1-1-2006

Presenting Information regarding Regional Anesthetic Consent

Samuel J. Mitzel

Presenting Information regarding Regional Anesthetic Consent

by

Samuel J. Mitzel BSN, RN
North Dakota State University

An Independent Study

Submitted to the Graduate Faculty

of the

University of North Dakota

In Partial Fulfillment of the Requirements

For the Degree of

Master of Science

Grand Forks, North Dakota

Table of Contents

Abstract

Many people have surgical procedures everyday without sufficient knowledge to make a proper informed consent to the different types of anesthesia available. The purpose of this independent study project was to review the different types of regional anesthesia and present them to individuals who will be having surgery, so these individuals can be informed as they give consent to anesthesia. Highlighted positive and negative aspects of both regional and general anesthesia are included along with indications and contraindications of each type of anesthesia.

The information presented is focused on the adult population who will be asked to make consent for themselves or other individuals who need assistance with consent. The information within this project was used to create a brochure filled with information about choosing the proper anesthetic for an individual having a surgical procedure. If the patient is properly informed about the addition of regional anesthesia to the surgical plan, it is believed that there will be better outcomes and more patient satisfaction with fewer complications and less patient anxiety. The study concludes with recommendations for nursing practice, education, further research and policy considerations.

Introduction

In the appropriate patient, regional anesthesia may produce better outcomes both during and after the surgical procedure. As is described later, the use of local and regional anesthesia is safer than general anesthesia, and decreases the need for intravenous narcotics that in and of themselves have many side effects that can be avoided. These side effects include respiratory depression or respiratory arrest, nausea, vomiting, itching, and a decrease in blood pressure. This is especially true with spinal anesthesia. It has been found that even in a teaching hospital setting, spinal anesthesia has economic advantages over general anesthesia (Schuster, Gottschalk, Berger, & Standl, 2005). Thus, regional anesthesia is not only safer than general anesthesia; it is also more cost effective.

This preference for general anesthesia by the majority of the population is obviously due to lack of knowledge on the part of the surgical candidate. If an individual is truly informed concerning the safety of regional anesthesia, along with the higher incidence of complications associated with general anesthesia; it is expected he or she would choose the administration of the regional technique.

With the intention of speeding the patient through the preoperative area, the anesthesia provider may not always inform the patient of the complications associated with general anesthesia. These complications include, but are not limited to, failed intubation and the aspiration of gastric contents, which, if it occurs, carries a high incidence of morbidity and mortality.

Purpose of the Project

The purpose of this independent project was to present information regarding regional anesthesia in a format that can be understood by the average individual entering

the surgical area. The author hopes that this knowledge will allow patients to make an informed consent to the specific anesthetic technique; specifically for situations in which regional anesthesia is appropriate.

Significance of the Study

In an attempt to hurry a patient through the pre-surgical arena, some anesthesia providers encourage the use of a general anesthetic over a regional technique. This trend in some institutions may also be linked to the anesthesia provider's decrease in use of regional anesthesia with a subsequent lack of expertise in the use of these techniques.

Overall the morbidity and mortality associated with use of regional anesthetic techniques are less than those associated with the use of general anesthesia. Also, with regional techniques, the patient has less postoperative pain. These facts alone may make the decision for a regional technique a better choice for the patient.

If a patient remains pain free throughout and after a surgical procedure, the individual is more likely to praise the overall experience to friends and family. This alone can be a benefit to the hospital, and could decrease the apprehension in individuals who have heard the account of having a good surgical experience.

With less complications and postoperative pain, anesthesia providers will also benefit from the use of regional anesthesia. With regional anesthesia, the patient may be discharged sooner than the patient recovering from a general anesthetic. This is especially true if the patient has nausea, vomiting, or excessive pain associated with the surgery and the use of general anesthesia.

Assumptions and Limitations

It is assumed that an individual who will be having a surgical procedure will not only want to be involved in decisions regarding the procedure, but will also expect the best outcome possible. It is also assumed that surgeons will want their patients to have better pain control with fewer side effects. Therefore, the patient will want the safest and most effective, rather than the most convenient, type of anesthesia.

When offered information regarding the use of regional anesthesia, in the presentation of the information, the author speculates that there will be some patients who do not want to learn, and just want "to go to sleep" and awakened "when it's all over." This information may not help those individuals, but it is the responsibility of the competent anesthesia provider to properly inform these patients of the types of anesthesia from which they can choose.

Theoretical Framework

The theoretical framework utilized by the author to write this teaching tool is that of Malcolm S. Knowles (1990). He wrote of six characteristics of adult learners. Each characteristic is discussed separately.

Adults need to understand why they are learning

Along with obvious benefits of learning new information, there must also be negative consequences of not learning this information. It is the responsibility of the individual providing information to notify the learners of the importance of the new material.

It is quite obvious that for a surgical procedure, an individual must give consent for that specific procedure. Not all of the individuals going through surgical procedures

understand that a verbal consent, and in some circumstances a written consent, must be given for the type of anesthesia to be provided. The surgical arena can be an extremely stressful one, and that alone can make it difficult for individuals to learn. Therefore, presenting the information to the surgical entrant prior to the day of this anxiety filled event may aid in the individual's ability to learn about the positive aspects of the use of regional anesthesia.

