



REGIONAL ANESTHESIA IN SPINAL SURGERY: COULD IT BE THE SOLUTION FOR DIFFICULT INTUBATION

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SUMMARY – This article includes two topics - anesthesia for spinal surgery and difficult airway, both of them are linked with the same topic, which is regional anesthesia. In recent years, regional anesthesia for spinal surgery has gained a great popularity, where neuraxial blocks are the first choice. Regional anesthesia seems to have benefits against general anesthesia due to lower rate of perioperative and postoperative complications, lower cost and length of stay. This is more evident in elderly population or patients with comorbidities. On the other hand, difficult airway is the life threatening condition and requires increased attention. There are many methods and tools for managing difficult airways, but there are few supporters of regional anesthesia as an option or solution in these cases. Of course, special attention is required during regional anesthesia in a patient with difficult airway, the decision must be correct, and an anesthesiologist must have a preformulated strategy for airway management.

However, does not the same happen even when we apply general anesthesia?

Key words: *spinal surgery, regional anesthesia, difficult airway*

Introduction

This review provides a novel overview of advantages and disadvantages of application of regional anesthesia during spinal surgery and a difficult airway management with regional anesthesia.

Regional anesthesia in spinal surgery

General anesthesia during spinal surgery is the accepted technique by anesthesiologist and surgeons due to prone position, surgeon's comfort, securing of airway, bleeding or extension of surgery (1). However, in recent years, application of spinal anesthesia, epidural anesthesia or combined spinal-epidural anesthesia is

widely used in spinal surgery, mostly in lumbar disc surgery, (2,3) but also during thoracolumbar instrumentation (4). More novel regional anesthesia blocks are erector spine plane block and thoracolumbar interfascial plane block. They provide postoperative analgesia, lower opioid consumption and increase the incidence of postoperative nausea and vomiting. (5,6).

Spinal anesthesia

Advantages and disadvantages of spinal anesthesia for lumbar spine surgery are recently explained in the review article by Lee JK and colleagues (7). Regional anesthesia decreased the mortality and morbidity due to lower blood loss, lower risk of thrombosis and myocardial infarction or renal failure. Advantages of this type of anesthesia are also evident in postoperative period with lower rate of hypoxic episodes in postanesthesia care unit (PACU), postoperative analgesic man-

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agement is improved and patients are highly satisfied. On the other hand, we could be faced with severe bradycardia or hypotension, risk of intraoperative moving and challenging sedation. Hemodynamic stability, reduced duration of surgery, lower cost, and lower rate of surgical complications are also reported (8).

De Cassai and colleagues (9) proved the superiority of spinal anesthesia against general anesthesia, and among others, due to better postoperative pain relief and longer time to first rescue analgesic, and reduced opioid consumption. Intensive care admission and complication rates are lower. Benefits from spinal anesthesia are more evident in geriatric patients and patients with comorbidities (9, 10).

Complications of spinal anesthesia are rare and could happen not only in the operating room, but also in PACU. Postoperative vasovagal cardiac arrest in Picrocuris is described by Keenan C and colleagues (11). Thoracic sympathetic blockade leads to episodes of bradycardia. Hypotension also might be present and requires immediate application of atropine, ephedrine, and epinephrine (12).

Epidural anesthesia

Anesthesiologists before the surgery generally perform epidural anesthesia and placement of epidural catheter. Also, surgeons could put the epidural catheter during the surgery (13). Highly recommended is the delivery of local anesthetics for postoperative analgesia through epidural catheters, especially in big spine surgeries such as scoliosis surgery. This leads to decreased use of opioids in postoperative period, and lowers the rate of opioid induced complications, like nausea, vomiting, obstipation and respiratory compromise (13).

The rate of atelectasis and other postoperative pulmonary complications, which are enhanced by general anesthesia, significantly decreases with epidural anesthesia and analgesia (14). Decreased functional residual capacity, forced vital capacity and prone positioning lead to atelectasis (15). Studies reported that the incidence of atelectasis in postoperative period is up to 50%, followed by infiltrate, lobar collapse and pneumonia in patients who received general anesthesia (14, 15).

