



SPINAL ANESTHESIA IN DAY SURGERY – EARLY EXPERIENCES

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ABSTRACT – Day surgery is a term that refers to performing an operation under anesthesia without needing to stay in the hospital for more than 24 hours. Day surgery has many advantages over surgery that involves a multiple-day hospital stay. Anesthesia for day surgery must have a rapid onset of action, a rapid cessation of action, and be free of, or have minimal side effects. For many years, general anesthesia was believed to be the anesthesia of choice for day surgery due to the delayed onset of local anesthetic after spinal anesthesia, a much longer duration of motor function recovery after surgery with spinal anesthesia compared to general anesthesia, and a more frequent incidence of side effects with spinal anesthesia, such as urinary retention or post-puncture headache. However, with the discovery of new, shorter-acting local anesthetics, and the use of smaller-diameter spinal needles, spinal anesthesia is becoming an equivalent anesthetic option for day surgery, if not a better one. Our early experiences with spinal anesthesia in day surgery are excellent.

Key words: *anesthesia, day surgery*

Day surgery is a term that refers to performing an operation under anesthesia without needing to stay in the hospital for more than 24 hours, or most commonly, without needing to spend the night in the hospital. Some of the most common surgical procedures that can currently be performed in day surgery are endoscopic procedures such as colonoscopy, gynecological procedures, urological procedures, arthroscopic and orthopedic procedures, hernia surgeries, minimally invasive spinal procedures, and procedures related to pain treatment in general.

Day surgery has many advantages over surgery that involves a multiple-day hospital stay. The advantages include a much shorter interruption of the patient's normal life, and thus less anxiety and greater patient

satisfaction, a faster return to regular life activities, the ability to treat more patients and thus reduce waiting lists, lower hospitalization costs due to the need for less staff, and a lower incidence of nosocomial infection. In day surgery, the patient usually arrives in the morning on the day of surgery and goes home the same day, a few hours after surgery or when he meets the criteria for discharge. PADS criteria (A Post-Anesthetic Discharge Scoring) (1) or "Safe Discharge Criteria" (2) are most commonly used for discharge after daily surgery. According to these criteria, prior to discharge, the patient must be awake, well-oriented in time and space, must have stable vital functions, a good control of postoperative pain and postoperative nausea and/or vomiting, be able to walk without dizziness, and be without expected major postoperative bleeding. The patient must be accompanied by someone and understand all instructions related to recovery. Fulfilling all these criteria mainly depends not on the operation itself, but also on the anesthesia applied. Anesthesia for day surgery must have a rapid onset of action, a rapid

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cessation of action, and be free of, or have minimal side effects. For many years, general anesthesia was believed to be the anesthesia of choice for day surgery due to the delayed onset of local anesthetic after spinal anesthesia, a much longer duration of motor function recovery after surgery with spinal anesthesia compared to general anesthesia, and a more frequent incidence of side effects with spinal anesthesia, such as urinary retention or post-puncture headache. However, with the discovery of new, shorter-acting local anesthetics, and the use of smaller-diameter spinal needles, spinal anesthesia is becoming an equivalent anesthetic option for day surgery, if not a better one.

Spinal anesthesia is easy to perform, it is inexpensive, has less effect on the cardiovascular system than general anesthesia, has a minimal impact on the respiratory system. The use of spinal anesthesia avoids the possibility of difficult airway establishment. All these benefits of spinal anesthesia lead to the possibility of day surgery for patients who have had certain risks and contraindications for general anesthesia, such as the elderly, the overweight, or those with comorbidities (3).