Adults need to be recognized as being personally responsible for their lives

This aspect of learning for the adult population stresses that the learner must take an active role in the acquiring of the knowledge as well as the decision making process. With this characteristic of the adult learner in mind, the information presented to he or she must not be such that it makes one fear the learning process.

One of the aims of this project is to place more responsibility and decision making ability in the hands of the individual going through the surgical procedure. Specific requests or refusals may be done at any time before the operative medications are given.

Adults have a wide variety of past experiences that influence their learning

When attempting to educate members of the adult population, one must remember that as people age, different experiences lead to diverse abilities to acquire and properly use new information. The data presented to these individuals must be such that most adults will learn, and therefore benefit from the facts.

It was a goal of the author of this study to make the information presented to the surgical candidate appropriate for all adult individuals who will be consenting to a surgical procedure. The overall objectives were to prepare the learner and to help him or

her make the best decision when choosing how anesthesia will be provided for their individual surgery.

Adults must be ready to learn

This aspect of instruction reveals that the timing of the presentation of educational material is as important as the information itself. It is the hope of the author of this project that the patients who accept the brochure take the time and are truly ready to discover the facts provided.

Timing is the precise reason that the author of this project wrote a brochure. The pamphlet can be given to the patient any time after they decide to have a surgical procedure. Then, the individual can read and learn the information at his or her convenience. It is very difficult for some to learn different types of anesthesia the day of surgery due to the high stress levels associated with surgical procedures. It is common knowledge that stress level decreases as a person's control of a situation increases.

Adults want to learn how to deal with real life situations

For efficient and comprehensive learning to take place, an individual must agree that the information will help in some aspect of life. The teaching method must be task-centered and explain why the new facts must be learned.

It is human nature to want to retain a certain degree of control; especially where what is done to an individual's body is concerned. Offering a comprehensive and yet easy to understand explanation of techniques of anesthesia hopefully will help people deal with the stress of undergoing a surgical procedure. Decision making abilities are better when the stress is decreased.

Adults have internal motivators

The most powerful rationale for acquiring new knowledge is the motivation that comes form within. A person must truly want to gain a new understanding and comprehension of data for learning to take place.

The motivation to learn about the different types of anesthesia techniques, so one may make an informed decision, must come from within that individual. Therefore, the presentation of the information must stress the importance of gaining and utilizing the knowledge.

Definitions

For the purpose of this project, the following definitions are provided:

1. General Anesthesia: A drug induced reversible depression of the central nervous system resulting in the loss of response to and perception of all external stimuli; this includes amnesia and unconsciousness (Barash, Cullen, & Stoelting, 2001).
2. Regional Anesthesia (neuraxial blockade): The infiltration of local anesthetic into a nerve or group of nerves to provide analgesia to part of the body to facilitate a surgical procedure.
3. Spinal Anesthesia: Simple and very effective, it is the injection of local anesthetic into the easily identified dural sac providing ready access to the spinal nerves, resulting in anesthesia that is rapid, dense, and predictable (Mulroy, 2002). The medication temporarily stops the sensation of pain and may paralyze the muscles, usually only below the rib cage (Brochert, 2000).
4. Epidural Anesthesia: The injection of local anesthetic into the spinal epidural space; technically more difficult and less predictable than a spinal, but offers

greater flexibility in the extent, density, and duration of anesthesia (Mulroy, 2002).

5. Interscalene block: The injection of local anesthetic into a specific nerve in the neck to decrease pain and movement and to facilitate surgery of the shoulder or the upper arm.
6. Axillary block: The injection of local anesthetic into the underarm area into a specific nerve to decrease pain and movement to facilitate surgery of the lower arm and hand.
7. Local anesthetic: A class of drug that, when given topically, or injected, provides analgesia and a nerve block to a localized or regional aspect of the body.
8. Laminectomy: The removal of one or more of the disks that lie between the vertebrae of the skeleton; often done to relieve back pain.
9. Inhalation anesthesia: the administration of an inhalational agent, or gas. This is often used in the administration of general anesthesia.
10. Antiemetic medication: medication that is given to stop nausea.
11. Supraclavicular Nerve Block: The injection of local anesthetics into the area above the middle of the collar bone, or clavicle, to numb the elbow and lower arm to facilitate a surgical procedure in that area.
12. Infraclavicular Nerve Block: The injection of local anesthetics into the area below the middle of the collar bone, or clavicle, to numb the elbow and lower arm to facilitate a surgical procedure in that area.

