6]. However, it did not work well when used in predicting mortality after non-cardiac surgeries [8]. Although RCRI is the most widely used cardiac risk index, it has several limitations. Categorization of surgeries is not very relevant today since the field of surgery is exceedingly advanced and laparoscopic surgeries are broadly used. For example, in the RCRI, all supraingui-

Table 1. The RCRI score system

Variable	Points
History of ischemic heart disease	**1**
History of congestive heart failure	**1**
History of cerebrovascular disease	**1**
Use of insulin therapy for diabetes	**1**
Preoperative serum creatinine >177mmol/L (> 2.0 mg/dL)	**1**
High-risk surgery	**1**
Risk for cardiac death, nonfatal myocardial infarction, and nonfatal cardiac arrest: 0 predictors= 0.4%, 1 predictor=0.9%, 2 predictors=6.6%, ≥3 predictors=11%	

nal vascular, intrathoracic or intraperitoneal surgeries were classified as high risk, therefore equating laparoscopic appendectomy or cholecystectomy to liver or bowel resections [9].

A new index for preoperative cardiovascular evaluation (CVRI) was created in order to imitate what physicians do in daily clinical practice and could be simply adjusted in this practice [10]. CVRI has a strong discriminatory capability to predict cardiovascular events after non-cardiac surgery and can quickly stratify patients into low, intermediate and high-risk groups on the basis of 6 data components (age ≥75 years, heart disease, angina/dyspnea, hemoglobin <12mg/dl, vascular surgery and emergency surgery) [10]. Comparing to RCRI, which was used in our research, CVRI is equivalent in its simplicity, yet it has a better discriminatory potentiality. Furthermore, CVRI includes all low-risk patients and urgent surgeries that were not inserted in the RCRI. CVRI seems to have a great chance of becoming a new standard in preanesthesia evaluation, however further studies with larger populations must be conducted [10].

Conclusions

As we discussed in our article, assessment of the patients' risks is an essential component of the preanesthesia evaluation. All the patients who are scheduled to undergo non-cardiac surgery should have their medical history with documented comorbidities, laboratory tests and electrocardiogram prior to it. The purpose of this assessment is to help the anesthesiologist weigh the benefits and risks of the anesthesia. Patients with higher risk demand the anesthesia plan including enhanced preoperative testing and risk evaluation tools such as mentioned in our study. Our findings reveal that not every patient has their preoperative testing done according to their risk which becomes a challenge in a daily anesthesiologist clinical practice. Nevertheless, the majority of the patients with a higher cardiac risk according to RCRI score present ECG for their preanesthetic evaluation. No significant associations were found between patients ASA and RCRI scores and preoperative tests.

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ŠIRDIES RIZIKOS ĮVERTINIMAS, NAUDOJANT RCRI CHIRURGINIAMS PACIENTAMS

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Raktažodžiai: priešoperacinis įvertinimas, anestezija, ne širdies chirurgija, širdies rizika, patikslintas širdies rizikos indeksas.

Santrauka

Įvadas. Paciento įvertinimas prieš operaciją yra neatsiejama kiekvieno anesteziologo praktikos dalis. Yra priemonių ir testų,

leidžiančių numatyti galimą riziką operacijos metu ir parengti tinkamą anestezijos planą, naujausios rekomendacijos skatina šias priemones naudoti. Ištyrėme priešoperacinį širdies rizikos vertinimą, remdamiesi paciento laboratoriniais ir instrumentiniais tyrimais hospitalizacijos dieną ir taikant patikslintą širdies rizikos indeksą (RCRI).

Tyrimo medžiaga ir metodai. Tyrimas atliktas nuo 2021 m. birželio iki 2021 m. rugpjūčio mėnesio. Duomenys surinkti iš 117 pacientų nuasmenintos medicininės dokumentacijos, kuriems buvo suplanuota ne širdies operacija Lietuvos sveikatos mokslų universiteto ligoninėje Kauno klinikos (LSMUL KK) chirurgijos skyriuje. Surinkti duomenys apie lytį, amžių, gretutines ligas, operacijos tipą, ASA balą, patikslintą širdies rizikos indeksą (RCRI) ir laboratorinius bei instrumentinius tyrimus.

Rezultatai. Tyrime dalyvavo 117 pacientų: 27,4 proc. vyrų ir 72,6 proc. moterų. Išanalizavus priešoperacinius laboratorinius ir instrumentinius tyrimus, nustatyta, kad tik 67 pacientai (57%) į operaciją atvyko su atlikta EKG, 64 proc. pacientų buvo atlikti bendrieji ir 62 proc. − biocheminiai kraujo tyrimai. Svarbiausias mūsų tyrimo rezultatas − 72 proc. pacientų, kuriems pagal RCRI buvo didesnė širdies įvykių rizika (2 ar daugiau taškų), operacijos dieną buvo atlikta EKG.

Išvados. Didžiajai daliai pacientų, kuriems buvo didesnė širdies įvykių rizika pagal RCRI balą, priešoperaciniame įvertinime buvo EKG. Reikšmingų sąsajų tarp pacientų ASA, RCRI ir priešoperacinių testų nenustatyta.

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