Current Approaches in Hip and Knee Arthroplasty Anaesthesia

Gülen Güler¹, Şebnem Atıcı², Ercan Kurt³, Saffet Karaca⁴, Aysun Yılmazlar⁵

¹Department of Anaesthesiology and Reanimation, Erciyes University Faculty of Medicine, Kayseri, Turkey

²Department of Anaesthesiology and Reanimation, Mersin University Faculty of Medicine, Mersin, Turkey

³Department of Anaesthesiology and Reanimation, Gülhane Military Medical Academy, Ankara, Turkey

⁴Department of Anaesthesiology and Reanimation, İstanbul University Cerrahpaşa Faculty of Medicine, İstanbul, Turkey

⁵Department of Anaesthesiology and Reanimation, Private Medicabil Hospital, Bursa, Turkey

Risk assesment, preoperative drug regulation, the anesthesia and analgesia techniques are very important and the effectivity on success of surgery is great. So, these topics in arthroplasty were reviewed under current knowledge.

Keywords: Arthroplasty, preoperative evaluation, risk assessment, anaesthesia, analgesia

Arthroplasty is a surgical procedure where an implant is placed to reestablish an articular surface on bone structures that form the joint in order to provide painless movement to the joint and restore optimal function to the structures that control the joint.

Risk Assessment in Arthroplasty

In arthroplasty, identification of patients at risk for mortality and morbidity, prediction of intraoperative and postoperative complications and attempts to prevent them and careful preoperative preparation and provision of postoperative care increase the success rate and reduce health care costs substantially (1). The patient's age, presence of cardiovascular disease and chronic obstructive pulmonary disease (COPD), previous thromboembolic events, renal function and the questioning of the drugs used and the determination of functional capacity provide important information about the incidence of complications that may arise peroperatively (2). Physical examination is very important to reveal important aspects of the patient. Hypo- or hypertension, brady- or tachycardia, arrhythmia, hypoxia, jugular vein distention, S3 gallop rhythm, cardiac murmurs, carotid, abnormal femur and abdominal auscultation symptoms are some of the vital signs that should be investigated. Preoperative tests for complete blood count, haemoglobin, electrolytes, blood glucose level, urea, creatinine, liver enzymes, bleeding and coagulation times and urine screening should be performed. Also, chest radiography and electrocardiography (ECG) should be considered. If ischemia and left ventricular hypertrophy symptoms in ECG or systolic murmur is observed, echocardiography should be requested. The most important symptom to determine the risk in echocardiography is ejection fraction; ejection fraction lower than 35% is a high-risk indicator. Cardiac complications during and after arthroplasty are among the primary causes of mortality and morbidity. High American Society of Anesthesiologists (ASA) class and decrease in functional capacity are the most important risk factors. In the last 30 years, several risk indexes, such as the Lee Risk Index, Revised Cardiac Risk Index and modified Goldman index, have been developed to determine the incidence of perioperative cardiac morbidity and mortality in non-cardiac surgery. In the modified Goldman index, high risk surgery, ischemic heart disease, congestive heart failure, previous cerebrovascular incident, preoperative insulin therapy, preoperative serum creatinine value higher than 2 mg dL⁻¹ are regarded as the most important parameters (3). According to the Lee risk index,

the incidence of cardiac complications have been reported as 0.4% for no current risk factors, 0.9% for one risk factor, 7% for two risk factors and 11% and higher for three or more risk factors. In addition to these factors that pose a risk in arthroplasty, it has been reported that advanced age, revision surgery and bilateral arthroplasty increase the risk of cardiac complications (4). Thromboembolic incidents ranks second among the causes of mortality and morbidity in arthroplasty. Previous thromboembolic incidents and obesity in addition to high ASA values, immobilization, advanced age, congestive heart failure, malignancy, prolonged surgery and blood transfusions are the most important risk factors for these complications (5). The risk of thromboembolic complications will decrease significantly by delivering an appropriate pharmacological prophylaxis, continuing mechanical prophylaxis until the patient is mobilized and proceeding pharmacological prophylaxis after the patient is discharged. Cement that is used in arthroplasty causes bone–cement implantation syndrome in various degrees that range from from controllable haemodynamic changes and hypoxia to cardiovascular collapse. Access of acrylic monomers in to the systemic circulation leads to vasodilatation, and because of the increased intramedullary pressure, fat, bone marrow, thrombus, air and bone cement flow into circulation and pulmonary embolisms are formed. Therefore, patients with significant heart disease and pulmonary hypertension are at high risk (6, 7). Tourniquet application may cause volume overload and pulmonary embolism and metabolic changes (especially when applied bilaterally); hence, it significantly increases the risk of complications. It has been reported that the need for intensive care increased in patients who were administered cemented arthroplasty, underwent general anaesthesia and allogeneic blood transfusion and particularly patients who were heavy smokers or patients with severe COPD (8). If preoperative dyspnoea and smoking are present and FEV₁/FVC rate is lower than 65%, blood gas analysis should be conducted. Patients are considered to be at a high pulmonary risk if diagnosed with partial pressure of arterial carbon dioxide (PaCO₂) >45 mmHg in blood gas analysis. Although partial pressure of arterial oxygen (PaO₂) <60 mmHg does not comprise absolute contraindication, it should be a warning in terms of preoperative support, follow-up in postoperative period and intensive care.