Review of the Literature

The use of regional techniques with or without general anesthesia is associated with many positive outcomes for the patient in the perioperative setting. The positive outcomes include, but are not limited to, decreased blood loss (and therefore less need for transfusions), lower frequency of toxicity from local agents (a type of drug overdose caused by the surgeon injecting local anesthetics below the skin to assist with post operative pain control), and lower frequency of postoperative complications (including pain, nausea, and vomiting). In one study, the use of combined spinal-epidural anesthesia in renal transplant patients helped maintain higher peak systolic blood flow in the main renal artery than did general anesthesia (Sener, Torgay, Akpek, Colak, Karakayali, Arslan, & Haberal, 2004). This result was obtained with the use of ultrasonography and the difference was found to be non significant (P= 0.35). In theory, this could reduce the rate of rejection of the kidneys.

General anesthesia is associated with a significantly greater risk of perioperative myocardial infarction (Mollhoff, Schmidt, Van Aken, Berendes, Rolf & Buerkle, 2001). Spinal anesthesia, along with other forms of regional anesthesia, is widely utilized in patients with identified pulmonary and cardiac dysfunction. This is due to the fact that general anesthesia is known to cause complications when utilized in individuals with preexisting pulmonary conditions. These complications may include decreased oxygen levels, and the need for assisted post-operative ventilation.

The use of regional anesthesia is also associated with faster cognitive recovery compared to general anesthesia, which is especially important for the elderly population. Total hip replacement performed under regional anesthesia with propofol sedation

enabled recovery of cognitive function two hours after surgery (Sharrock, Fischer, Goss, Flynn, Go, Sculco, & Salvati, 2005). This was assessed using the Stroop Color and Word Test, which directly measures cognitive function. In a study of the intellectual abilities of surgical patients, the use of spinals and epidurals allowed faster cognitive recovery than general anesthesia (Igarashi, Konishi, Sonehara & Asahara, 1995). In this study, cognitive recuperation was assessed using Hasegawa's Dementia Scale: one of the most popular tests for evaluating dementia or delirium.

Decreasing the adverse effects of general anesthesia is very important in the perioperative arena. The use of spinal and peripheral nerve block techniques allows rapid and complete anesthetic blocks. There is a decreased amount of adverse events and unplanned hospital admissions and an increase in the quality of prolonged postoperative pain if continuous peripheral nerve blocks are used (Capdevila & Dadure, 2004). A further study found neuraxial blockade reduced the odds of deep vein thrombosis by 44%, pulmonary embolism by 55%, transfusion requirements by 50%, pneumonia by 39%, and respiratory depression by 59% (Rodgers, Walker, Schug, McKee, Kehlet, van Zundert, Sage, Futter, Saville, Clark & MacMahon, 2000). The results showed a significant difference ($P<0.001$) in all aspects of the study. The study explored complications from a chart review and values for each outcome of interest were calculated using Peto's modification of the Mantel-Haenszel method. Homogeneity was assessed by a chi-squared test.

The use of central neuraxial blockade will probably increase in the future, as serious complications have been reported to be extremely rare (Moen, Dahlgren & Irestedt, 2004). This was found in a retrospective study of the reported complications

associated with the use of regional anesthesia in Sweden between 1990 and 1999. Because there are fewer complications associated with regional anesthesia, those techniques should be used as often as possible to decrease the amount of morbidity and mortality.

Surgical candidates have the right to be informed of the incidence of complications associated with regional and general anesthesia. When the use of regional techniques would be appropriate, they should be utilized. Regional anesthesia is effective and safe. It is documented that general anesthesia has a higher incidence of complications. The incidence of complications are estimated to be 13.4% in inhalation anesthesia, 11.9% in inhalation anesthesia plus epidural, spinal or conduction block, 8.9% in continuous spinal epidural anesthesia, zero % in epidural anesthesia and 7.5% in spinal anesthesia (Minami, Ogata, Horishita, Shiraishi & Sata, 2005). It was found in this retrospective study of anesthesia related complications that the avoidance of inhalational medications is a major factor in the prevention of complications. In caesarean sections, the incidence of anesthetic complications remains low; this is primarily due to the increasing use of regional anesthesia (both spinal and epidural anesthesia) as general anesthesia is associated with a 17-fold increase in complications in this population (Lynch & Scholz, 2005).

A survey administered by Sosis et al. (1995) reported a strong patient preference for general anesthesia and a phobia for spinal anesthesia. This may be linked to the fear of intraoperative awareness and pain. The myth that the use of neuraxial anesthesia is an uncomfortable experience needs to be dispelled.

Complications

The risks for regional anesthesia are associated with the insertion of a needle and the administration of medication into an individual. Some of the complications associated with regional anesthesia include backache, headache, nerve injury, vascular injury, infection, decreased blood pressure, myocardial infarction, and death (Morgan, Mikhail & Murray, 2002). These complications can be decreased if the anesthesia provider is competent and well informed concerning the techniques of regional anesthesia.

Backache

Today, many people suffer from back pain. The pain may have a variety of causative factors that may leave the affected individuals with a wide range of ability to work and accomplish activities of daily living. Some of this pain may be decreased or alleviated with certain therapies or surgical procedures.

Regional anesthesia can also occasionally cause a backache. The backache associated with regional anesthesia is usually self limited and benign, but also may be associated with abscess or epidural hematoma. Treatment is generally with non-steroidal anti inflammatory drugs, acetaminophen, or hot or cold compresses (Morgan, Mikhail & Murray, 2002). If the pain is treated properly, it is usually limited in duration and has no long-term effects.

