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How to Reduce the Cardiac Risk, one of the Most Common Perioperative Complications Following Invasive Surgery in Gynecology

Sonila Bele M.D. Phd[1], Jon Cane M.D.[2], Liri Hoxha Ass. Prof.[3]

[1,3] Department of Medical Imaging and Clinical Semiology Faculty of Medicine, University of Medicine, Tirana

[2]University Hospital of Obstetrics & Gynecology "Queen Geraldine", Tirana

ABSTRACT

The role of preoperative cardiac evaluation is to determine the medical condition of the patient's cardiovascular status .A history and cardiovascular examination are crucial to identify severe cardiac conditions such as unstable coronary syndromes, serious arrhythmias, decompensated HF, and valvular disease. These conditions would place the patient in a high surgical risk category. In some situations, an additional diagnostic cardiac evaluation is necessary on the basis of the results of the initial preoperative test. In an acute surgical emergency, preoperative evaluation might have to be limited to simple tests, such as a rapid assessment of cardiovascular vital signs, ECG, blood pressure, hematocrit, electrolytes, renal function, blood analysis. Only the most essential tests and interventions are appropriate until the acute surgical emergency is resolved. Under other, less urgent circumstances, the preoperative cardiac evaluation may lead to a variety of responses, including delay or cancellation of surgery until the cardiac problem has been clarified and treated appropriately. This ideally would include direct communication with the surgeon, anaesthesiologist, and other physicians, as well as discussion directly with the patient and, if appropriate, the family.

Conclusion: Preoperative cardiac evaluation is very important for all the patients undergoing gynaecologic surgery because cardiac related perioperative complications are well-known in general practice.

KEYWORDS: perioperative cardiac evaluation, perioperative complications, gynaecologic surgery

ARTICLE DETAILS

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INTRODUCION

On daily gynaecological practice there is a wide range of patient age deriving from young patients up to the elderly patients. Most of them are middle aged and elderly people that have together with the gynecologic disease other comorbidities. Patients which undergo gynecologic surgery are worried not only about their health but also for their femininity. Patients tend to be on a continuous anxious state not only regarding to the preoperatory time but also regarding to their physical, physiological and cosmetic rehabilitation. This is why preoperatory evaluation on gynecologic surgery should be seen on a detailed and wide range in order to understand and estimate the actual state of the patients and the risks that surgery has. The aim of preoperatory cardiac evaluation on gynecologic surgery is evaluation of the status of the patient and determining of optimal moment to do the surgery if the patient suffers from a cardiac disease.

Evaluation of perioperative cardiac risk can be affected by the type of gynecologic surgery that is going to be performed, if the surgery if going to performed in emergent conditions, the duration of surgery and the type of anaesthesiology that is going to be used. This risk is evaluated up to 30 days after the surgery for events like death from cardiovascular events, myocardial ischemia and stroke considering the fact that comorbidities that increase furthermore the risk. This can lead to changing medical therapy, further examinations and intensive care during surgery and post-surgery. It is not rare that during preoperatory evaluation detailed anamnesis and objective examination can detect important illnesses like acute coronary syndrome, a past myocardial infraction, presence of decompensated cardiac insufficiency, life-threating arrythmias, advanced valvular pathologies, unstable arterial hypertension on advanced stages, presence of a pacemaker of a defibrillator, peripherical vasal diseases, cerebrovascular diseases, diabetes, nephropathy and

