PERIOPERATIVNO ZBRINJAVANJE PACIJENATA SA KARDIOVASKULARNIM RIZIKOM U ABDOMINALNOJ HIRURGIJI

PRIKAZ SLUČAJA

CASE REPORT

PERIOPERATIVE MANAGEMENT OF HIGH-RISK CARDIOVASCULAR PATIENTS IN ABDOMINAL SURGERY

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SAŽETAK

Uvod: Priprema kardiovaskularnih bolesnika za različite vrste hirurških intervencija predstavlja svakodnevni izazov u radu anesteziologa. Kompleksnost se ogleda u težini osnovnog oboljenja pacijenta, efektima medikamentozne terapije, urgentnosti i vrsti hirurške intervencije. U proceni kardiovaskularnog rizika hirurškog pacijenta na raspolaganju su različiti skoring sistemi, među njima Revised Cardiac Risk Index (RCRI/Lee kriterijum) koji se zbog svoje sveobuhvatnosti i jednostavnosti procene najčešće koristi. Cilj rada je da kroz primer dva pacijenta sa kardiovaskularnim oboljenjima, pokaže kako se multidisciplinarnim pristupom, uz individualizovanu strategiju i primenu savremenih vodiča, rizik od perioperativnih komplikacija može redukovati.

Prikaz slučajeva: U prvom slučaju reč je o pacijentu sa kliničkom slikom akutnog apendicitisa. Zbog angine pektoris, mesec dana pre hirurške intervencije kod pacijenta je plasiran stent, i propisana dvojna antiagregaciona terapija.

U drugom primeru reč je o pacijentu sa kliničkom slikom akutnog kalkuloznog holecistitisa. Pacijent ima tešku formu ishemijske kardiomiopatije, zbog čega je planirana revaskularizacija miokarda, unutar mesec dana od abdominalne hirurške intervencije. Oba pacijenta su pod povišenim perioperativnim rizikom za razvoj miokardnog oštećenja, dok u slučaju prvog pacijenta postoji i povišen rizik od krvarenja, usled primene redovne terapije.

Zaključak: Prava ravnoteža u perioperativnom zbrinjavanju ove kategorije pacijenta može se postići mutidisciplinarnim pristupom, kao i prilagođavanjem savremenih smernica individualnim potrebama pacijenta.

Ključne reči: kardiovaskularni pacijent, abdominalna hirurgija, Lee kriterijum, miokardno oštećenje

ABSTRACT

Introduction: The preparation of cardiovascular patients for different types of surgical interventions represents a challenge in an anesthesiologist's everyday practice. Its complexity depends on the severity of the underlying disease, the effects of the drug treatment, urgency, and the type of surgical intervention. Different types of scoring systems are available when it comes to the assessment of cardiovascular risk in patients during surgery. One of them, Revised Cardiac Risk Index (RCRI/Lee criteria), stands out due to its comprehensiveness and simplicity, and is thus applied most frequently. Using the example of two patients with cardiovascular disease, the aim of this paper is to show how the risk of perioperative complications can be reduced by applying a multidisciplinary approach, along with an individualized strategy and modern guidelines.

Case reports: In the first case, we presented a patient with acute appendicitis. Because of angina pectoris, one month prior to the planned abdominal surgery, Percutaneous Coronary Intervention was performed placing one stent, after which dual antiplatelet drugs were prescribed.

A patient with acute cholecystitis is presented in the second case. Coronary artery bypass grafting is planned within a month upon the abdominal surgery, due to a severe form of ischemic cardiomyopathy. Both patients are at high risk of myocardial damage during surgery, the first patient being at high risk of hemorrhage as well.

Conclusion: The appropriate balance in the perioperative care of such patients can be achieved by a multidisciplinary approach, as well as by adapting modern guidelines to patients' individual needs.

Keywords: cardiovascular patient, abdominal surgery, Lee Criteria, myocardial injury

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UVOD

U svakodnevnoj kliničkoj praksi, priprema pacijenata za operativno lečenje nije nimalo lak zadatak. Prisustvo komorbiditeta, urgentnost hirurške intervencije, i potreba za dodatnim dijagnostičkim pretragama mogu uticati na tok lečenja pacijenta. Broj kardiovaskularnih oboljenja u svetu sa godinama se povećava. Na to utiču način života, hronična izloženost stresnim situacijama, kao i starenje populacije. Novine u farmakoterapji prate trend porasta obolelih.