Headache

Headache is acute or chronic pain occurring in various patterns over the face, scalp or neck (Hanson, 1998). The headache that accompanies regional anesthesia is associated with the puncture of the dura matter. This headache, inexplicably, is more common for individuals who are young, female, and those who are pregnant

(Kuczkowski, 2004). The pain is usually in the front or the back of the head and neck; it may be constant or throbbing, and is relieved by the affected individual lying flat (Morgan, Mikhail & Murray, 2002).

Once again, if a headache occurs because of the regional anesthetic technique, it is usually short lived and causes no permanent damage or problems for the suffering individual. Also, the technique and types of needles used to inject the medication have much to do with the occurrence of a postdural puncture headache. The incidence of a headache while using small and non-cutting needles is extremely miniscule, even for the highly susceptible population. During the performance of an epidural, the needle is usually larger; therefore, if the accidental puncture of the dura takes place (although this is not the objective for this particular procedure), it more frequently causes this headache. With the insertion of a spinal needle, the puncture of the dura is a defining characteristic of the procedure, but the needle is usually much smaller than the epidural needle.

Infection

Infection is the invasion of the body by bacteria. For healthy individuals with an intact immune system most infections are short lived and either resolves without treatment, or are easily treatable.

There have been some studies attempting to find the cause of the bacterial infection associated with regional anesthesia. Catheter localization in the groin, removal of the dressing and omission of postoperative antibiotics were associated with, but were not necessarily causal, for bacterial colonization of peripheral and epidural nerve catheters (Morin, Kerwat, Klotz, Niestolik, Ruf, Wulf, Zimmermann, & Eberhart, 2005).

Out of a possible 26 factors in this study, the three factors listed above were the only ones found to be statistically significant.

Hematoma Formation

A hematoma is the accumulation of blood under the skin, or internal bleeding. If the bleeding is excessive, it may require a transfusion or the surgical removal of the blood. In an individual with clotting systems operating at a normal level, if they occur at all, they are usually small and after a short time, the body reabsorbs the blood into the system.

Where bleeding is concerned, the problem in regional anesthesia is that the needle pierces the skin and is inserted into or near nerves. If a hematoma forms and increases in size, it may cause damage to those nerves. This may produce neurological deficits and or pain that could be temporary or of a more lasting duration. Serious complications associated with neuraxial blockade, such as a spinal hematoma, which may cause neurological problems to the lower abdomen and/or the lower extremities, are very rare (Rodgers et al., 2000).

Overdose

An overdose is usually an unintentional administration of an excessive amount of a drug. The severity of the body's reaction to the overdose is usually in relation to the amount of drug that is given.

In the administration of anesthesia, there are guidelines for the dosages of all of the medicine that is given to the patient. In rare instances, a drug may be given to a patient with no contraindications for that drug, and even though the dosage administered may fall within the recommended guidelines, the patient may experience signs or

symptoms of an overdose. With the administration of regional anesthesia, this reaction may be due to incorrect administration of the drug to an incorrect area of the body. An example of this is the accidental injection of local anesthetic meant for the epidural space into the subarachnoid, or spinal, space. Reactions may range from a mild decrease in blood pressure to seizures and cardiac arrest. Heart rhythm changes or extreme drops in blood pressure are often the presenting sign of local anesthetic overdose (Morgan, Mikkail & Murray, 2002). The prudent and safe anesthesia provider will have equipment, personnel, and medications ready to treat such reactions, and will do so before there are any long term effects.

Myocardial Infarction

Myocardial infarction usually occurs when the muscle of the heart receives less oxygen than it needs. Under most circumstances, this only occurs in an individual that is susceptible to the event. These individuals typically have coronary artery disease (CAD), which is a build-up of plaques and inflammation of the walls of the arteries that supply blood to the heart.

When heart attacks are associated with regional anesthesia (mostly spinals), it is largely due to a decrease in the patient's blood pressure. While heart attacks reportedly occur in 1.54%-5.6% of patients with CAD receiving spinal anesthesia, death is usually prevented if promptly treated with angiography (Mollhoff et al., 2001). The patient that is the most susceptible to hypotension, or low blood pressure, associated with spinal anesthesia, is the patient that is elderly and living with cardiac disease (Rooke, Freund & Jacobson, 1997).

Death

With the administration of medications to the surgical patient, especially if the patient is quite ill, there is always the rare possibility of death. Among other complications the occurrence of death is decreased with the use of regional anesthesia. Overall mortality was reduced by about a third in patients in a group receiving neuraxial blockade in a recent study (Rodgers et al., 2000). Nonetheless, roughly 1 out of every 10,000 people die when spinal anesthesia is given to them (Brochert, 2000).