Preoperative Drug Adjustment in Arthroplasty

In a prevalence study conducted between 1994 and 2004, it was stated that increase in arthroplasty is mostly seen between 75–85 years of age, and associated diseases and drug use also increase with age. Anaesthesiologists must assess the risks and plan their applications by knowing the impacts of the drug on the patient's body as well as its interactions with other drugs.

Antihypertensives and other cardiovascular drugs: In hypertension treatment, beta-blockers, angiotensin converting enzyme inhibitors (ACEs), angiotensin receptor blockers

(ARBs), statins, nitrates, calcium canal blockers and diuretics are frequently used singly or in combination. The continuation of beta-blockers in the perioperative period is controversial. In many randomized controlled studies, it has been reported that for surgical patients in medium to high risk groups, using preoperative beta-blocker reduces myocardial ischemia and postoperative cardiac problems (10). However, in the POISE study, in which 8351 people were included, it was observed that the preoperative use of beta-blockers didn't reduce cardiac complications, but increased the risk of stroke and death due to bradycardia and hypotension, particularly in atherosclerotic patients (11). In addition, the consensus in all studies was that the patient's heart condition, surgical risks and initiation time of beta-blockers are important in the decision pertaining to the continuation of the drug. If a beta-blocker is prescribed for atherosclerotic heart disease (ASHD) or arrhythmia and is used to compensate heart failure and left ventricular dysfunction, it should not be discontinued (12). In patients taking beta-blockers, in the perioperative period, hypotension and bradycardia (the most alarming effects) are more significantly seen in untitrated doses and increase the risk of stroke (13). Therefore, if it is to be initiated, surgery must definitely be postponed for dose titration (at least 1 week and may take up to 30 days). The purpose of dose titration is to have systolic blood pressure >100 mmHg and heart rate between 60–70/min. If possible, it is recommended to start with atenolol or bisoprolol (14, 15). In the treatment of hypertension, it has been reported that during anaesthesia induction for patients taking ACE/ARB, severe hypotension might be seen. During anaesthesia assessment, combined use of beta-blockers and the dose of medication should be questioned. As this combined use may cause severe hypotension, it should be discontinued the day before. However, if the patient is taking high doses of ACE/ARB, the cessation of the drug may result in withdrawal syndrome. Yet another point to remember for patients taking high doses is that in case hypotension is observed in the perioperative period, the response to vasopressors might be decreased. If the presence of left ventricular dysfunction is observed during preoperative assessment and ACE/ARB is going to be initiated, surgery must be postponed for dose titration, and medication intake for at least a week should be recommended. In a meta-analysis that contained eleven studies and in which the use of calcium canal blockers was questioned, the relapse risk of myocardial ischemia and supraventricular tachycardia was found to be decreased (16). However, in another study that evaluated 1,000 patients, it was reported to increase the risk of perioperative mortality. In particular, it was recommended not to use nifedipine.

In order to obtain a decrease in heart rate, calcium canal blockers should only be used in patients having contraindication or no tolerance to beta-blockers. Calcium canal blockers should be continued only if vasospastic angina is present (12).

In the POISE-2 study, where perioperative ischemia was assessed, Alpha₂ receptor agonists, especially clonidine, were found to cause severe hypotension, (17). It has been reported that it also increases the possibility of non-fatal cardiac arrest. Therefore, it should not be used in patients undergoing non-cardiac surgery.

Diuretics: Preoperative use of diuretics should be continued, but it should be noted that because they can create changes in K and Mg levels, arrhythmias may develop. There shouldn't be any preoperative electrolyte imbalance.