Smatra se da se oko 5% svetske populacije svake godine podvrgne nekoj vrsti hirurške intervencije, sa tendencijom procentualnog povećanja broja pacijenata iz godine u godinu [1,2]. Od toga čak 85% nije iz oblasti kardiovaskularne hirurgije [2].

Šta onda raditi kada se susretnete sa pacijentom sa kardiovaskularnim oboljenjem,koji je na terapiji poslednjom generacijom antikoagulatnih lekova, a kod koga je neophodna hirurška intervencija? Da li pacijenta sa povišenim kardiološkim rizikom treba dodatno pripremati za elektivnu hiruršku intervenciju?

Pokušaćemo da, kroz dva primera, predstavimo problematiku pacijenata sa povišenim kardiovaskularnim rizikom i njihovim perioperativnim zbrinjavanjem, te kako pravilna i pravovremena procena rizika, poštovanje smernica i vodiča, i multidisciplinarni pristup ovim pacijentima smanjuju rizik od perioperativnih komplikacija. U proceni pacijenata koristili smo RCRI, kao metod procene kardiološkog rizika, a kao temelj za preoperativnu pripremu pacijenata vodič Evropskog udruženja anesteziologa (Preoperative evaluation of adults undergoing elective noncardiac surgery) objavljen 2018.godine, kao i vodič Evropskog udruženja kardiologa (ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery) objavljen 2022. godine.

PRIKAZ SLUČAJA

Slučaj 1

Muškarac starosti 49 god, BMI=25,7 kg/m^2, primljen je na Kliniku za urgentnu hirurgiju UKCS-a zbog akutnog apendicitisa. U ličnoj anamnezi negira alergije, dok od hroničnih bolesti navodi hipertenziju (HTA), anginu pektoris (AP), hiperlipoproteinemiju (HLP), i giht, zbog čega je na redovnoj terapiji ACE inhibitorima, beta blokatorima, statinima, urikostaticima. Pacijentu je mesec dana pre prijema, nakon koronarografije, učinjeno plasiranje jednog stenta (PCI LAD proximal Resolute Onyx 4,0x22mm), nakon čega je u terapiju uvedena i dvojna antiagregaciona terapija acetilsalicilnom kiselinom (ASA) i ticagrelorom (P2Y12 ADP receptor inhibitorom trombocita).

INTRODUCTION

In everyday clinical practice, preparing a patient for surgical treatment is not an easy task. The presence of comorbidities, the urgency of surgical intervention, and the need for additional diagnostic procedures can affect the course of the treatment. There is a constant increase in the number of individuals suffering from cardiovascular disease worldwide due to lifestyle, chronic exposure to stressful situations, as well as aging populations. Achievements in pharmacotherapy follow the trend of an ever-increasing number of patients.

It is believed that around 5% of the world population undergoes some sort of surgical intervention every year, with a tendency of a constant increase in the number of patients [1,2]. Of these, 85% of interventions do not belong to the field of cardiovascular surgery [2].

So, what should be done with a patient who suffers from cardiovascular disease, who is treated with the latest generation of anticoagulant drugs and who needs surgical intervention? Should a high-risk cardiovascular patient be additionally prepared for elective surgery?

Using two examples, we will try to present problems related to high-risk cardiovascular patients and their perioperative care, as well as the impact of adequate and timely risk assessment, adherence to guidelines and a multidisciplinary approach to such patients on reduced risk of perioperative complications. RCRI, a method for cardiac risk assessment, was used for patient evaluation, while the guide of the European Association of Anesthesiologists (Preoperative evaluation of adults undergoing elective noncardiac surgery) published in 2018 and the guide of the European Association of Cardiologists (ESC Guidelines on cardiovascular assessment and management of patients undergoing non-cardiac surgery) published in 2022 were used as the basis of preoperative preparation of patients.