chronical pulmonary conditions. In a number of cases these conditions lead to other cardiac examination to evaluate and then treat the patients, in order to take the right medical therapy. Sometimes on scheduled surgeries the cardiac evaluation can postpone or cancel the surgery until the cardiac pathology is fully examined and the state of the patients is stable. Regarding to our hospital, less than 32% of gynecologic surgeries are minor where the risk for cardiovascular events is low less than 1%, around 34% of gynecologic surgeries are laparotomies and the risk for cardiovascular events is moderate around 1-5% and on other gynecologic surgeries there is a high risk for cardiovascular events which is more than 5%. The risk depends on age, cardiovascular disease presence and other commodities. For ages more or equal to 65 years old which also have a higher prevalence for coronary disease, diabetes and stroke there is a high peri-operatory risk. On patients less than 65 years old without risk factors for cardiovascular disease, if they have a familial anamnesis for cardiomyopathy an ECG and cardiac ultrasound should be performed. For patient 45 up to 65 years old that are going to have surgery with moderate or high risk, if they have positive familial history for coronary disease additional cardiac biomarkers should be evaluated preoperatory. Despite the age of the patient, in all cases that an abnormal cardiac murmur is heard, that has a cardiovascular disease a routine ECG, cardiac ultrasound, BNP and pro-BNP evaluation is asked. For patients with chronic coronary disease that have done before PCI and CABG, even if they're asymptomatic, stress test should be recommended. Cessation of smoking and controlling the other risk factors (hypertension, dyslipidemia, diabetes) is recommended on all scheduled gynecologic surgeries to low the risk for complications and mortality. (1)

COMORBIDITIES

BLOOD DISEASES

Anemia is very often finding at gynecologic patients because of menstrual disorders, uterine fibroids, adenocarcinoma or ovarian cysts. Anemia induces stress on cardiovascular system and this can lead to myocardial ischemia and heart failure. Blood transfusions before the surgery on patients with coronary disease and on patients with heart failure can reduce perioperative cardiac disease. A full blood count is essential for evaluation of patients before the intervention. A detailed examination should investigate on coagulation cascade and if there is a prolonged haemorrhage time it is of primary importance to evaluate prothrombin time, PLT count, time of haemorrhage and aPTT. Other examinations may be needed but approximately 95% of coagulation anomalies can be detected by the four tests mention above. Perioperative risk increases 30 days after the intervention and when hematocrit is lower than 39% or higher than 51% and platelet count is less than 500 000/mm^3.(1) Polycythemia, thrombocytosis and every factor which rises viscosity and hypercoagulability can increase the risk for thromboembolic events. We should highlight that anemia should be corrected before the scheduled surgery and not during it with hemotransfusion. Patients with very high hemoglobin (such as polycythemia vera) are rarely seen on practical basis in gynecology. Such patients are in increased risk for hemorrhage and thrombosis. Chronical smokers have a high value of hemoglobin, but their values are still lower than those in patients with polycythemia. (2)

DIABETES

Patients that suffer from diabetes mellitus (DM) and patients that take oral corticosteroids are often seen in gynecological practice. Patients with DM are in increased risk for cardiovascular events and difficulty in wound healing where the risk of postoperative infections is high because of gram negative microorganisms. A way to reduce these complications is a good control of glucose levels in blood. The stress of the procedure surgery can lead to hyperglycaemia and insulin resistance, which are caused by catecholamines high levels. Patients which non stabilized glucose levels should be considered to have re-evaluation of their short acting insulin dose by controlling their glycaemia levels carefully, intravenous infusion of insulin and subcutaneous insulin can be used. Glycemia levels should be lower than 10.0 mmol/L, but the risk of hypoglycaemia episodes lower than 5.6 mmol/L should be avoided especially on patients with coronary disease. Evaluation of HbA1c before the surgery is strongly recommended. On cases when HbA1c is over 8.5% postponing surgery is recommended in order to reduce the post operatory infection rate after the intervention. For all the patient with DM type II which are treated with SGLT-2 inhibitors, this medication should be stopped 3 days prior to high-risk surgery. On patients with DM electrolyte levels should be evaluated and acid basic deficits also with other test should be performed prior to surgery. (1)

RENAL DISEASES

Patients over 65 years old,with BMI over 30, DM, hypertension, dyslipidemia and cardiovascular disease which should perform a high-risk gynecological surgery should evaluate the level of creatinine and glomerular filtration because of the risk of alterations for renal dysfunction.(1) There is different studies that show that preoperatory level of creatinine over 2 mg/dl is an independent risk factor for cardiac complication after surgery. (3)

PULMONARY DISEASES

Chronical pulmonary diseases indicate that the patients are at high operatory risk for perioperative complications of cardiovascular system. It is essential to evaluate the actual status of the patients not only with one pulmonary radiography but also to be evaluated by pneumologist,

allergologist and anaesthesiologist in order for the patient to be stable to avoid the possible complications.