Statins: Statins have coronary plaque stabilization forming, lipid-lowering and anti-inflammatory effects. It has been reported that they reduce perioperative plaque rupture and myocardial ischemia occurrence (18). Myopathy or rhabdomyolysis, which are reported as the side effects, might be seen at the beginning of the treatment. There is no study that clearly demonstrates its relationship with the drugs used in anaesthesia. There is no need to discontinue the treatment that has already been initiated.

Antiagregants and Anticoagulants: The drugs and techniques used for treating cardiac problems vary (19). About 5% of the patients who required placement of a stent for acute coronary syndrome or myocardial ischemia needed a surgical operation (12). During the period following stent implantation, dual antiplatelet therapy is required. In case of perioperative antiplatelet therapy interruption, due to stent thrombosis, it has been reported that the mortality rate may reach up to 20%. Antiplatelet treatment must be received for at least 3 months in metal stents and for at least 12 months for drug-coated stents (20, 21).

However, when the discontinuation of the drug for the surgery of the patient with stent implantation is required, the cardiologist, the surgeon and anaesthesiologist should review the risk of operational bleeding and stent thrombosis together. When necessary, clopidogrel and ticagrel should be discontinued 5 days before the surgery and prasugrel should be discontinued 7 days before (21, 22). In the presence of arterial thromboembolic risk, it is more advisable to continue administration of low-dose aspirin (12, 23, 24). Surgeries that require aspirin cessation are spinal surgeries, neurosurgeries and ophthalmological surgeries. Aspirin should be discontinued at least 7 days before the surgery. Apart from these, if the risk of bleeding outweighs cardiovascular benefits, aspirin should be discontinued.

Warfarin should be discontinued 5 days before the surgery. Bridge therapy should be applied for high-risk thromboembolism (low-molecular-weight heparin [LMWH]). In regional anaesthesia in tromboprophylactic doses, LMWH intake should be discontinued at least 12 hours before the surgery, and for high doses it should be at least 24 hours before (12, 20, 23). Heparin should be discontinued 4 hours before the surgery. The renal elimination of LMWH should also be not-

ed. Although having followed the recommendations of the literature pertaining to the cessation of the medication, in a report of two cases who developed spinal hematoma, renal diseases were identified.

The cessation time of new anticoagulants (non-vitamin K antagonists) dabigatran, rivaroxaban, apixaban and edoxaban should be determined by evaluating the bleeding risk of the surgery (20, 21). Discontinuation should be performed 2 or 3 times earlier than the half-life in normal risk of bleeding, and for high risk of bleeding, it should be 4 or 5 times earlier. The use of herbal products does not constitute a contraindication for the central blocks (evidence level 1C) (23). However, it should be treated with caution in surgeries.

Antidiabetic drugs: Preoperative blood sugar control should be provided with insulin. Discontinuation of metformin intake 48 hours before the surgery and cessation of other short-acting antidiabetics on the morning of the surgery is sufficient (22).

Anaesthesia in Arthroplasty

In patients undergoing arthroplasty, the first anaesthesia method to choose is the central neuraxial block. In arthroplasties, it is known that regional anaesthesia decreases the incidence of deep vein thrombosis and pulmonary embolism, shortens the length of hospital stay and reduces intraoperative blood loss and consequently, the need for transfusion. However, despite these advantages, it is sometimes an evaded anaesthetic method because it may cause unwanted side-effects, such as hypotension, motor block, urinary retention and pruritus and pose unwanted dural puncture and neurological damage risks (24-32).

Allogeneic blood transfusions are often needed in arthroplasty. Surgical site infections are one of the most important and the most common problems of surgical applications.

After hip arthroplasty, difference in height between the lower extremities is also one of the major problems. While patients often do not complain if the operated leg is shorter than the other one, they complain if the operated leg is longer, and this may cause serious medicolegal problems. It has been revealed that spinal anaesthesia increases the possibility of soft tissue laxity, thereby influencing the length of the limb that was operated. Therefore, while assessing the stability of the hip joint in patients undergoing regional surgeries under regional anaesthesia, orthopaedic surgeons must be more careful (33-35).