CASE PRESENTATION

Case 1

A 49-year-old male, BMI=25,7 kg/m^2, was admitted to the Emergency Room of the University Clinical Centre of Serbia for acute appendicitis. He denies any previous history of allergies and reports the following chronic diseases: arterial hypertension (HTA), angina pectoris (AP), hyperlipoproteinemia (HLP), and gout, which is why he is on regular therapy with ACE inhibitors, beta blockers, statins, and uricostatics. One month prior to admission, after coronary angiography, one stent (PCI LAD proximal Resolute Onyx 4,0x22mm) was placed, after which dual antiplatelet therapy with acetylsalicylic acid (ASA) and ticagrelor (P2Y12 ADP receptor platelet inhibitor) was introduced.

U laboratorijskim analizama preoperativno, izdavaja se povišena vrednost inflamatornih parametara Le 16,0 x10^9/L, CRP 142mg/L, PCT 0,12ng/ml, dok je vrednost trombocita iznosila 301x10^9/L. Efekat antiagregacione terapije procenjen je point-of-care metodom, ispitivanjem funkcije agregabilnosti trombocita, Multiplate testom. Vrednosti ASPI 947; ADPhs 201, ukazale su na pozitivan terapijski efekat ticagrelora na funkciju trombocita, a efekat ASA je bio odsutan. RCRI skor kod pacijenta je bio 1.

Pacijent je u sklopu preoperativne pripreme pregledan od strane kardiologa, a u dogovoru sa kliničkim transfuziologom napravljena je strategija perioperativnog tretmana krvarenja, i to primenom sistemskih i lokalnih antifibrinolitika, kao i transfuzije trombocita u slučaju aktivnog krvarenja.

Šest sati od prijema, nakon preoperativne pripreme kod pacijenta je učinjena apendektomija, laparoskopskom hirurškom metodom, u uslovima balansirane opšte endotrahealne anestezije (OETA). Korišćen je osnovni respiratorni i hemodinamski monitoring (SpO2, EtCO2,EKG,NIBP), i tokom operacije nisu zabeležene epizode hemodinamske nestabilnosti. Neposredno preoperativno ordinirana je traneksamična kiselina (TXK), u dozi od 30mg/kg TT, a kako je tokom operacije bilo minimalnih gubitaka krvi, odustalo se od predloga za primenu lokalnih hemostatika (fibrinskog lepka, TXK) na mestima hirurških incizija.

Laparoskopska operacija je protekla bez komplikacija, pacijent je ekstubiran, hemodinamski stabilan, preveden u sobu za buđenje, a potom na odeljenje hirurgije.

Nakon urađenih laboratorijskih analiza, multiplate nalaza kao i praćenjem abdominalnih drenova, koji su bili bez sadržaja, u konsulatciji sa kardiologom , 12h nakon operacije kod pacijenta je uvedena ASA u dozi od 100mg jednom dnevno, a nakon 24h i ticagrelol u dozi od 90mg dva puta na dan. Kod pacijenta u postoperativnom toku nije zabeležena epizoda hemodinamske nestabilnosti, kao ni akutnog koronarnog dešavanja. Otpušten je iz bolnice drugog postoperativnog dana, nakon započetog per os unosa i uspostavljene pasaže gastrointestinalnog trakta.

Slučaj 2

Muškarac, starosti 67 godina, BMI= 27,8 kg/m^2, primljen je na Kliniku za urgentnu hirurgiju UKCS zbog akutnog holecistitisa. Šest dana pre prijema, pacijent je otpušten sa Klinike za kardiologiju, gde je postavljena indikacija, od strane kardiohirurškog konzilijuma za hiruršku revaskularizaciju miokarda. Tokom hospitalizacije na Klinici za kardiologiju, u sklopu kardiološke procene rađena je selektivna koronarografija, kao i ehokardiografija srca.

In preoperative laboratory analyses, high levels of inflammatory markers were present (WBC 16.0 x10^9/L, CRP 142mg/L, PCT 0.12ng/ml), whereas the platelet count was 301x10^9/L. The effect of the antiplatelet therapy was evaluated using point-of-care testing to examine platelet aggregation (the Multiplate test). The values of ASPI (947) and ADPHS (201) indicated a positive therapeutic effect of ticagrelor on platelet functions, whereas there was no effect of ASA. The RCRI score in this patient was 1.

