

Comparative Analysis of Regional versus General Anesthesia

Luisa Mason¹ and Dr. Tiffany Jackman¹

¹University of West Florida, Pensacola, Florida, United States

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ABSTRACT

The administration of regional or general anesthesia is dependent upon many factors to help reduce complications and improve patient outcomes after surgery. In this comparative analysis, the advantages and disadvantages of both types of anesthesia as well as their respective contraindications are reviewed. Both regional and general anesthetics come with adverse effects including morbidity/mortality, and a certain threshold that warrants a type of anesthesia suitable for a surgical procedure. Although there are risks associated with both, certain patient populations may be at higher risk of complications including the elderly, severely ill, and individuals with specific medical conditions. A review of current literature advises the following factors to be examined prior to choosing an anesthesia method most appropriate for the patient including: body mass index (BMI), medical history, age, current medications, fasting time, alcohol/drug intake, pharmaceutical drug use, dental work and airway inspection, as well as neck flexibility and head extension. The research suggests that the patient be fully informed of the risks and benefits of both regional and general anesthesia, as well as taking part in the decision-making process.

Introduction

The administration of regional or general anesthesia is dependent upon many factors to help reduce complications and improve patient outcomes after surgery. While general anesthesia is performed to induce a loss of consciousness, regional anesthesia is used to numb a specific portion of the body. Regional anesthesia includes: spinal anesthesia, epidural anesthesia, and nerve blocks (Torpy, Lynn, & Golub, 2011).

Anesthesia has been around for over a hundred years, Dr. Morton performed the first successful surgical procedure using anesthesia in 1846 (Robinson & Toledo, 2012). Since then, many types of anesthesia were developed using many different drugs. William Halsted, founder of the John Hopkins School of Medicine, first used cocaine as a nerve block during surgery in 1884 (Redman, 2011). Nowadays, propofol is commonly used for general anesthesia. However, for regional anesthesia there are a variety of different drugs used for each subtype of regional anesthesia such as ropivacaine (Thompson, 2010). Each drug that is used in anesthesia comes with its own side-effects, making it even more important that the patient be well informed prior to a procedure. The goal for this research was to compare the differing types of anesthesia and to determine whether general or regional anesthesia was a safer option.

Methods

The research plan included a review of the most recent peer-reviewed articles from journals dated between 2016 through 2019 to determine the side-effects, indications, and contraindications to both regional and general anesthesia. The projected outcome expected that regional anesthesia would have fewer risks than general anesthesia. The data was compiled by outlining the advantages, disadvantages, side-effects, as well as contraindications and indications of both types of anesthesia. Peer-reviewed journal articles were chosen using the following:

1. Databases: Pubmed, National Institute of Health (NIH), and Google Scholar
2. Keywords: General Anesthesia, Regional Anesthesia, Contraindications, and Complications
3. Inclusion/Exclusion: Scholarly Peer Review within the last three years

The expectation of this research assumed that regional would be a safer method of anesthesia with less side-effects.

Results

The literature advises several factors to be examined prior to choosing a anesthesia method most appropriate for the patient including: body mass index (BMI), medical history, age, current medications, fasting time, alcohol/drug intake, pharmaceutical drug use, dental work and airway inspection, neck flexibility and head extension. As noted in Table 1, both regional and general anesthesia come with respective advantages and disadvantages that should be taken into consideration before a procedure. Although predictions hypothesized that regional anesthesia is safer, the literature conceded that both have equal risks and the decision to use either was based on multiple factors.

With modern advances in medications, monitoring technology, and safety systems, as well as highly educated anesthesia providers, the risk caused by anesthesia to a patient undergoing routine surgery is extremely remote. Mortality attributable to general anesthesia is said to occur at rates of less than 1:100,000. Minor adverse events occur at more frequent rates, even in previously healthy patients Newman, 2018).