PREOPERATIVE RISK CALCULATION

Clinical evaluation based on anamnesis, physical examination and ECG is usually insufficient for calculation of preoperative cardiac risk. Cardiovascular morbidity and mortality are tightly connected with the actual status of the patients and comorbidities, type of gynecologic surgery and type of anesthesia that is going to be used. Goldman index created on 1977 was used many years ago in order to calculate the cardiac risk and then Lee on 1999 (RCRI) reviewed it and this led to important diagnostic, management and anaesthesiology management changes. (4) There are many objections regarding to use of cardiac risk index in surgery cases on different population because it can estimate the individual risk of the patient. (5) RCRI points can identify the risk class of patient base on presence or absence of six factors accompanied with preoperative cardiac complications, risk for sudden death, myocardial infarction or cardiac arrest for 30 days.

During the last years there have been identified six independent risk factors (6):

Age ≥ 70 years

Positive anamnesis for ischemic disease of the heart and heart failure.

Positive examination for angina and/or dyspnoea.

Anemia ≤ 12 gr/dl.

Vascular surgery.

Cardiac emergency.

The presence of this risk factors in a patient correlates with a high-risk situation should lead to a careful evaluation and management of the patient itself. Depending on these factors the gynecologic surgery may be postponed or cancelled until the patient is fully examined and stable. All the evaluations and indexes have their limitations also, it not possible to apply them on every circumstance so more studies should be done in order to achieve 'the gold standard'.

HYPERTENSION

Preoperatory evaluation can identify the patients with hypertension and this is a good way to start the proper treatment. Unfortunately, hypertension is very common and not fully controlled on patients that have the medical treatment. Prevalence of hypertension nowadays is 30-45% and less than 40% of people who suffer from hypertension and take medication have a normal blood pressure. Stage 1 and 2 of hypertension it is not an independent risk factor for cardiovascular complications and it is not reasonable to postpone the scheduled surgery.(7) On cases with stage 3 hypertension (BP > 180/110 mmHg) the benefits from postponing surgery to optimize the medication versus the risk that postponing the surgery has should be evaluated. High blood pressure during surgery can lead to ischemic changes in ECG in hypertensive persons. Ischemic changes during surgery can lead to high risk post operatory morbidity for heart and the right treatment for hypertension will reduce the numbers for cardiovascular complications. A high blood pressure diagnosed for first time during surgery leads to unstable blood pressure under anesthesia; despite that the severity of hypertension can only be determined after the surgery. This is why it is strongly recommended to stabilize blood pressure and to avoid post operatory hypertension on scheduled surgeries. Examinations should evaluate injuries in target organs and presence of cardiovascular pathology. If the patients are under medication with ACE-I, ARB and diuretics it is advised to stop them the day of scheduled surgery to avoid hypotension after it. Anti-hypertensive medication should be continued after the surgery. (1)

HEART FAILURE (HF)

Prevalence of HF is increased not only because of the process of the aging of population but also the new cardiovascular therapies effect which have prolonged the lifespan on these patients. This leads to a higher number of patients with HF that need preoperatory evaluation including examinations like ECG, cardiologist consult, heart ultrasound, BNP, proBNP and not only. (8) Patients with decompensated HF that refer dyspnoea, present distended jugular veins or peripheral oedema have a very high perioperator risk and this is why the patients should be in a stable state before the gynecologic surgery. (9) Patients with known history for HF and stabilized under treatment also present a high-risk group for perioperator complications, this is why they can continue ACE-I and ARB. (1)