As part of the preoperative preparation, the patient was examined by a cardiologist, and in cooperation with a clinical transfusion specialist a perioperative bleeding treatment strategy was developed including systemic and local antifibrinolytics, as well as platelet transfusion in case of acute bleeding.

Six hours upon hospital admission, after preoperative preparation, appendectomy was performed using the laparoscopic surgical technique and balanced general anesthesia (BGA). Basic respiratory and hemodynamic monitoring (SpO2, $EtCO_2$, ECG, NIBP) was used and no hemodynamic instability was recorded during the operation. Shortly before surgery, tranexamic acid had been prescribed (TXA), in a dose of 30 mg/kg, and since blood loss during surgery was minimal, the proposal to apply local hemostatics (fibrin sealant, TXA) at the sites of surgical incisions was abandoned.

There were no complications during the laparoscopic surgery, and the patient who was extubated and hemodynamically stable was first transferred to the recovery room and then to the surgery department.

Following lab analyses, multiplate findings and monitoring of abdominal drains (which were empty), and in cooperation with a cardiologist, the patient was prescribed 100 mg of ASA per day 12 hours upon surgery, and 90 mg of ticagrelol twice a day 24h later. No episodes of hemodynamic instability or acute coronary events were recorded during the postoperative course. He was discharged from the hospital on the second postoperative day, after oral intake was introduced and normal peristalsis established.

Case 2

A 67-year-old male, BMI= 27,8 kg/m^2, was admitted to the Clinic for Emergency Surgery of the University Clinical Centre of Serbia for acute cholecystitis. Six days before the admission, the patient had been discharged from the Clinic for Cardiology where the Cardiosurgical council had found indications for surgical myocardial revascularization. During his stay at the Clinic for Cardiology, selective coronary angiography and echocardiography were performed as part of a cardiac evaluation.

Koronarografija je pokazala sledeće: okluziju RCA u proksimalnom delu, Cx stenozu od 90-99%, dok je stenoza u LAD u proksimalnom segmentu iznosila 50%, i medijalnom od 50%-70% . Ehokardiografijom utvrđena je vrednost EF 40% sa znacima dijastolne disfunkcije leve komore (LK), hipo- do akinezija ½ donjeg zida LK, ožiljak bazalne ½ donjeg zida LK. U ličnoj anamnezi pacijent negira alergije. Od komorbiditeta navodi dijabetes melitus, pri čemu je 15 godina na terapiji oralnim antidijabeticima, zatim hipertenziju (HTA) i kardiomiopatiju (CMP), tretiranu ACE inhibitorima, beta blokatorima, diureticima, antianginoznim lekovima (trimetazidin), acetilsalicilnom kiselinom (ASA). Zbog hiperlipoproteinemije (HLP) na redovnoj je terapiji statinima, dok terapiju za hroničnu opstruktivnu bolest pluća (HOBP) neredovno koristi.

S obzirom na učinjene preoperativne preglede i dijagnostiku, najveća pažnja je usmerena na rizik od perioperativne ishemije miokarda, tako da je rađen monitoring kardiospecifičnih enzima za vreme hospitalizacije pacijeta. Preoperativni RCRI skor je iznosio 3.

Klasična holecistektomija je učinjena u uslovima opšte endotrahealne anestezije (OETA), uz osnovni respiratorni i hemodinamski monitoring. Operacija je protekla uredno, uz minimalne gubitke krvi, dok je intraoperativna hipertenzija kupirana infuzijom gliceriltrinitrata. Pacijent je nakon operacije ekstubiran, hemodinamski stabilan, preveden u sobu za buđenje, a potom na odeljenje poluintenzivne nege. Vrednost troponina preoperativno iznosio je 15ng/L, a trend vrednosti troponina praćen je 24h i 48h nakon operacije, i iznosio je 19ng/L, odnosno 11ng/L. Pacijent je u postoperativnom toku bio dobrog opšteg stanja, te je šestog postoperativnog dana otpušten iz bolnice.