With the discovery of new short-acting local anesthetics, spinal anesthesia has a rapid onset of action, rapid cessation of action with rapid recovery of motor function, adequate analgesia (better than with general anesthesia) with minimal side effects, making it an ideal anesthesia for day surgery (4). Other benefits of spinal anesthesia include a lower incidence of postoperative nausea and vomiting, the possibility of early oral hydration and food intake, which is especially important in diabetics, as well as the possibility of intraoperative or early postoperative communication with the surgeon (5). Spinal anesthesia can also be opioid-free anesthesia. Spinal anesthesia avoids cognitive impairment, which is often seen in elderly patients following general anesthesia. Spinal anesthesia has gained in importance during the corona pandemic, as it allows surgery to be performed without interfering with the airways, thus lessening the chance of infecting staff. The negative aspects of spinal anesthesia are: the inability to perform it due to anatomical reasons, an inadequate effect and duration of the drug, hypotension after spinal anesthesia (which can be prevented by adequate preoperative hydration of the patient), delayed recovery of motor functions and therefore delayed home discharge, and the possibility of postoperative urine retention and post-puncture headache. However, with the right choice of patients, the correct choice of medication and needles for spinal

anesthesia, and the performance of anesthesia by experienced staff, the percentage of failures and side effects are very small (6, 7).

The properties of the ideal local anesthetic for spinal anesthesia in day surgery are rapid onset of action and rapid cessation of action without side effects, or with minimal side effects. The choice of local anesthetic for spinal anesthesia in day surgery also depends on the expected duration of surgery. The duration and quality of the sensory and motor blockade in spinal anesthesia can be optimized by adding adjuvant drugs to the spinal mixture, most often opioids or adrenaline, for example. The use of some other drugs is also possible, such as clonidine, dexmedetomidine, neostigmine, magnesium, or bicarbonate, but all these drugs, in addition to reducing the dose of the local anesthetic, thereby reducing its side effects, have their own side effects (e.g. more frequent itching, postoperative nausea and vomiting, and urinary retention, when using opioids) (8). We can affect the spread of the drug within the spinal space by changing the baricity of the drug, thus affecting the width of the motor blockade area. The width of the motor blockade area can also be modified by placing the patient in a certain position during drug "fixation". For example, unilateral anesthesia (the anesthesia of only one leg) is achieved by placing the patient on his side, choosing the diseased or healthy side depending on baricity. This technique of spinal anesthesia requires a slightly longer time to begin the activity of the spinal anesthesia, even up to 20 minutes, which delays the start of surgery. To avoid this, it is possible to perform spinal anesthesia in the patient preparation area in front of the operating room, but this requires additional staff. Unilateral anesthesia is associated with a shorter motor blockade and better hemodynamic stability, and can be achieved with lower doses of the drug. The disadvantage is pain in the healthy leg due to pressure during surgery if the patient is on his side. Local anesthetics registered for use in spinal anesthesia in Croatia are lidocaine, bupivacaine, levobupivacaine and chloroprocaine. In other countries, ropivacaine, mepivacaine, articaine, prilocaine, and procaine are also used for spinal anesthesia. The amide local anesthetic lidocaine has the properties of an ideal anesthetic for spinal anesthesia in day surgery in terms of a rapid onset of action of a few minutes, as well as a short duration of action of 60-120 min at a dose of 60-100 mg, but it is mostly not used today due to the high incidence of transient neurological symptoms (TNS) (17%). (5) Bupivacaine is an amide local anesthetic that has a slightly slower

onset of action compared to lidocaine, with a very low incidence of TNS (1%). It has a long duration of action of 3-4 hours (according to some papers even 6 hours) at a dose of 10-20 mg, and consequently, a delayed establishment of motor function as well as spontaneous urination, which postpones home discharge. The use of lower doses of 5-10 mg is associated with a shorter duration, but also with a higher incidence of failure in terms of inadequate quality of sensory and motor blockades, and overly short duration. Levobupivacaine has a similar effect to bupivacaine, with slightly better hemodynamic stability. Newer local anesthetics that have a very fast onset of action and short duration of action with minimal side effects are chloroprocaine and prilocaine, of which chloroprocaine is registered in Croatia. Chloroprocaine is an ester local anesthetic, has a very rapid onset of action at a dose of 40-60 mg, lasts 70-150 minutes, is registered in Croatia for procedures of up to 40 minutes, and is very hemodynamically stable, with a low incidence of hypotension and bradycardia per application. The incidence of TNS is only 0.6%. It is as potent as bupivacaine, but of a shorter duration of action (9).