Postoperative delirium and cognitive dysfunctions were two main complications that caused a delay in the hospital discharge and have affected life quality. The incidence of delirium has been reported in the literature as high as 24.3% after spine surgery in el-

derly patients (16). General anesthesia is associated with postoperative delirium (17) and may increase the risk of developing postoperative cognitive dysfunction (18). It is suggested that the higher rate of delirium in patients might cause additional risk factors such as higher blood loss, pain, and opioid use.

Difficult airway management

All life threatening procedures starting with A-airway management, and each anesthesiologist daily deal with approximately 6 patients, who need A-airway management, in or out of operating rooms. Failure or difficult airway management have high mortality and morbidity rate. About 25% to 46% of anesthesia-related deaths are associated with difficult airways (19). The incidence of difficult face-mask ventilation ranges from 1.4 to 5.0% (20). The incidence of difficult tracheal intubation ranges from 5 to 12%, and failed tracheal intubation from 0.05 to 0.35% (21, 22).

American Society of Anesthesiologists defined the difficult airway as follows: "A difficult airway includes the clinical situation in which anticipated or unanticipated difficulty or failure is experienced by a physician trained in anesthesia care, including but not limited to one or more of the following: facemask ventilation, laryngoscopy, ventilation using a supraglottic airway, tracheal intubation, extubation, or invasive airway." (23)

The reasons to failure during airway management are different and ASA classified it to practitioner related, patient related (anatomical or physiological), environmental factors (difficult airway equipment monitoring) and institutional (24).

Detailed airway assessment mostly could predict the difficult airway. However, the tests used to assess airways are not sensitive enough to detect unexpectedly difficult airways (25).

Predicted difficult airways guide us to prepare the appropriate airway management equipment, human factor and environment, and act according to guidelines. Unpredicted difficult airway presents a serious problem, where the guidelines come to our aid, again. Extubation of these patients is recommended with a previously formulated strategy and subsequent airway management, led by a professional (24).

There are several complications during airway management. The Fourth National Audit Project (NAP4) of the Royal College of Anesthetists and the Difficult Airway Society (DAS) in the United Kingdom

showed that one of 22,000 cases of tracheal intubation was associated with severe adverse airway management events in the operating room, such as death and brain damage. Aspiration of gastric contents was the major cause of airway-related mortality and morbidity in these patients. Authors suggested that the number of cases may have been underreported, and the true incidence of severe events might have been 4 times as high (1 of 5500 cases) (19).

Regional anesthesia for difficult airway

In 2016, during the night shift the neurosurgeon decided to perform the elective lumbar discectomy, for herniated disc in level L₂₋₃, on a healthy man in his forties. He suffered from severe back pain and limited movement. It was his first surgery. During the preoperative visit, he had the normal mouth opening, Mallampati grade II and normal neck movement. After induction to anesthesia, the mask ventilation was successful, but during laryngoscopy, the visualization of epiglottis and vocal cords was impossible. After many failed attempts of two anesthesiologists, it was decided that the attempt to intubate should be stopped. There was no difficult intubation equipment in the hospital, the patient was awakened, and the surgery was planned after two days under regional anesthesia. Spinal - epidural anesthesia was performed in L₄₋₅ level and the epidural catheter was placed. The surgery was performed without complications. The equipment for difficult intubation equipment was taken from the other hospital and was ready if regional anesthesia failed (25).

The question is to use or not to use regional anesthesia in predicted difficult airway management. Anesthesiologist often ask this question during their daily practice. The literature provides advantages and disadvantages of the answer.

Neuraxial blocks, spinal and epidural or both are mostly performed during thoracic, abdomen and lower limb surgery. Peripheral nerve blocks are used for trunk and upper or lower limb surgery. However, neuraxial blocks are also used during spinal surgery. Pregnant, obese and elderly patients present the risk group and difficult airway management is predicted. Patients with rheumatoid arthritis and ankylosing spondylitis may provide difficulties for airway management but also performing of regional anesthesia may be unsuccessful, especially spinal and epidural anesthesia or inability to obtain proper body posture during instrumentation.