DISKUSIJA

Revised Cardiac Risk Index (RCRI) je jednostavan metod za procenu kardiološkog rizika, upotrebom šest parametara: 1) hirurgije visokog rizika, 2) istorije ishemijske bolesti srca, 3) kongestivne srčane slabosti, 4) cerebrovaskularnih bolesti, 5) dijabetesa melitusa – terapije insulinom, 6) bubrežne slabosti (Cr ≥ 2,0mg/dL) (Tabela 1). Svaki parametar nosi po jedan poen, a smatra se da zbirna vrednost parametara ≥ 2, predstavlja povišen rizik od postoperativnog kardiološkog dešavanja [2,3] (Tabela 2). Iako postoje različiti scoring sistemi za procenu kardiovaskularnog rizika, odlučili smo se za RCRI kao najsveobuhvatniji u proceni rizika kardiovaskularnih pacijenata u abdominalnoj hirurgiji.

Niz faktora utiče na povećanje kardiološkog rizika tokom operativnog lečenja pacijenta. Hitnost hirurške intervencije, vrsta hirurške tehnike, medikamentozna terapija, procenjeni funkcionalni kapaciteti pacijenta,

The results of coronary angiography were as follows: RCA occluded proximally, Cx with 90-99% stenosis, 50% stenosis in the proximal LAD, and 50-70% in its mid portion. Echocardiography revealed EF of 40% with signs of left ventricular (LV) diastolic disfunction, hypokinesia/akinesia of ½ left ventricular inferior wall (LVIW) and scarring in the basal part of LVIW. The patient denies any previous history of allergies. He reports the following comorbidities: diabetes mellitus (he has been on oral antidiabetic therapy for 15 years), hypertension (HTA), and cardiomyopathy (CMP) treated with ACE inhibitors, beta blockers, diuretics, antianginal drugs (trimetazidine), and acetylsalicylic acid (ASA). Due to hyperlipoproteinemia (HLP), he has been on regular statin therapy, whereas he uses his therapy for chronic obstructive pulmonary disease (COPD) irregularly.

Considering the performed preoperative examinations and diagnostics, the greatest attention was focused on the risk of perioperative myocardial ischemia, so monitoring of cardiospecific enzymes was done during the patient's hospitalization. The preoperative RCRI score was 3.

Classical cholecystectomy was performed in general endotracheal anesthesia (GETA), with basic respiratory and hemodynamic monitoring. The surgery was uneventful, with minimal blood loss, and intraoperative hypertension was controlled by intravenous glyceryl trinitrate solution. The patient was extubated after the surgery, he was hemodynamically stable and first transferred to the recovery room and then to the semi-intensive care unit. Pre-operative troponin level was 15ng/L, its trend was followed for 24h and 48h after surgery and it was 19 ng/L and 11 ng/L, respectively. The patient's condition was good during the postoperative course, so he was discharged from the hospital on the sixth day upon surgery.

DISCUSSION

Revised Cardiac Risk Index (RCRI) is a simple method for cardiac risk assessment which relies on six parameters: 1) high-risk surgery, 2) history of ischemic heart disease, 3) congestive heart failure, 4) cerebrovascular diseases, 5) diabetes mellitus – insulin therapy, 6) renal failure (Cr ≥2.0mg/dL) (Table 1). Each parameter is worth one point, and it is considered that the overall value of all parameters ≥ 2 represents an increased risk of postoperative cardiac events [2,3]. (Table 2). Although there are various scoring systems for cardiovascular risk assessment, we have decided on the RCRI as the most comprehensive system in assessing high-risk cardiovascular patients in abdominal surgery.

A number of factors influence an increase in cardiac risk during the surgical treatment of a patient – the

Tabela 1. Revised Cardiac Risk Index-Lee kriterijumi

Table 1. Revised Cardiac Risk Index-Lee Criteria

Klinička slika / *Clinical variable*	Poeni / *Points*
Hirurgija visokog rizika / *High-risk surgery*	1
Ishemijska bolest srca / *Ischemic heart disease*	1
Kongestivna srčana slabost / *Congestive heart failure*	1
Cerebrovaskularna bolest / *Cerebrovascular disease*	1
Šećerna bolest-terapija insulinom / *Diabetes mellitus-insulin treatment*	1
Hronična bubrežna slabost, Cr ≥ 2,0 mg/dL / *Chronic kidney disease, Cr ≥ 2.0 mg/dL*	1