Contraindications in the use of Regional Anesthesia

The use of regional anesthesia is accompanied with relative and absolute contraindications. Absolute contraindications for use of regional anesthesia include infection over the injection site, problems with blood clotting, patient refusal, inability of the patient to cooperate with the anesthesia provider, very low blood pressure (especially for a spinal), and allergy to local anesthesia agents. Relative contraindications for regional anesthesia are a pre-existing neurological disorder, a back disorder, cardiovascular disease, and aortic stenosis. Marked cardiovascular disease may also be an indicator for regional anesthesia for those who may not be able to tolerate general anesthesia. Other risk factors that increase the incidence of complications are diseases that may be associated with coagulation disorders: such as renal or liver failure; obstetric syndrome of hemolysis, elevated liver enzymes, and low platelets; the presence of ankylosing spondylitis; evident spinal deformity; and increased trauma during the performance of the neuraxial blockade (Moen, Dahlgren & Irestedt, (2004).

Future Anesthetic Considerations

Regional anesthesia can also be used during general anesthesia to reduce the amount of intravenous pain medications needed during and after the surgical procedure. Patients managed with regional techniques during cardiac surgery were found to have significantly less incidence of atrial fibrillation, supraventricular arrhythmia, and myocardial infarction while experiencing superior postoperative pain control and shorter postoperative ventilation (Djaiani, Fedorko, & Beattie 2005). This study also found that for every episode of neurologic complication, 20 myocardial infarctions and 76 episodes of atrial fibrillation were prevented. Another study describing the positive aspects of regional anesthesia reported the findings when a continuous epidural was used in the upper back during coronary artery bypass grafting. The report informed practitioners that not only were there excellent analgesia in these individuals, but in 75% of these patients, the endotracheal tube was removed in the operating room (Pastor, Sanchez, Casas, Mateu & Bataller, 2003).

Some skilled anesthesia providers are using nerve blockade that are not considered to be the classic types of anesthesia for certain surgical procedures. If it is found that the use of these unconventional blocks are successful with few of the associated side effects or complications, the author believes that it is the responsibility of these healthcare providers to report these findings along with the step by step description of how they were accomplished. It was found that in a recent study that spinal anesthesia can indeed be used with patients having a lumbar laminectomy (McLain, Kalfas, Bell, Tetzlaff, Yoon & Rana, 2005). Using spinal anesthesia in these cases was found to be safe and effective, as well as offering advantages such as shorter anesthesia duration,

decreased nausea, decreased antiemetic and analgesic requirements, and fewer overall complications (McLain, et al., 2005). The study also found that, when compared to general anesthesia, this method of regional anesthesia had decreased anesthetic and operative times, less incidence of nausea and a greater requirement for antiemetic medications, and greater rate of urinary retention (all with a $P<0.05$).

If a regional anesthetic fails to produce sufficient analgesia and decreased movement, when needed, increased sedation and pain medicine must be provided. This may possibly include the application of a general anesthetic. The rate of failure of a regional block depends on the type of nerve block utilized. Spinals have a low failure rate, while an interscalene nerve block has a much lower incidence of failure.

Summary

This chapter reviewed much of the current knowledge comparing regional and general anesthesia. Basic ideas were drawn from this data to construct the informational brochure. The literature reflects that the use of regional anesthesia, despite some complications, is safer than the use of general anesthesia in most instances. Safety coupled with improved pain control make the use of regional anesthesia a good choice for most patients during surgical procedures.

Materials Utilized in the Brochure

The brochure includes detailed information about both general and regional anesthesia. Highlighted is the process of each, so the patient will be aware of what to expect, along with the rates and types of complications of the anesthetic techniques.

Final Recommendations

As was mentioned before, the educational brochure should be given to surgical candidates days to weeks prior to the surgical procedure. This timeframe should allow him or her to absorb all of the information necessary to make an informed decision about the anesthetic technique.

Nursing Practice, Research, and Policy

Continued research in the practice of anesthesia to examine the safety of anesthetic techniques and procedures is mandatory to ensure patient safety. The safest anesthetic for each individual should always be used. Thus, if some form of regional anesthesia is found to be unsafe, or not effective versus the possible complications, the anesthesia provider should inform the patient.

To allow proper time to absorb all of the information and make a decision regarding the selection of anesthesia, this brochure should be given to the surgical candidate days to weeks prior to the day of the procedure. If this is not possible, offering the information to individuals the day of the procedure may have to suffice. If the brochure is found to decrease patient anxiety and increase patient satisfaction, a policy may be instilled to provide this information to all patients for which regional anesthesia is appropriate. The policy may even specify the timing of the brochure's dispersal, if one time or another appears to more consistently achieve positive results.

If the brochure is not found to decrease patient anxiety and satisfaction, it may be of benefit to find out from individuals who did not report a decrease in anxiety if there was a reason for their feelings. If a specific reason is obtained, this information should

then be used to augment the brochure, so individuals with the same feelings in the future can be helped.

Anesthesia providers must stay informed about current practice and the safety involved with the delivery of anesthesia. This information is incorporated into the learning practice, and protection of patients under their care obligates them to stay informed. Likewise, providing this information to their patients in one way or another is a current standard of practice that must be upheld.