On the other hand, there are absolute and relative contraindications for regional anesthesia. Patient refusal, coagulopathies, allergy to local anesthetics, and infection at the injection site are absolute contraindications to regional anesthesia. For neuraxial blocks it refers to severe hypovolemia and increased intracranial pressure. Relative contraindications are sepsis, uncooperative patient, preexisting myelopathies or demyelinating diseases, and aortic or mitral stenosis, spinal deformities for neuraxial blocks (26).

Complications and side effects of regional anesthesia have been recently described in retrospective cohort study by Brazilian authors, included 10,838 patients with neuraxial or peripheral nerve blocks. The complications or side effects are presented in 10.1% (1039) patients, from whom 11.4% were from neuraxial block and 5.2% from peripheral nerve blocks. The most common side effects are sensory or motor deficits, nausea and vomiting, and pruritus. The most common complications were subcutaneous cell tissue hematoma, epidural abscesses and arachnoiditis (27).

The benefits of regional anesthesia are explained in the first part of the article.

The other advantage of regional anesthesia is that we avoid the problem when managing difficult airway. Although, there is no conclusive evidence in the literature to support the use of regional or general anesthesia when we deal with difficult airway.

American Society of Anesthesiologists (ASA) guidelines for management of difficult airway published in 2003, 2013, and 2022 (23) recommended regional anesthesia as an option, but one must be aware and prepared for difficult airway management, if an unsuccessful block or its complications may occur.

Pascarella and colleagues (28) created informative flowchart, the deciding SOS guide for regional anesthesia in patients with difficult airway management (Figure 1).

Complications of regional anesthesia are rare. The needs for immediate airway management of patient with regional anesthesia are as follows: failed or incomplete block, high or total spinal anesthesia, deterioration of patient's condition during surgery, toxic or allergic reaction to local anesthetic or prolonged surgery (29). The other factors, which limit safety of regional anesthesia, are major blood loss, position during surgery, duration of surgery more than 60 minutes and surgeon's skills.