*Cr – creatinine

Tabela 2. Tumačenje risk skora

Table 2. Interpretation of risk score

Klasa Rizika / *Risk class*	Bodovi / *Points*	Rizik od komplikacija (%) / *Complication risk (%)*
Veoma nizak / *Very low*	0	0.4%
Nizak / *Low*	1	0.9%
Umeren / *Moderate*	2	7.0%
Visok / *High*	3+	11.0%

itd. Prema vrsti hirurške intervencije, kod ne-kardiohirurških operacija, operacije su podeljene na one sa niskim, srednjim i visokim rizikom od perioperativnog krvarenja. Abdominalne operacije spadaju u grupu operacija srednjeg rizika [2].

Primera radi, pacijente sa plasiranim PCI karakteriše primena dvojne antiagregacione terapije. Ukoliko je neophodna hirurška intervencija, takav pacijent je pod povišenim rizikom za neželjena koronarna dešavanja u prvih mesec dana od plasiranog PCI [2,4]. Zlatni standard u proceni efekta antiagregacione terapije ogleda se u primeni standardnih laboratorijskih analiza, prateći vremenski profil od poslednje doze leka do vremena operativnog lečenja. Poluživot ASA u plazmi je samo 20min, ali je efekat leka prisutan 7-10 dana nakon poslednje primenjene doze leka. Što se ticagrelola tiče, kao terapije kod jednog od naših pacijenta, vreme poluživota u plazmi iznosi 6-12h, a efekat leka je prisutan 3 do 5 dana od poslednje doze [2]. U stanjima u kojima je aktiviran inflamatorni odgovor organizma, efekat leka na funkcionalnost trombocita može biti narušen. Tada nam u proceni može poslužiti i point-of-care metoda, Multiplate test. Kombinacijom standardnih laboratorijskih testova i point-of-care metoda, može se dobiti dobra procena perioperativnog krvarenja, kao i rezidualni efekat primenjene terapije. *U današnje vreme, Multiplate test se rutinski koristi, ali u slučajevima kada nije dostupan, kliničari se najčešće oslanjaju na standardne analize i "terapijski prozor" od poslednje doze leka. U slučajevima neodložne hirurške intervencije, prema proceni stepena perioperativnog krvarenja, vođeni dostupnim podacima o frekvenci upotrebe redovne terapije, rukovodimo se primenom terapije transfuzijom kao i dostupnom lepezom hemostatskih lekova (dezmopresin, antifibrinolitici, rekombinantni aktivni faktor VII, koncentrant fibrinogena, protrombinski kompleks koncentrat, aktivirani protrombinski kompleks, itd).*

urgency of surgical intervention, the type of surgical technique, drug therapy, the evaluated functional capacities of the patient, etc. When it comes to the category of noncardiac surgery, according to the type of surgical intervention, interventions can be classified as those with low, intermediate, and high risk of perioperative bleeding. Abdominal surgeries belong to the group of intermediate-risk procedures [2].

For example, it is typical that patients who have undergone percutaneous coronary intervention (PCI) with stent placement are prescribed dual antiplatelet therapy. In case of a necessary surgical intervention, such a patient is at an increased risk of adverse coronary events in the first month upon the performed PCI [2,4]. The gold standard in evaluating the effect of antiplatelet therapy is reflected in the application of standard laboratory analyses, and following the time profile from the last taken dose of the drug to the time of the surgical intervention. ASA's plasma half-life is only 20 minutes, but the effect of the medication is present for 7-10 days after the last dose. When it comes to ticagrelol, which is one of our patient's prescribed medications, its plasma half-life is 6-12h, and its effect is present for 3 to 5 days after the last dose [2]. In conditions where the inflammatory response of the organism is activated, the effect of a drug on platelet functions may be impaired. This is when the point-of-care method, Multiplate test, can be of help in the assessment. By combining standard laboratory tests and the point-of-care method, a good assessment of perioperative bleeding can be obtained, as well as the residual effect of the applied therapy. *Nowadays, Multiplate test is routinely applied, but in cases where it is not available, clinicians most often rely on standard laboratory analyses and the "therapeutic window" since the last dose of the drug. In cases of urgent surgical interventions, according to the assessment of the degree of perioperative bleeding and guided by the available data on how often regular therapy is used, we are governed by the application of transfusion therapy, as well as the available range of hemostatic drugs (desmopressin, antifibrinolytics, recom-*

Oštećenje miokarda tokom nekardiohirurških operacija (MINS) predstavlja perioperativnu ishemiju miokarda, izazvanu neravnotežom između potreba miokarda za kiseonikom i isporuke kiseonika miokradu, tj. tip 2 miokardnog oštećenja [2,5,6].