Surgical centers are moving toward the way of providing this type of informed consent in a mandatory procedure. The current trend is to give this information to the patients as a separate consent for their surgical procedure. Making patients sign a separate consent for anesthesia compels them to appreciate the benefits and possible complications associated with certain types of anesthesia.

Brochure Design:

The brochure is a tri-fold hand out, that can be given to individuals in their doctor's office as the need for surgery is prescribed. It is entitled: Making the Correct Decision with your Anesthesia.

The following information was used to create the brochure:

For some types of surgery, a general anesthetic must be used. For other types of surgery, the use of regional anesthesia may be safer and reduce complications. Regional anesthesia is the injection of local anesthetic, or numbing medication, into a region of the body that has a group of nerves, to provide a temporary decrease in pain sensation and movement.

It is documented that regional anesthesia has a lower incidence of complications than general anesthesia. The incidence of serious complications are estimated to be 13.4% in inhalation anesthesia, 11.9% in inhalation anesthesia plus epidural, spinal or conduction block, 8.9% in continuous spinal epidural anesthesia, zero % in epidural anesthesia and 7.5% in spinal anesthesia (Minami, Ogata, Horishita, Shiraishi & Sata, 2005). In caesarean sections, the incidence of anesthetic complications remains low; this is primarily due to the increasing use of regional anesthesia (both spinal and epidural anesthesia) as general anesthesia is associated with a 17-fold increase in complications in this population (Lynch & Scholz, 2005).

Types of surgical procedures where regional anesthesia may be used include those involving the lower abdomen (except laparoscopic procedures) and the legs, as well as the shoulder and the entire arm.

The goal in the use of regional anesthesia is to avoid the complications associated with a general anesthesia. The rates of complications during a general anesthesia are greater and are associated with more sickness and death than the complications associated with regional anesthesia. Therefore, a request for one of the types of regional anesthesia described below is a request for a safer anesthetic. Also, for the elderly, the use of regional anesthesia is associated with faster cognitive recovery than is general anesthesia.

The incidence of some complications is **decreased** due to the use of some types of regional anesthesia. These complications include: excessive blood loss, inappropriate blood clots (DVTs), and decreased circulation. A study found neuraxial blockade reduced the odds of deep vein thrombosis by 44%, pulmonary embolism by 55%, transfusion

requirements by 50%, pneumonia by 39%, and respiratory depression by 59% (Rodgers et al., 2000).

General Anesthesia

General Anesthesia is a drug induced reversible depression of the central nervous system resulting in the loss of response to and perception of all external stimuli; this includes amnesia and unconsciousness (Barash, Cullen, & Stoelting, 2001). For this depression of the central nervous system to occur, the anesthesia provider will give the individual having surgery medications. This medication induced loss of consciousness will also depress upper airway reflexes, such as swallowing and coughing, and usually depresses or stops respirations. After this occurs, the anesthesia provider must breathe for the patient. This is usually done through some type of breathing tube that is placed in the upper airway. After surgery, when the patient is waking up, if a breathing tube is used, it is usually removed before the person regains full consciousness.

Complications Associated with General Anesthesia

The complications associated with a general anesthesia include: a sore throat, inability to place the endotrachial tube (breathing tube), acid from the stomach entering the lungs, and death (from a drop in blood pressure or an inability to breathe for the patient).

Regional Anesthesia

Regional anesthesia may be used for most surgical procedures that involve an incision in the lower abdomen, lower extremities, the shoulder, or the arm. Prior to the placement of the regional anesthesia, the patient usually will receive a small amount of sedation to decrease anxiety and concern about the situation. Then, a small amount of

local numbing medication will be placed: this may be somewhat uncomfortable for a moment. The needle is then placed, and more local anesthetic is placed in the proper space. If regional anesthesia is chosen for any procedure except a spinal, the anesthesia provider may use a nerve stimulator to elicit twitches in that extremity prior to injection of the medication to ensure its proper placement. After this occurs, the target area may feel warm, heavy, and numb. At this time, the patient may request more sedation, so he or she may sleep, and might not remember the remainder of time in the operating room. At the end of the procedure, the patient will be allowed to wake, and will be taken to the recovery room. There, the regional anesthesia will ware off and the numbness, heaviness, and the inability to move will slowly recede until normal function and sensation returns. At this time, the patient must request other medications to control the discomfort or pain.

Spinal Anesthesia

Spinal anesthesia may be used for most surgical procedure that involves an incision in the lower abdomen or lower extremities. In this case, the medication is placed in the lower back.

Epidural Anesthesia

This type of regional anesthesia is similar to spinal anesthesia in that it decreases pain sensation to the abdomen and the lower extremities. It differs in the fact that it provides a less dense blockade of the pain sensation and it takes longer for the medication to take effect. It also involves a small catheter that will stay in place and may be redosed for postoperative pain control.

Femoral Block

This type of regional anesthesia targets the front of the thigh and the knee. The medication is placed in the upper frontal thigh.

Interscalene Block

This type of regional anesthesia targets the shoulder and upper arm. The medication is placed in the side of the neck.

