

REVIEW

Advantages of spinal compared to general anesthesia

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ABSTRACT

Spinal anesthesia is a regional anesthesia technique achieved by a local subarachnoid anesthetic injection. Local anesthetic blocks conduct of pain on the spinal level and provides analgesia of the body below the navel. It can be used in a wide array of procedures, including laparoscopy. Inguinal hernia surgery is performed under general or regional anesthesia, depending on the indications and the individual approach of the anesthetist and surgeon. This article brings review of the literature and our experience in advantages and disadvantages of spinal anesthesia in open inguinal hernia surgery. We find that spinal anesthesia is cost effective and has advantages in inguinal hernia surgery when compared with general anesthesia, in terms of better postoperative pain control, and less nausea and vomiting, with minimal effects on hemodynamic stability.

Keywords: spinal anesthesia, regional anesthesia, general anesthesia, inguinal hernia

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Introduction

Anesthesia is a word of Greek origin and means insensitivity. In surgery, anesthesia is a deliberately induced insensitivity achieved by introducing an anesthetic into the body or using a physical method (i.e. cold). Surgical anesthesia implies analgesia or loss of sensitivity to pain. In addition to this, general anesthesia implies loss of consciousness. General anesthesia is achieved by introducing various anesthetic agents into the body and delivering them through the blood to the cells of the central nervous system. Anesthetics can be administered by oral, subcutaneous, intramuscular, intravenous or rectal routes, or by inhalation¹.

General and regional anesthesia are two different but complementary techniques, comparable in terms of safety and risk, each with real advantages and disadvantages, experienced in different ways by patients. While some believe that regional anesthesia is safer, others prefer to be completely unaware of the procedure itself and prefer general anesthesia. The increasingly frequent application of regional anesthesia in recent years is the reason for many clinical studies and analysis of existing data in the literature to determine the real advantages of its application over general anesthesia, and whether regional anesthesia reduces mortality after surgery. In addition to morbidity and mortality as important indicators of quality, patient satisfaction is recognized as another important component of both health care in general and anesthesia care¹.

The goal of this paper is to encourage anesthetists to apply spinal block anesthesia whenever the opportunity and the indications exist, due to the advantages elaborated in the cited literature. With this way of thinking and the application of medical doctrines, we provide a higher degree of intraoperative safety for the patient, better control of postoperative pain, a lower incidence of postoperative nausea and vomiting, with a not negligible financial benefit.

General anesthesia

General anesthesia is a pharmacologically induced state of insensitivity to external stimuli, characterized by controlled, reversible depression of the central nervous system. It includes loss of consciousness, all painful sensations (analgesia), extinguishing of defensive reflexes, and muscle relaxation. Muscle relaxation makes it impossible for the patient to breathe spontaneously, which is why it requires maintenance of breathing by artificial ventilation. These effects can be induced by a single anesthetic, but they are most often induced by different means: anesthetics, analgesics and muscle relaxants. In terms of the route of entry of the anesthetic into the body, general anesthesia can be inhalatory, intravenous or rectal. Inhalatory general anesthetics enter the blood through the lungs, intravenous general anesthetic is introduced through a vein, and sedation can also be induced by intramuscular administration of drugs or rectal application. Nowadays, pharmacological agents are combined with these techniques of introducing anesthetics into the body, and this is known as balanced anesthesia^{2,3}.

Regional anesthesia

Regional anesthesia using local anesthetics inhibits sensation, motor stimuli and pain, enabling spontaneous breathing and communication with the patient, who is not deprived of consciousness during the surgical procedure. By inhibiting the transmission of pain impulses, the anesthetics applied also prevent the endocrine-metabolic response to stress⁴. This method is divided into central (neuroaxial) and peripheral techniques. Central techniques include epidural and subarachnoid (spinal) anesthesia, while peripheral techniques include blocks of peripheral nerve bundles or individual peripheral nerves. Spinal anesthesia is a technique in which a local anesthetic is injected into the subarachnoid space, that is, the space between the pia and the arachnoid mater, so perhaps the more appropriate name is subarachnoid or intrathecal anesthesia.