Stepen oštećenja korelira sa porastom high sensitive (hs) troponina-T u serumu. VISION studijom je pokazano da je porast vrednosti hsT preko 20ng/L, tj. porast od 5ng/L, od preoperativnih vrednosti, praćenih tokom tri dana nakon operacije dobar prediktor 30-dnevnog moratliteta nakon nekardiohirurških operacija[2,7].

Vrsta hirurške tehnike, klasična ili laparoskopska, kao i vrsta anestezije, OETA ili regionalna anestezija, utiču na kardiovaskularni status tokom perioperativnog perioda. Laparoskopska hirurgija, vezana je za česte promene položaja pacijenta na operacionom stolu, a sama tehnika podrazumeva ,,kreiranje" pneumoperitoneuma insuflacijom CO2. Usled tranzitornog jatrogenog abdominalnog kompartmant sindroma, prilikom laparoskopije, dolazi do smanjenjena priliva krvi u srce (pre-load), porasta sistemske vaskularne rezistence, centralnog venskog pritiska, što može uticati na smanjenu perfuziju kroz koronarne krvne sudove [8]. Stoga, kod pacijenta koji ima prethodno verifikovanu bolest koronarnih krvnih sudova ovo nije najpopularnija tehnika.

ZAKLJUČAK

Tretman hirurškog pacijenta sa kardiovaskularnim bolestima može biti za kliničara posebno izazovan. Rizik od potencijalnog krvarenja, procena kardiološkog rizika, i strategija primene kardiološke terapije tokom perioperativnog perioda problemi su sa kojima se anesteziolog svakodnevno susreće.

Prava ravnoteža može se postići multidisciplinarnim pristupom hirurga, kardiologa, kliničkog transfuziologa i anesteziologa, a u današnje vreme veliki akcenat stavlja se i na prilagođavanje savremenih smernica individualnim potrebama pacijenta.

Sukob interesa: Nije prijavljen.

binant activated factor VII, fibrinogen concentrate, prothrombin complex concentrate, activated prothrombin complex, etc.).

Myocardial injury during noncardiac surgery (MINS) is perioperative myocardial ischemia caused by an imbalance between myocardial oxygen needs and the delivery of oxygen to the myocardium, i.e., type 2 myocardial damage [2,5,6].

The degree of damage correlates with an increase in high-sensitive (hs) serum troponin-T. The VISION study showed that an increase in the levels of hsT >20ng/L, i.e., a 5ng/L-increase compared to preoperative levels followed for three days upon surgery, was a good predictor of 30-day mortality after noncardiac surgery [2,7].

The type of surgical technique (classical open surgery or laparoscopic surgery), and the type of anesthesia (GETA or regional anesthesia) affect the cardiovascular status during the perioperative period. Laparoscopic surgery is related to frequent changes in the patient's position on the operating table, and the technique itself involves "creating" the pneumoperitoneum by CO2 insufflation. Due to transient iatrogenic Abdominal Compartment Syndrome, during laparoscopy, there is a decrease of blood flow to the heart (pre-load), an increase in systemic vascular resistance, and central venous pressure, which can affect reduced perfusion through the coronary blood vessels [8]. Therefore, this is not the most popular technique in a patient with previously verified coronary artery disease.

CONCLUSION

Treating a surgical patient who suffers from cardiovascular disease may be highly challenging for a clinician. The risk of potential bleeding, cardiac risk assessment, and the strategy of applying cardiovascular therapy during the postoperative period are some of the problems an anesthesiologist faces on a daily basis.

A real balance may be achieved by a multidisciplinary approach of a surgeon, a cardiologist, a clinical transfusion specialist, and an anesthesiologist, and nowadays a great emphasis is also placed on adapting modern guidelines to individual patient needs.

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