CHRONIC CORONARY SYNDROME

Coronary disease is still a major factor for morbidity and mortality in noncardiac surgery. For all patients that will undergo scheduled surgery is recommended clinical examination, ECG, cardiac biomarkers, transthoracic echocardiogram and stress test. When the patients suffered a myocardial infarction (MI) for the last 6 months before the surgery the risk for mortality is 8 times higher. Patients that suffered IM should postpone at least 60 days the gynecologic surgeries.(9)Another risk factor is the advanced age and cardiac mortality is seen among patients older than 70 years old that undergo noncardiac surgery. Perimenopause patients have a low incidence of coronary disease and asymptomatic coronary disease happens 10 years later on women in comparison to men, but the surgical menopause is an exemption from this rule.On the other side patients with DM have the same risk to develop this disease as men on the same age. (10)

ACUTE CORONARY SYNDROME (ACS)

When revascularisation with balloon (PCI) is indicated before the scheduled surgery it is recommended implantation of

drug-eluting stent (DES) and to postpone the scheduled surgery at least 3 months after. Scheduled surgery is not recommended before 6 months after PCI and 12 months after ACS and antithrombotic therapy cannot be stopped.(1)If the surgery is necessary, it should be postponed at least 1 month after PCI and patient should be during this month on antiaggregant while high risk patients should receive at least 3-month antiaggregant therapy. For all patients that take aspirin despite the fact if they had a PCI procedure, it is recommended to continue aspirin if the risk for hemorrhage during surgery is low.(1)Patients that take antithrombotic do have a higher risk for bleeding and thrombosis on peri operatory time. In cases when the scheduled surgery should be done and the patients in under therapy with antiaggregant it is recommended stopping of clopidogrel for 5 days, ticaglerol 3-5 days before, plasugrel 7 days before the intervention. When surgery is going to be performed with spinal anesthesia aspirin should be interrupted 7 days before the surgery.After the intervention it is recommended starting antithrombotic therapy 48 hours after in order to evaluate the risk for bleeding.(11,12, 13,14)

BETA BLOCKERS

Beta blockers can be continued on patients which are selected for scheduled surgeries. It is not recommended starting them routinely during the peri operatory period. There are data that support advising beta blockers from 2 to 30 days before the scheduled surgery with high risk in all patients with at least two risk factors. Despite that, these data are not conclusive. Dosing should be done in individual way to avoid hypotension and bradycardia before, during and after surgery. The heart rate at rest should be around 60-70 bpm and systolic blood pressure over 100 mmHg while using beta blockers.

STATINS

Statins should be continued on perioperatory period in patients that undergo scheduled surgeries. On the other side by judging the patients with high risk factors perioperatory period can be the right time to start statins. (1)

CARDIOMYOPATHY

There are limited data regarding to preoperatory evaluation regarding to cardiomyopathy,despite that the preoperatory evaluation includes echocardiography. Unfortunately, hypertrophic cardiomyopathy with left ventricle insufficiency has high risk for perioperator complications. Avoiding dehydration, avoiding vasodilatation from anaesthetics that may induce hypotension, arrythmias and atrial fibrillation is essential. Heart rate of 60-65 bpm is the optimum in these cases. No deaths have been reported but there is a high incidence for cardiac complications usually manifested as heart failure. (15, 16)

VALVULAR DISEASE

Aortic stenosis

Patients that suffer from aortic stenosis have a high risk regarding to noncardiac surgery. In cases where patients are symptomatic and is undergoing a high-risk surgery the first procedure to be done is valvular replacement of aorta or TAVI. The surgery can be postponed or cancelled. These recommendations are the same in the case of an asymptomatic patient. (17, 18, 19)

Mitral stenosis

In patients with light and moderate mitral stenosis the heart rate should be properly controlled on perioperator period because unstable heart rate can lead to pulmonary edema. (20) For symptomatic patients with moderate stenosis and important stenosis where SPAP is over or equal to 50 mmHg valvular replacement is recommended before the scheduled surgery. (1)