In addition to the rapid recovery of motor function, day surgery requires getting out of the hospital bed early, which with the use of spinal traumatic needles of large diameter was contraindicated due to the possibility of post-puncture headache because of the leakage of cerebrospinal fluid. However, thanks to the production of atraumatic needles of a smaller diameter, patient verticalization is permitted immediately after the recovery of spontaneous motor function. Studies have shown that the incidence of post-puncture headache when using spinal needles thinner than 25 G is less than 1% (10). However, thinner needles sometimes make it difficult to perform spinal anesthesia, and consequently, unsuccessful punctures are more frequent. Therefore, proper patient selection for day surgery is important (10). With the use of short-acting local anesthetics and small-diameter spinal needles, verticalization of the patient is already possible in 3-4 hours.

The criteria for home discharge after spinal anesthesia are somewhat broader compared to those for general anesthesia and include the return of sensation in the perianal region, possibility of plantar flexion of the foot, and return of proprioception in the big toe. Recovery of urination is not a condition for discharge, but this condition is often placed due to fear of bladder distension and infection. As a means of

preventing urinary retention, some papers recommend limiting intraoperative fluid administration to 500 ml. On the other hand, limiting fluid intake delays the first urination, and adequate hydration is important in preventing postoperative nausea and vomiting. Spontaneous urination should return within 6 hours of the injection of the spinal anesthesia. Recovery of spontaneous urination should be a condition for discharge only in patients who are already at risk for urinary retention, namely those with a history of urinary retention, prostate hypertrophy, or those who have undergone urological surgery (11, 12, 13).

Our early experiences

Today, many orthopedic surgeries of short duration and without expected severe postoperative pain, such as knee arthroscopy, are performed in a one-day surgery (14). However, is it also possible to perform major orthopedic procedures such as hip or knee prosthesis implantations in a one-day surgery? (15). It is well known that spinal anesthesia is the anesthetic of choice for this type of surgery due to the much better analgesia, as well as the avoidance of the systemic effect of anesthetics in such a population which often has multiple comorbidities (16).

Six months ago, the short-acting local anesthetic chloroprocaine started to be used for spinal anesthesia in our clinic. With the beginning of its application, there was an opportunity to perform more extensive procedures such as hip implants as part of the Fast Track Surgery, according to which patients tend to be discharged on the first postoperative day. So far, about thirty patients have been treated in this way, but for now, they are not being sent home on the first postoperative day, but on the second or third.

As part of our protocol, we use multimodal analgesia, which consists of preoperative preemptive analgesia, intraoperative anesthesia/analgesia with the short-acting local anesthetic chloroprocaine along with an intravenous combination of analgesics, and a precisely prescribed postoperative analgesia. Chloroprocaine is a local anesthetic that is an ideal anesthetic for spinal anesthesia in day surgery due to its rapid onset of action, relatively short duration of action, and no side effects. It is hemodynamically stable and causes almost no hypotension or bradycardia. The previously described neurotoxicity of chloroprocaine is caused by the preservative sodium bisulfate, which is no longer used, and the said neurotoxicity being at doses above 100 mg (17).

According to many papers, it has many advantages over lidocaine and bupivacaine (18). Given the relatively short effect of chloroprocaine of 90–120 min, it is very important to prescribe adequate parenteral analgesia at the end of the operation. The verticalization of the patient according to our Fast Track Surgery protocol is done about 4 to 6 hours after the end of the operation, approximately 6 hours after the injection of the spinal anesthesia. So far, no patient has had a post-puncture headache (all patients were given spinal anesthesia with a 26 or 27 G needle). Good patient selection for day surgery is very important. It would be ideal to conduct preoperative patient education related to the whole process as well as to everything that awaits the patient.

Patients must be motivated, in good physical condition, and close to their ideal weight. They must be anatomically suitable to have spinal anesthesia injected. They should have no contraindications to spinal anesthesia in terms of coagulopathy, should not be taking drugs that affect coagulation or have a heart disease that is a contraindication for spinal anesthesia. Since tranexamic acid is also used within the Fast Track Surgery protocol, patients should not have any contraindications for its use.