Infraclavicular and Supraclavicular Blocks

This type of regional anesthesia targets the elbow and middle arm area. The medication is placed slightly above or below the collar bone (or clavicle).

Axillary Blocks

This type of regional anesthesia targets the lower arm and hand. The medication is placed in the inner aspect of the upper arm

.

Complications Associated with Regional Anesthesia

The complications associated with regional anesthesia, which are related to nerves and the use of the local anesthetics, are usually temporary. They include: backache, headache, infection, hematoma formation (which rarely causes paralysis), overdose, myocardial infarction, and death.

For backache, treatment is generally with non-steroidal anti inflammatory drugs, acetaminophen, or hot or cold compresses (Morgan, Mikhail & Murray, 2002).

Serious complications associated with neuraxial blockade, such as a spinal hematoma, which may cause neurological problems to the lower abdomen and/or the lower extremities, are very rare (Rodgers et al., 2000).

While heart attacks reportedly occur in 1.54%-5.6% of patients with CAD receiving spinal anesthesia, death is usually prevented if promptly treated with angiography (Mollhoff et al., 2001). Overall mortality was reduced by about a third in patients in a group receiving neuraxial blockade in a recent study (Rodgers et al., 2000). Nonetheless, roughly 1 out of every 10,000 people die when spinal anesthesia is given to them (Brochert, 2000).

The complications associated with the use of regional anesthesia are extremely rare and are usually related to a decrease in the patient's ability to clot. This is typically caused by medications that the patient is taking. Therefore, discontinuation of those medications in an appropriate timeframe prior to a surgical procedure will allow the blood to properly clot, so the patient may then be a candidate for the use of regional anesthetic techniques. A surgeon or anesthesia provider will inform the patient of when certain medications need to be stopped to allow the blood to clot correctly, so the patient has less bleeding and so the patient can take advantage of regional anesthesia in suitable situations.

Although the injection of local anesthetic may be uncomfortable, the majority of anesthesia providers will give the patient some sedative in her or his IV to relieve the discomfort and may even render the patient unable to remember the displeasing aspects of the situation.

If the circumstances and the patient condition exist along with the proper surgical procedure, regional anesthesia is considered safer and more cost effective than the use of a general anesthetic. Along with the decrease in complications, the immediate postoperative pain may be decreased, allowing an overall superior recovery.

Contraindications

Other risk factors that increase the incidence of complications are diseases that may be associated with coagulation disorders: such as renal or liver failure; obstetric syndrome of hemolysis, elevated liver enzymes, and low platelets; the presence of ankylosing spondylitis; evident spinal deformity; and increased trauma during the insertion of the needle.

The incidence of post dural puncture headache also depends on the type of needle that is used for the procedure. If the perforation of the dura is done with the large needle that is used for an epidural, the incidence of the associated headache is higher. With a 17 gauge epidural needle, the incidence is between 50-70% (with this method, the dural puncture is usually inadvertent), while the rate of that same headache with the smaller 24-25 gauge spinal needles is considerably less, at a rate of 3.1-8.7% (the puncture of the dura is mandatory for a spinal) (Chadwick et al.,1995; Holst et al., 1998: Vallejo et al., 2000).

In a prospective study of 40,640 cases of spinal anesthesia, the authors performance of the neuraxial blockade (Moen, Dahlgren & Irestedt, 2004) reported an incidence rate of serious neurological deficit of 0.5 per 10,000 (with confidence intervals of 0.2-1.1 per 10,000) (Auroy, 1997). The incidence of hypotension following spinal anesthesia is 10-40%, but is easily treated with IV fluids and medications (Mackey, 1996).

The incidence of serious complications of spinal anesthesia was found to be 1:10,000, and the incidence of serious neurological complications was found to be 1:11,000 (Faure, 2006). A more recent study by Hellman reported that more than 20,000

epidural anesthetics for C sections took place without one serious neurological complication.

Despite new antiemetics particularly 5-hydroxytryptamines, the incidence of post operative nausea or vomiting remains between 20% and 70% (Grief, 1999). Most maternal deaths due to complications of anesthesia occurred during general anesthesia for cesarean section (Hawkins, 1997).During a carotid endarterectomy the incidence of non neurological, non fatal complications was significantly less in the regional anesthetic (1.6%) than the general anesthetic group (14.6%, $p<0.0001$) (Papavasiliou, 2000).

References

Auroy, Y., Narchi, P., Messiah, A., Litt, L., Rouvier, B., & Samii . 1997. Serious complications related to regional anesthesia. *Anesthesiology, 87*:479-8.

Barash, P. G., Cullen, B. F. & Stoelting, R. K. (2001).*Clinical anesthesia* (4th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Brochert, A. (2000). *Definition of spinal anesthesia. Health encyclopedia of North Memorial Medical Center.* Retrieved March 15th, 2006 from Academic Index.

Capdevila, X., & Dadure, C. (2004). Perioperative management for one day hospital admission: regional anesthesia is better than general anesthesia. *Acta Anesthesiol Belg., 55*, 33-6.