Aortal regurgitation

Advanced aortal regurgitation does not profit from lowering of heart rate but careful management of liquids and lowering afterload is recommended. Symptomatic and asymptomatic patients with DS > 50 mm and EF $\leq$ 50% should have valvular replacement and scheduled surgery should be postponed or cancelled. (1, 21)

Mitral regurgitation

Patients with moderate and advanced mitral regurgitation can profit from reducing afterload and administration of diuretics to achieve hemodynamic stability before the surgery. (22) On cases with advanced regurgitation because of rheumatic heart disease where the patient is symptomatic and in asymptomatic cases where there is left ventricle dysfunction (DS $\geq$ 40mm dhe EF $\leq$ 60%) valvular replacement should be considered and the surgery may be postponed. (1)

Valvular prothesis

Managing anticoagulant therapy in patients with mitral and aortal mechanical valvular prothesis is challenging. INR $\leq$ 1.5 is recommended together with cessation of oral anticoagulant and starting low weight heparins as the best alternative in comparison to sodic heparins. (1) Using of heparin is essential on perioperative period because of high risk for hemorrhage that may induce from oral anticoagulant and from high risk of valvular thrombosis. In the case of an emergency, on patients that have mechanical valvular prothesis there is no hesitation to stop oral anticoagulation.

Arrythmias and conduction alterations

Supraventricular and ventricular cardiac arrythmias are not rare on perioperatory period. They have been identified as an independent risk factor for cardiovascular morbidity and mortality. All the patients that suffer from arrythmias should have a preoperatory evaluation of ECG and cardiologic detailed examination. It is not recommended stopping antiarrhythmics before the surgery. Prevention of life-

threating arrythmias is very important. For every patient that suffers from supraventricular or ventricular arrythmia a preoperatory ECG and an echocardiography should be done. Cardiac biomarkers evaluation, coronary tomography and magnetic resonance should be included on patients that suffer from heart disease. (1) On patients with unstable supraventricular tachycardia vagal manoeuvres, IV adenosine, IV beta blockers, Ca^{2+} channel blockers and cardioversion are recommended to be used. On patients with unstable ventricular tachycardia and structural and functional damages of the heart the usage of IV beta blockers, amiodarone and cardioversion is recommended. On high-risk surgeries ablation may be considered before the intervention. On patients with atrial fibrillation with unstable hemodynamic who should undergo high-risk surgeries electric cardioversion and amiodarone is recommended for best control of their heart rate. For ventricular arrythmia on symptomatic patients except from optimal medical therapy ablation before the surgery is recommended for high-risk surgeries. It is not recommended starting of therapy on patients with rare ventricular extrasystoles during the gynecologic surgeries. (1, 26, 27, 28, 29, 30). For all the patients that have an indication for pacemaker or ICD, on all cases implantation should be done prior to surgery. On patients that already have a pacemaker or ICD it is important to highlight the possibility of a possible interaction between them and the electrocautery and the impact of anesthesia on them. A re-evaluation before the surgery should have been done at least in the last 12 months in patients with pacemaker and a re-evaluation at least on the last 6 months on ICD patients. (1, 31)

Pulmonary hypertension

Pulmonary hypertension presents a high operatory risk on scheduled noncardiac surgery and the mortality in these cases arrives up to 3-18%. (32) On surgical emergency this risk is even higher. It is recommended continuation of usual therapy on all patients and strict monitorization on 24 first hours after the surgery. Diuretics in high dose and starting of IV vasodilatations is recommended on complicated cases. Medicaments like dobutamine, milniron and levosimendan that incrise the cardiac output and lower pulmonary vascular resistance should be used according to the clinical status of the patient. (32)

Pericarditis

On patients with acute pericarditis postponing of the gynecologic surgery is reasonable until the patient is healthy. On patient with chronic pericarditis which are under therapy with colchicine or immunosuppressor therapy the gynecologic surgery will be done under general anesthesia.(1, 33)