When using central neuraxial methods, one should exercise extreme caution to avoid possible complications. Neurological complications are the most important ones. Today, regional anaesthesia is preferred for many surgeries. Compared with general anaesthesia, regional anaesthesia has many benefits, such as decreasing morbidity and mortality, making a contri-

bution to postoperative analgesia and cost reduction. However, it is clear that it increases the incidence of certain complications, and therefore, one should be extremely careful in terms of possible complications. Neurological damage is the most important complication. Block formation after ultrasonographic evaluation or accompanied with ultrasonography improves the safety of the application (36-44). In order to reduce the pain experienced in the early postoperative period, local infiltration analgesia as a part of multimodal analgesic techniques is recommended. Muscle weakness resulting from peripheral nerve blocks may cause falls, especially during mobilization (45-53). For these patients, periarticular injection is recommended in order to avoid this situation.

Periarticular injection: The most important advantage is that it allows early ambulation. Therefore, it should be a part of multimodal analgesia in patients who underwent hip arthroplasty. A typical periarticular injection solution contains 0.5% bupivacaine 200–400 mg, 4–10 mg morphine sulphate, 300 mcg epinephrine, 40 mg methylprednisolone, 750 mg cefuroxime and saline (total 60 mL volume). Bupivacaine and morphine inhibit peripheral pain receptors. Epinephrine, with its vasoconstriction effects, enables the local anaesthetic to stay in the region and prolongs the action time. Methylprednisolone shows an anti-inflammatory effect, and cefuroxime causes infection prophylaxis. This solution is prepared by the anaesthesiologist. In sterile conditions, the anaesthesiologist hands the solution to the orthopaedic surgery nurse, the nurse hands it to the orthopaedic surgeon, and the orthopaedic surgeon administers the periarticular injection.

In hip arthroplasty, before the reduction, the orthopaedist administers periarticular injection to the anterior capsule, the iliopsoas tendon and its insertion. After the reduction, periarticular injection is administered to abductors, fascia lata, synovia, gluteus maximus and its insertion, posterior capsule and short external rotators. However, in knee arthroplasty, before the reduction, periarticular injection is administered to the posterior capsule and the posteromedial and posterolateral structures. After the reduction, periarticular injection is administered to the extensor mechanisms, synovia, the capsule, the iliotibial band, periosteum, pes anserinus, anteromedial capsule and collateral ligament and its origins.

Position: The orthopaedic surgeon, acting upon his experience and preference and considering patient characteristics, might perform total hip arthroplasty with anterior and posterolateral approach. Posterolateral approach provides an excellent access to the femur and acetabulum. As in the anterior approach, the extent of the damage is minimum in the peripheral muscle tissue surrounding the hip joint. It is usually the orthopaedic surgeons' preferred method. Patients who have been operated with this method are positioned in the lateral decubitus with the operated side on top. Because this position may impair oxygenation due to ventilation-per-

fusion mismatch, especially in obese patients, caution is required. In order to avoid axillary artery and brachial plexus injury in the arm positioned underneath the body, a round cushion or a pad should be placed between the upper part of the thorax and the operating table. The arm underneath the body should be supported with gel pads to prevent damage to the ulnar nerve at the elbow. Other pressure points that must be considered in a patient in this position are the fibular head and the lateral malleolus in the leg underneath the body. In order to prevent damage to the peroneal nerve and the sural nerve, these pressure points should be supported with gel pads. Also, to reduce the compression in the iliac crest, soft pads are placed between the operating table and iliac crest. The patient's head should be placed on a round cushion, with the ear underneath the head in the hole of the cushion. The pelvis of the patient should be secured by stabilizing the supports placed in the abdominal cavity and in the hip. The anterior approach allows reaching the hip joint without damage to surrounding muscle tissue, but this method is not easy to reach the femur, and it is possible to damage the lateral femoral cutaneous nerve during such manipulations. Patients who will be operated with this method are placed in the supine position. The placement of the arm on the operation side of the hip on the patient's body is preferred as it will facilitate surgical manipulations. The other arm of the patient is placed open sideways with maximum 90 degrees from the body so that damage to the brachial plexus is prevented. The arm should be supported with gel pads to prevent damage to the ulnar nerve at the elbow. Similarly, gel pillows should be placed under the head, the popliteal fossa and the ankles.

Fluid therapy: Colloids should be the first choice in fluid therapy during the intraoperative period. In a prospective randomized study that compared the effects of colloids and crystalloids on cardiac output and hypotension incidence in elderly patients undergoing arthroplasty under spinal anaesthesia, in terms of providing protection for cardiac output and haemodynamic stability, colloids were found to be superior to crystalloids in intravascular volume replacement. It has been shown that HES application reduces the need for transfusion.