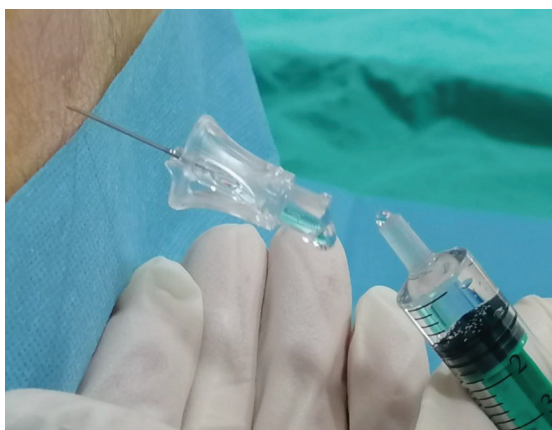


Figure 1. Cerebrospinal fluid backflow trough spinal needle after successful intrathecal puncture.

Although it is possible to introduce anesthetic at any level, it is common to insert the needle below the terminal part of the spinal cord, for example below the L2 level, to minimize the possibility of injury to the spinal cord.



Figure 2. Assessment for spinal block level L3/L4 or L4/L5.

All surgical procedures can be performed under general anesthesia, while regional anesthesia is suitable for some procedures as a complete substitute for general anesthesia. Spinal anesthesia, as a type of regional anesthesia, can be used specifically for almost all procedures on the legs, hips, pelvis and lower abdomen, including caesarean sections. In addition, spinal anesthesia can be used for ambulatory laparoscopy, and urological and ano-rectal procedures⁵.

Comparison of anesthesia techniques

By comparing the two techniques over the last few decades, numerous studies have attempted to determine whether there are convincing advantages of regional over general anesthesia. It has been shown that some of the benefits derive from the already mentioned sympatholytic action of neuraxial anesthesia. These are lower vascular resistance and the less frequent occurrence of perioperative supraventricular arrhythmia in cardiac patients. However, data on the reduction of overall cardiac morbidity and mortality differ. Regional anesthesia provides good preemptive analgesia, thereby reducing the need for long-term postoperative analgesia. Better pulmonary function has been reported, especially in patients with chronic obstructive pulmonary disease, which is attributed to the lower use or even avoidance of opioids during neuraxial anesthesia. The advantages include anti-inflammatory and antithrombotic effects, faster recovery of bowel function, and the beneficial effects on intestinal peristalsis, thereby reducing the occurrence of postoperative ileus, as an important factor in morbidity and mortality^{6,7}. On the other hand, the disadvantages of regional anesthesia are that it sometimes requires a longer induction time, and is associated with possible failure, inadequate analgesia or a failed block⁸. Despite the well-known fact that each of the techniques carries a specific risk, the prevailing belief is that patients undergoing surgery under regional anesthesia are exposed to a lower risk than those in which general anesthesia is applied, or simply that regional anesthesia is safer than general anesthesia. Some of the supporters of regional anesthesia want to be awake during the operation, avoiding the loss of autonomy and consciousness⁸. General anesthesia is often perceived as a potentially dangerous procedure. The participants of the research conducted report the fear of being awake during the operation and the fear of not waking up after the operation. However, some people are reluctant to accept or expressly refuse regional anesthesia due to the fear of discomfort and pain during the procedure and possible consequences in case of damage to nerve structures. While the loss of consciousness is considered a disadvantage by the proponents of regional anesthesia, it

is considered an advantage by the proponents of general anesthesia. A special group for which the advantages and disadvantages of general and regional anesthesia should be analyzed are geriatric patients. As total perioperative mortality increases with advancing age, already from the third decade, one should be especially careful in the choice of technique and drugs for anesthesia of elderly patients. This group often requires smaller doses of anesthetics than younger patients, and the frequency of side effects and drug interactions is higher, due to the changing physiology during aging, but also due to polypharmacy at older ages. What actually increases the morbidity and mortality in this group are age-related diseases, not age in itself⁹. Furthermore, an increased occurrence of thromboembolic incidents was recorded in patients after surgical treatment of hip fractures, or during major urological operations when using general anesthesia compared to regional anesthesia. While the use of regional anesthesia brings the risk of more frequent occurrence of hypotension in this group of patients, the sympathectomy, or “stress-free” feature, makes this anesthesia more convenient, reducing the body’s stress response and improving the outcome^{7,10}. Although the choice of anesthetic technique is individualized regardless of age, and requires careful processing and assessment, the general recommendation for anesthesia of geriatric patients is regional anesthesia, and when this is not possible, then a combination of general and regional anesthesia¹¹. Inguinal hernia surgery can be performed under spinal anesthesia, as well central neuroblock, induced by the subarachnoid injection of a local anesthetic solution, and is most often used during operations in the pelvis and lower extremities. The advantages of spinal anesthesia are: fast formation of the block, simplicity of execution, small doses of local anesthetic (2-4 ml), reduction of the intensity of the metabolic response to surgical stress, and reduction of the incidence of deep vein thrombosis. There is also a possibility of side effects, primarily arterial hypotension. The degree of hypotension, in some patients, can be significant (up to 50% compared to basal values), which can critically worsen an already existing, basic cardiac disease. Hemodynamic instability (arterial hypotension) was observed in only 5% of patients. Intrathecal