Perioperative thromboprophylaxis

On our daily clinical practice using of prophylaxis with low weight heparins 12 to 48 hours before the surgery and 7 to 10 days after the surgery according to the type of risk that the procedure presents, clinical status of the patients and comorbidities is a standard nowadays. The risk for venosus thrombosis is increased with age, long time of immobilisation, malignant disease, obesity, varicose vein presence, estrogenic pill usage, hypercoagulability alterations and abdominal surgery itself. All this risk factors seek for the necessity of prophylactic measurements like elastic socks, using of heparins and further examinations to exclude deep venous thrombosis. (34, 35) Patient under therapy with oral anticoagulant like dabigatran should stop it 24 to 96 hours before the surgery and for patients that use apixaban, rivaroxaban, endoxaban should stop their therapy 24 to 48 hours prior to surgery after evaluation of their glomerular renal fraction and routine specific test of anticoagulation. On cases when spinal or epidural anesthesia is scheduled to be used dabigatran should be stopped 4-5 days before the surgery while inhibitors of factor X-a 3 days prior to surgery and can be started 24 hours after the surgery, after evaluation the risk for hemorrhage. General anesthesia is mostly recommended to avoid spinal or epidural anesthesia in these cases. (1, 36, 37, 38)

Surgical emergencies

Time is not always sufficient to evaluate and manage a patient on emergency. This is why evaluation and management of patient is done in basis of actual status and comorbidities. It is well known fact that cardiac complications happen 2 to 5 times more on surgical emergency in comparison to scheduled surgery.

Emergency surgeries: On critical life-threating situations where there is no time or limited time to perform the surgery (less than 6 hours) a minimal clinical evaluation should be done.

Urgent surgeries: On cases when there is limited time to perform the surgery from 6 to 24 hours the examination should include ECG, BP measurement, complete blood count and electrolytes measurement until the urgency is resolved.

Necessary surgeries: When the surgery can be postponed for 1 to 6 weeks, the evaluation, management and therapy for the patient may be done. This includes surgeries on gynecologic oncology.

Obligatory surgeries: When the surgery can be postponed for 1 year or more.

One of the big dilemmas on emergency cases are patients which take oral anticoagulation especially because the efficacity of thrombocyte transfusion is not proven yet. General anesthesia is recommended on these cases and avoiding spinal and epidural anesthesia. Every gynecological surgery is risky but what we should do is combining the actual status of patients and type of gynecology the patient is to do.

Post operatory follow-up

Patients that suffer myocardial infarction after surgery have a mortality rate that increases 40 to 70%. This is why a post operatory ECG changes suggest an acute coronary syndrome seek a very careful follow-up. Monitorization of ST segment on intraoperatory and postoperatory period should be applied on all patients with chronic coronary syndrome. Troponin evaluation is necessary at this category of patients. (9, 13) Many studies conclude that using of beta blockers and calcium channel blockers can reduce arrythmias on perioperator period. (27) Careful evaluation and management of high-risk patient for cardiovascular event in gynecologic surgery seeks for a multi-disciplinary work with cardiologist, anaesthesiologist, gynaecologist, patients and patient's familiar when necessary.

Abbreviations: HF; Heart failure, ECG;electrocardiogram, PLT; platelet count test, aPTT activated partial thromboplastin time, DM; diabetes mellitus,HbA1c SGLT-2 inhibitors, BMI; Body Mass Index, ACE-I;angiotensin-converting enzyme , ARB;Angiotensin receptor blockers. BNP; B-type natriuretic peptide, proBNP; pro-brain natriuretic peptide, MI;myocardial , ACS;Acute coronary syndrome , PCI;revascularisation with balloon, DES;drug-eluting stent, TAVI;transcatheter aortic valve implantation, SPAP systolic pulmonary artery pressure, EF; Ejection fraction, INR; international normalized ratio, ICD;
, implantable cardioverter-defibrillator, IV; intravenous.

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