Monitorization: In arthroplasty, when the feature of the surgery and patient population are considered, 'goal-directed therapy' protocols should be developed, and the fluid and vasoconstrictor therapies to be applied should be set out on the basis of goals determined in these protocols. For fluid and vasoconstrictor therapies, monitoring the patients only with advanced technology devices is not enough, haemodynamic goals to be achieved must also be determined.

It is known that in patients undergoing a major surgery under general anaesthesia, 'goal-directed therapy' algorithms of the fluid and vasoconstrictor therapies reduce postoperative morbidity and mortality. Also, under regional anaesthesia, they are known to improve the results.

Haemorrhage: Tranexamic acid should be used to reduce perioperative blood loss and transfusion requirements. Ten minutes prior to the incision, 1 g of tranexamic acid should be administered intravenously. In arthroplasty, significant blood loss that requires allogeneic blood transfusions can be seen. Blood transfusion has risks, such as immunological reactions, infection transmission, intravascular haemolysis, transfusion-associated coagulopathy and kidney failure. In order to decrease blood loss and the need for postoperative transfusion, techniques such as controlled hypotension, regional anaesthesia, autologous blood transfusion, intraoperative blood salvage and the use of erythropoietin and antifibrinolytic agents are still in use. Among the antifibrinolytics, tranexamic acid, aminocaproic acid and aprotinin are present. They act via different mechanisms that inhibit clot lysis. They can also be administered to the surgical site in a 2-g local instillation form.

Hypotensive anaesthesia: In order to optimise blood utilization, either there should be very little bleeding or no bleeding at all. This would be ensured by 'hypotensive anaesthesia' that will be administered by the anaesthetist. Hypotensive anaesthesia reduces mean blood pressure up to 50 mmHg in a controlled way.

Parenchymal perfusion of the organs, and most importantly cerebral perfusion, is not damaged with this value. However, for patients with coronary, renal and cerebral insufficiency, caution is still required when using this technique. Thanks to hypotensive anaesthesia, the surgical site is bloodless. A surgeon can operate more comfortably on a bloodless surgical site, and therefore, surgery time is shortened. Blood transfusion is not performed as there is no bleeding. Therefore, with a decrease in the risk of blood transfusion reactions, there is a decrease in the cost of the surgery as well. Regional anaesthesia is the most important hypotensive anaesthesia method. Pharmacological methods can also be applied. Vasodilator and beta-blocker infusion can be the examples of pharmacological methods.

Thromboprophylaxis: For venous thromboembolism prophylaxis, vitamin K antagonists, fondaparinux or heparin with low molecular weight, are recommended. After surgery, these patients are at a 40%–60% risk for subclinical deep vein thrombosis and at a 4%–10% risk for pulmonary embolism. International evidence-based guidelines suggest the use of appropriate prophylaxis for the prevention of venous thromboembolism after orthopaedic surgery. There are serious evidences showing that the use of these agents may reduce postoperative deep vein thrombosis by 60%–70%. During prophylaxis, in patients contraindicated with anticoagulant prophylaxis, mechanical methods, such as compression stockings and intermittent pneumatic compression devices, emerge as an alternative. In major orthopaedic surgeries, while planning venous thromboembolism prophylaxis, the initiation and termination times of anticoagulant prophylaxis

is must definitely be determined. Anticoagulant prophylaxis should be initiated in an optimal time, neither too early nor too late, considering the agent that is used, dose, type of surgery and patient characteristics.

Early ambulation: In hip arthroplasty, in order to contribute to thromboembolism prophylaxis, after the surgery, it is necessary to provide the patient with early ambulation. Therefore, the anaesthesiologist should definitely take part in the patient's first ambulation. It is necessary to perform ambulation in a painless way, and haemodynamics must be stable. For this, motor and sensory block regression is provided with 10 mL of saline via an epidural injection with epidural wash (or washout). Half an hour later, in order to avoid orthostatic hypotension, the patient is first placed in a sitting position and his/her pulse and blood pressure are checked. Afterwards, prophylactic sympathomimetic and antiemetic are performed. Then, accompanied by orthopaedic surgeons, anaesthetists, physiotherapists and nurses, the patient walks a maximum of 10 steps or as many as the patient can tolerate, with the help of a 'Walker'. Then, the patient is again put to bed. This can be done in the recovery unit of the operating room or in the ward (53-59).