opioids, alone or in combination with a local anesthetic, enhance sensory blockade, without affecting the degree of sympathetic blockade. Also, intrathecally administered opioids provide excellent intra- and postoperative analgesia. Due to the risk of late respiratory depression, preference is given to highly liposoluble opioids, e.g. fentanyl. The effect of fentanyl occurs quickly and, because of its lipophilicity, it does not tend to migrate into the fourth brain ventricle in sufficient quantity to cause delayed respiratory depression¹¹.

Materials and methods

In this research we included data from 40 patients of the ASA I/II group who underwent spinal anesthesia at the General Hospital “Dr. Mustafa Beganović” in Gračanica, in the Department of Surgery, for inguinal hernia surgery, using the open method in the period from 2018-2020. All patients were prepared preoperatively in an identical manner with standard laboratory tests, EKG, chest X-ray and examination by internal medicine specialists. Spinal anesthesia was introduced in aseptic conditions by subarachnoid injection of 2-2.5 ml of 5% Bupivacaine with adjuvant 25 mcg of Fentanyl.

Results

Intraoperatively during spinal anesthesia, 2 patients showed signs of hemodynamic instability (a drop in 30% from the preoperative blood pressure value) followed by compensatory tachycardia, which was stopped by the immediate administration of 500 ml of Ringer lactate. From Table 1, we can see that immediately postoperatively, two patients complained of signs of postoperative nausea and vomiting, which were treated by Metamizole and Metoclopramide i.v. with 0.9% NaCl. Postpuncture headache was observed in two patients, one of whom was treated symptomatically after discharge for up to 10 days, and there was one patient without symptoms of postpuncture headache after discharge. Two patients were converted from spinal to general anesthesia due to an

Table 1. Adverse effects of spinal anesthesia

Complications of spinal anesthesia	40 patients ASA I/II operated for inguinal hernia under spinal anesthesia		Complications of spinal anesthesia - percentage
	From intraoperative to 7 days postoperative	From 7 to 21 days postoperative	
Postoperative transient headache	1	1	5 % (2.5 % + 2.5 %)
Postoperative pain and nausea	2	0	5 %
Hemodynamic instability	2	0	5%
Neurological side effects	0	0	0
Cardio-respiratory arrest	0	0	0

unsuccessful spinal block. From the above sample, we note that there were no severe complications of spinal anesthesia. Postoperatively, early puncture headache occurred in 2.5% and late postpuncture headache was observed in 2.5% of patients. Immediate early postoperative pain and nausea was recorded in 5% of the patients of this sample.

Conclusion

Previous experiences presented in the literature show that spinal anesthesia (especially selective block) has an advantage over other forms of anesthesia. The effect on hemodynamics and the need for postoperative analgesics is minimal. General anesthesia is recommended if there are absolute contraindications for spinal anesthesia. It is necessary to have a good knowledge of all the advantages, but also the potential complications of a certain type of anesthesia, and to approach each patient individually in order to achieve an optimal outcome.

Conflict of interests

The authors have no relevant financial or non-financial interests to disclose.

Patient Consent Form: All participants were informed about subject of the study.

Author's Contribution:

Almir Sakic: Data curation, Visualization, Investigation, Writing-Reviewing, Software, Validation. Bakir Helic: Conceptualization, Methodology, Writing-Original draft.

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