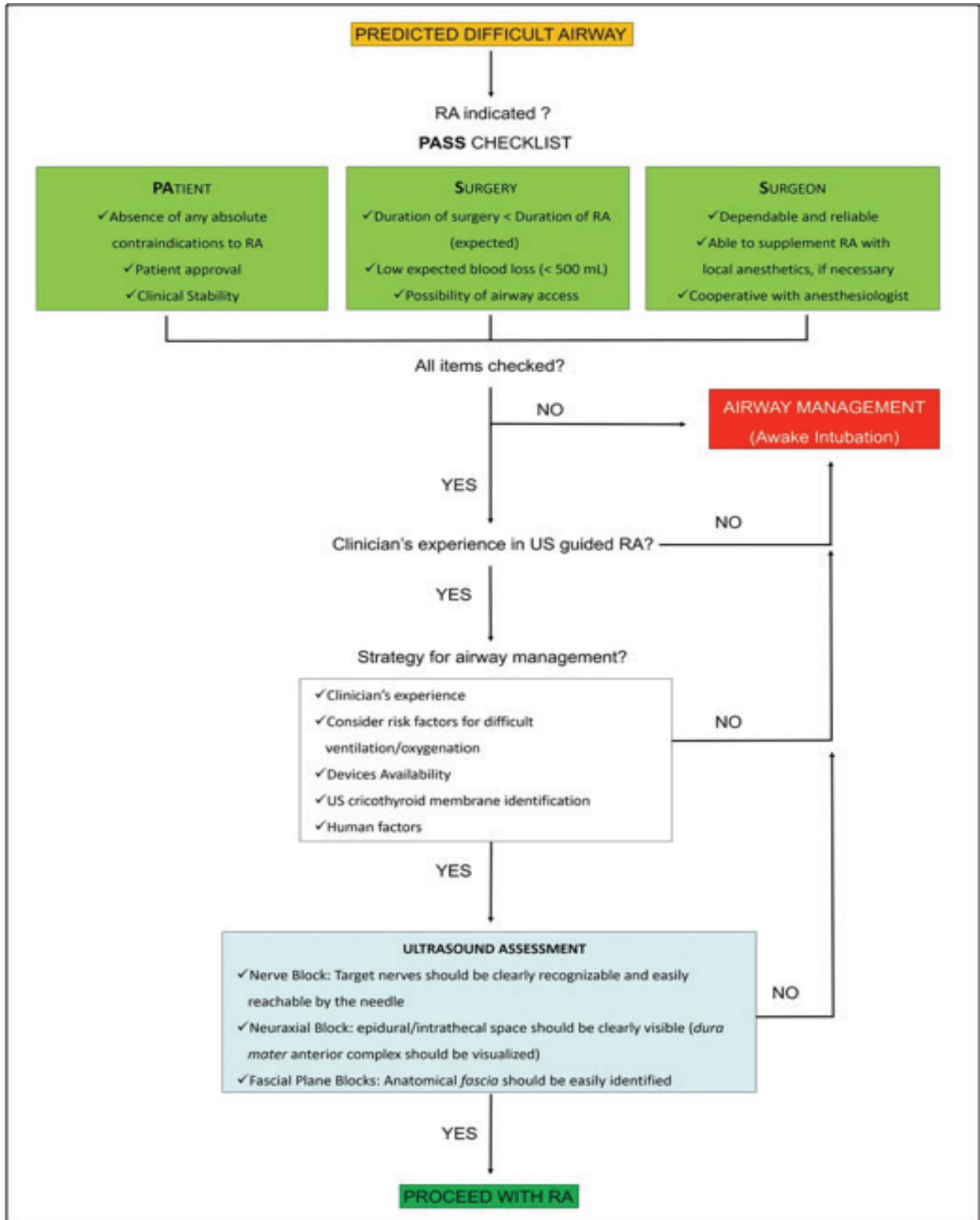


Figure 1. RA in patients with predicted difficult airways: the SOS algorithm. Reproduced from: Giuseppe Pascarella et al. Reg Anesth Pain Med 2021;46:285-286. (28) Copyright notice April, 2022 with permission from BMJ Publishing Group Ltd.

All these unpredicted adverse events require the conversion from regional to general anesthesia to secure the airway. In this situation, backup airway management plan must be present. All required difficult airway equipment must be provided, team members must be prepared and any life saving techniques must be deployed in this situation.

Conclusions

There is a triangle between the patient, the anesthesiologist and the surgeon, and in the middle there is the best choice of anesthesia for all of them. Given the risks and benefits, it is evident that regional anesthesia is superior to general anesthesia and could be used during spinal surgery safely, especially in elderly patients and patients with comorbidities. Regional anesthesia technique is a part of difficult airway management guidelines. The anesthesiologist must be aware and prepared for airway management if regional anesthesia fails, the surgery becomes complicated or patient's health conditions deteriorate.

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Sažetak

REGIONALNA ANESTEZIJA U SPINALNOJ KIRURGIJI: MOŽE LI TO BITI RJEŠENJE ZA TEŠKE INTUBACIJE

A. Hasani

Ovaj članak obuhvaća dvije teme - anestezija za operaciju kralježnice i otežani dišni put, obje su povezane s istom temom, a to je regionalna anestezija. Posljednjih godina veliku popularnost stekla je regionalna anestezija za operaciju kralježnice, gdje su neuroaksijalni blokovi prvi izbor. Čini se da regionalna anestezija ima prednosti u odnosu na opću anesteziju zbog niže stope perioperativnih i postoperativnih komplikacija, niže cijene i duljine boravka. To je izraženije kod starije populacije ili bolesnika s komorbiditetima. S druge strane, otežani dišni putovi su stanje opasno po život i zahtijevaju povećanu pažnju. Mnogo je metoda i alata za zbrinjavanje otežanih dišnih putova, no malo je pristaša regionalne anestezije kao opcije ili rješenja u ovim slučajevima. Naravno, potrebna je posebna pozornost tijekom regionalne anestezije kod bolesnika s otežanim dišnim putovima i odluka mora biti ispravna, a anesteziolog mora imati unaprijed formulu strategiju upravljanja dišnim putovima.

No, ne događa li se isto i kada primijenimo opću anesteziju?

Ključne riječi: *spinalna kirurgija, regionalna anestezija, otežan dišni put*