Analgesia in Arthroplasty

In the postoperative period, the main goals are to provide comfort for patients with effective analgesia, to prevent acute pain from becoming chronic and to enable the patient to cough, breath comfortably and to move easily. It should also be noted that postoperative analgesia is a fundamental human right. There are many factors affecting the analgesic requirements in the postoperative period. These include age, gender, cultural features and personality characteristics, preoperative patient education, patient's physiological and psychological preparation for the surgery, surgical site and its size, the attitude of health care personnel and patient's individual response towards pain and comorbid diseases. Although the main objective is to provide a pain-free postoperative period, for patients who have undergone hip and knee surgery providing early mobilization and oral intake, improving motivation and enabling them to return quickly to their normal life are also very important. Today, in hip and knee surgeries, it is unlikely to provide a very successful and effective postoperative analgesia with a single method. The main objective of the postoperative period in such major joint arthroplasties is to implement a multimodal analgesia (60-62). For this purpose, multimodal analgesia can be performed by administering pre-emptive analgesic or applications (oral NSAIDs, iv corticosteroids, LA infiltration around the incision) in the preoperative period, administering periarticular injections in the intraoperative period and co-administration of central and/or peripheral blocks used in the postoperative period. Rescue analgesics should definitely be planned in case all applied analgesia may be inadequate. As rescue analgesics, in general, narcotic analgesics should be preferred. When we

look at the literature, the most preferred narcotic analgesic is morphine. In the selection of effective analgesia in hip and knee arthroplasty, the main objective is to keep the value of visual analogue score (VAS) less than three or four. While obtaining low VAS values by means of the selected technique, it is ideal not to have motor block formation, to have unaffected cognitive functions and to have minimal side effects.

Analgesia in hip arthroplasty: In these surgeries, it is controversial to use intravenous NSAIDs postoperatively. It shouldn't be used because it can cause deterioration in liver and renal functions, particularly because the patients are elderly and because it can adversely affect bone healing. However, it might also be used for being part of a multimodal analgesic and reducing oedema in the tissues and reducing the opioid consumption. Compared to continuous femoral nerve block, continuous psoas compartment block, in particular, provides more effective analgesia because the psoas compartment block blocks lumbar plexus more proximally and is more effective. Especially in patients operated with general anaesthesia, continuous psoas compartment block might be preferable. Low-dose local anaesthetic should be preferred in order to limit motor block in the continuous psoas compartment block. For this, 4–6 mL of 0.2% or 0.1% ropivacaine might be administered hourly through the catheter (63). Fascia iliaca compartment block can also be applied for hip surgeries, but its effect not significantly different from placebo (64).

Analgesia in knee arthroplasty: Although it is known that the central blocks are superior, today there are also some analgesic methods alternative to the central blocks. Though it is superior, especially in continuous epidural block in knee arthroplasty analgesia, severe side effects (motor block, urinary retention, hypotension, nausea and/or vomiting, patchy block) resulting from central blocks have also been reported. However, in cases where central blocks cannot be applied (bad anatomical structures, bleeding tendency, patient's refusal, etc.) and to avoid side effects associated with central blocks, peripheral nerve blocks may also be preferred. These include femoral nerve block, adductor canal block, saphenous nerve block and sciatic nerve block. Either as a single dose or via a catheter, appropriate blocks can be applied to these peripheral nerves. Peripheral nerve blocks are very advantageous for multimodal analgesia because although central blocks block both extremities, they can create motor block, resulting in serious problems with regard to the patient's mobilization. In recent years with the introduction of ultrasound, peripheral nerves and surrounding anatomical structures can be observed and thus, more successful block, can be formed. In the postoperative analgesia of total knee surgery, adductor canal block was found significantly superior to placebo (65).

In knee arthroplasty, when the adductor canal block is used for analgesia, it reduces morphine consumption, increases the walking distance and reduces pain scores. However, it should be noted that although motor block is not observed in adductor canal block, because quadriceps muscles are weak, the patient may fall

down. In a clinical study, following femoral nerve block, loss of strength in quadriceps muscle was found to be 49%, and the risk of falling increased due to adductor canal block (66).

After knee surgery, the addition of sciatic nerve block to femoral or psoas block is controversial. In some studies, whereas some researchers suggest blocking the sciatic nerve for the back of the knee, some authors do not (67).

As a result, in arthroplasty, considering available facilities and capabilities, each institution should improve its multimodal anaesthesia and analgesia protocols with preoperative risk identification and drug regulations (68)

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