Table 1. Side-by-side Comparison of Regional Versus General Anesthesia

Type	Advantages	Disadvantages	Side Effects	Contraindications	Indications
Re-gional	<p>Less nausea</p> <p>Less vomiting</p> <p>Less blood loss</p> <p>Less risk of infection and pneumonia</p> <p>Optional post-op pain relief</p>	<p>Time consuming (sciatic and femoral blocks take 15-30 minutes to be effective)</p> <p>Failure rate is 5%</p> <p>Anesthesia provider must have adequate training</p>	<p>Hypovolemia (increase in blood volume)</p> <p>Indeterminate neurologic disease</p> <p>Coagulopathy</p> <p>Increased intracranial pressure</p> <p>Direct needle trauma</p> <p>Abscess</p> <p>Meningitis</p> <p>Vertebral canal hematoma</p> <p>Spinal cord ischemia</p> <p>Cauda equina syndrome (spinal cord damage)</p> <p>Arachnoiditis (inflammation of spinal sheath)</p> <p>Peripheral nerve injury</p> <p>Cardiovascular collapse</p> <p>Shivering</p> <p>Transient mild hearing impairment</p> <p>Urinary retention (New York School of Regional Anesthesia, 2019)</p> <p>Headache</p> <p>Skin reaction or itch</p> <p>Infection</p> <p>Nerve damage</p> <p>Paralysis</p> <p>Respiratory failure</p> <p>Pain</p> <p>Numbness</p> <p>Seizures</p> <p>Reduced muscle control</p>	<p>Infection at site or sepsis</p> <p>Patient refusal or is uncooperative</p> <p>Low blood pressure</p> <p>Allergy to local anesthesia</p> <p>Anticoagulation</p> <p>Preexisting peripheral neuropathy</p> <p>Abnormal anatomy (OpenAnesthesia, 2019)</p>	<p>Conditions which regional anesthesia is preferred:</p> <p>Diabetic</p> <p>Ischemia</p> <p>Respiratory diseases</p> <p>Cardiac failure</p>

			Death (American Society of Anesthesiology, 2015)		
General	<p>Reduces intraoperative patient awareness and recall</p> <p>Allows use of muscle relaxants</p> <p>Facilitates complete control of the airway, breathing, and circulation</p> <p>Can be used in cases of sensitivity to local anesthetic agent</p> <p>Can be administered without moving the patient from the supine position</p> <p>Can be adapted easily to procedures of unpredictable duration or extent</p> <p>Can be administered rapidly and is reversible</p>	<p>Requires preoperative patient preparation</p> <p>Requires increased complexity of care and associated costs</p> <p>May induce physiological fluctuations that require active intervention</p> <p>May induce malignant hyperthermia (lethal temperature rise, hypercarbia, metabolic acidosis, and hyperkalemia)</p>	<p>Nausea/vomiting</p> <p>Sore throat</p> <p>Incisional site pain</p> <p>Emergence delirium (in children) (Adler, 2018)</p> <p>Unintended intraoperative awareness</p> <p>Postoperative confusion and memory loss (although this is more common in the elderly)</p> <p>Dizziness</p> <p>Difficulty passing urine</p> <p>Bruising or soreness from the IV drip</p> <p>Shivering and feeling cold</p> <p>Heart attack</p> <p>Pneumonia</p> <p>Stroke</p> <p>Death (Newman, 2018)</p>	<p>There are no absolute contraindications to general anesthesia; however, there are many relative contraindications. A preoperative evaluation is completed reviewing patients' medical comorbidities, heart/lung/kidney function, and pregnancy/smoking status (Smith & Goldman, 2018). Conditions that increase risks: obstructive sleep apnea seizures existing heart, kidney or lung conditions high blood pressure alcoholism smoking history of reactions to anesthesia medications that can increase bleeding drug allergies</p>	<p>Reduces intraoperative awareness</p> <p>Allows use of muscle relaxants</p> <p>Facilitates complete control of the airway</p> <p>Can be used in cases of sensitivity to local anesthetic agent</p> <p>Can be administered without moving the patient from the supine position</p> <p>Can be adapted easily to procedures of unpredictable duration or extent</p> <p>Can be administered rapidly and is reversible (Adler, 2018)</p>

				diabetes obesity or over- weight (Newman, 2018)	
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Conclusion

There are no absolute contraindications to general anesthesia. However, there are many relative contraindications. The research suggests that the patient be fully informed of the risks and benefits of both regional and general anesthesia, as well as taking part in the decision-making process. The patients who plan to go through general anesthesia should undergo preoperative evaluation by the anesthesia provider. This evaluation involves a review of the patient’s medical comorbidities, heart/lung/kidney function, and pregnancy/smoking status. The patient’s medical condition is maximized preoperatively if at all possible, meaning that any risk factors or possible complications are eliminated prior to the procedure (Smith & Goldman, 2018). There was no evidence to suggest that anesthesia type influences postoperative delirium or mortality. Some studies suggested a small reduction in length of hospital stay with regional anesthesia; however, more research is needed to determine subsequent patient outcomes.

Future Considerations

There are many subcategories of regional anesthesia, including epidural, spinal, and nerve block. The advantages and disadvantages of regional anesthesia can be summarized when comparing it to general anesthesia, but there are still differences between the subcategories that should be considered when choosing regional anesthesia for a procedure. Future research will include a comparative analysis between types of regional anesthesia to further aid in the decision-making process when choosing an anesthesia for a procedure.

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