According to the Fast Track Surgery protocol, non-opioid preemptive analgesia is started 2 hours before the operation. After receiving sedatives as premedication, patients arrive at the operating room, and chloroprocaine is spinally administered, without adjuvant drugs. As part of multimodal analgesia, patients receive small doses of several analgesics (ketamine, dexamethasone, lidocaine) before the operation, which act synergistically, and without side effects, and at the end of the operation they receive tramadol intravenously and levobupivacaine for infiltration of the surgical wound. Postoperative analgesia at the ward consists of a combination of non-opioid analgesics respecting maximum daily doses. Before bedtime on day zero and the first postoperative day, patients receive the opioid analgesic orally. In all patients, the first urination happened within 6 hours of injecting spinal anesthesia. The advantage of multimodal analgesia, which includes spinal anesthesia with chloroprocaine, is better respiratory and cardiovascular intraoperative stability of the patient, better analgesia, and greater patient satisfaction, which is especially evident in elderly patients with comorbidities. In addition to the many benefits of such protocols for the patient, this is financially advantageous for the hospital itself.

Case report

A 71-year-old man underwent elective hip replacement surgery due to coxarthrosis. He has hypertension due to comorbidity, weighs 103 kg, and is 173 cm tall. Two hours before surgery, he received celecoxib and paracetamol orally. Just before coming to the operating room, he was given midazolam orally. Upon arrival in the operating room, he was given spinal chloroprocaine without additives, with a 26 G needle, at the L3/4 level. After spinal anesthesia, he received dexamethasone, ketamine, and lidocaine intravenously as part of multimodal anesthesia. He received tranexamic acid intravenously to prevent major perioperative bleeding. During surgery, the patient was sedated with propofol. At the end of the operation, he received metoclopramide and tramadol intravenously and levobupivacaine for wound infiltration. It took 80 minutes from entering to leaving the operating room, including 45 minutes from the first cut to the last seam. Sensation returned in about 100 minutes after the injection of the spinal anesthesia, motor function after 120 minutes, and the first urination was in about 6 hours after the injection of the spinal anesthesia. The patient was verticalized 6 hours following the injection of the spinal anesthesia. Postoperative analgesia through day zero and the first postoperative day consisted of a combination of celecoxib and paracetamol respecting the maximum daily doses, and in the evening on both days, it consisted of the opioid analgesic (oxycodone) given orally. He did not request additional analgesics other than those prescribed. On the second postoperative day, he was discharged with the recommendation of taking the analgesia celecoxib once daily and paracetamol as needed.

In conclusion, we can say that the prerequisites for the successful application of spinal anesthesia in day surgery are good patient selection, proper patient preparation, perioperative multimodal analgesia, the use of short-acting local anesthetics for spinal anesthesia, fast work by the surgeons, and well-coordinated teamwork (anesthesiologists, surgeons, and physiatrists).

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Sažetak

SPINALNA ANESTEZIJA U DNEVNOJ KIRURGIJI – RANA ISKUSTVA

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Dnevna kirurgija podrazumijeva izvođenje operacije uz boravak u bolnici kraći od 24 sata. Dnevna kirurgija ima mnoge prednosti pred kirurgijom koja podrazumijeva boravak u bolnici kroz nekoliko dana. Anestezija za dnevnu kirurgiju mora imati brzi početak djelovanja, brzi prekid učinka i biti bez ili imati minimalne nuspojave. Dugi niz godina se vjerovalo da je anestezija izbora za dnevnu kirurgiju opća anestezija zbog odgođenog početka djelovanja lokalnih anestetika koji se upotrebljavaju za spinalnu anesteziju, odgođenog oporavka motorike nakon spinalne anestezije u usporedbi sa općom anestezijom i veće učestalosti nekih nuspojava nakon spinalne anestezije, poput retencije mokraće ili postpunkcijske glavobolje. Međutim, s otkrićem novih kratkodjelujućih lokalnih anestetika, te primjene spinalnih igala manjeg promjera, spinalna anestezija je postala jednakovrijedna općoj anesteziji, ako ne i bolji izbor. Naša rana iskustva sa spinalnom anestezijom u dnevnoj kirurgiji su izvrsna.

Ključne riječi: *anestezija, dnevna kirurgija*