Chadwick, H. S., & Bonica, J. J. (1995): Complications of Regional Anesthesia. In J. J. Bonica, & J. S. McDonald, eds. *Principles and Practice of Obstetrical Anesthesia and Analgesia.* Baltimore: Williams & Wilkins, pp 538-572.

Djaiani, G., Fedorko, L., & Beattie, W. S. (2005). Regional anesthesia in cardiac surgery: A friend or a foe? *Semin Cardiothoracic Vasc Anesth., 9*(1), 87-104.

Faure E. (2006). Common and Not So Common Complications of Epidural Anesthesia. Retrieved May 15, 2006. http://acc-www.uchicago.edu/manuals/epidural.html.

Greif, R., Laciny, S., Rapf, B., Hickle, R. S., & Sessler, D. I. (1999). Supplemental oxygen reduces the incidence of postoperative nausea and vomiting. *The Journal of the American Society of Anesthesiologists, Inc., 91*(5):1246.

Hanson, M. (1998). *Pathophysiology: Foundations of Disease and Clinical Intervention.* Philadelphia, PA: W. B. Saunders Company.

Hawkins, J. L., Koonin, L. M., Palmer, S. K., & Gibbs, C. P. (1997). Anesthesia-related deaths during obstetric delivery in the United States. *Anesthesiology, 86*(2):277-284.

Holst, D., Mollman, M., Ebel, C., Hausman, R., & Wendt, M. (1998): In vitro investigation of cerebrospinal fluid leakage after dural puncture with various spinal needles. *Anesth Analg., 87:*1331-5.

Igarashi, T., Konishi, A., Sonehara, D., & Asahara, H. (1995). Changes in intellectual Function during perioperative period evaluated by Hasegawa's Dementia scale. *Masui.*, 44(1):60-5.

Knowles, M. S. (1990). *The Adult Learner: A Neglected Species* (4th ed.). Houston, TX: Gulf Publishing.

Kuczkowsk, K. M. (2004). Post-dural headache in the obstetric patient: An old problem. New solutions. *Minerva Anestesiol, 70*, 823-830.

Lynch, J., & Scholz, S. (2005). Anesthesia-related complications of Caesarean section. *Zentralbl Gynakol., 127(*2);91-5.

Macvey, D. C. (1996). Physiological effects of regional block In *Regional anesthesia and analgesia.* (pp. 397-422). Philadelphia: WB Saunders.

McLain, R. F., Kalfas, I., Bell, G. R., Tetzlaff, J. E., Yoon, H. J. & Rana, M. (2005). Comparison of spinal and general anesthesia in lumbar laminectomy surgery: A case-controlled analysis of 400 patients. *Journal of Neurosurgery of the Spine, 2*(1): 17-22.

Minami, K., Ogata, J., Horishita, T., Shiraishi M., & Sata, T. (2005).Complications related to anesthesia method in the University of Occupational and Environmental Health Hospital. *Masui., 54*(3):320-6.

Moen, V., Dahlgren, N., & Irestedt, L. (2004). Severe neurological complications after central neuraxial blockades in Sweden 1990-1999. *American Society of Anesthesiologists, Inc., 101*(4):950-959.

Mollhoff, T., Schmidt, C., Van Aken, H., Berendes, E., Rolf, N., & Buerkle, H. (2001). Perioperative Myocardial Infarction: A Never-ending story. *American Society of Anesthesiologists, 94*(3): 540-541.

Morgan, G., Mikhail, M., & Murray, M. (2002). *Clinical Anesthesiology* (3rd ed.). New York: Lange Medical Books/McGraw-Hill.

Morin, A. M., Kerwat, K. M., Klotz, M., Niestolik, R., Ruf, V. E., Wulf, H., Zimmermann, S., & Eberhart, L. H. (2005). Risk factors for bacterial catheter colonization in regional anesthesia. *Bmc Anesthesiol, 17*; 5(1):1.

Mulroy, M. F. (2002). *Regional Anesthesia* (3rd ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

Pastor, M. C., Sanchez, M. J., Casas, M. A., Mateu, J., & Bataller, M. L. (2003). Thoracic epidural analgesia in coronary artery bypass graft surgery: seven years' experience. *Journal of Cardiothoracic Vascular Anesthesia, 17*(2):151-3.

Papavasiliou, A. K., Magnadottir, H. B., Gonda, T., Franz, D., Harbaugh, R. E. (2000). Clinical outcomes after carotid endarterectomy: comparison of the use of regional and general anesthetics. *Journal of Neurosurgery, 93*(2):363-4.

Rodgers, A., Walker, N., Schug, S., McKee, A., Kehlet, H., van Zundert, A., Sage, D., Futter, M., Saville, G., Clark, T., & ManMahon, S. (2000).Reduction in postoperative mortality and morbidity with epidural or spinal anesthesia: results from overview of randomized trials. *BMJ.*, 321(7275): 1493.

Rooke, G. A., Freund, P. R., & Jacobson, A. F. (1997). Hemodynamic response and change in organ blood volume during spinal anesthesia in elderly men with cardiac disease. *Anesth Analg.*, 85(1):99-105.

Sener, M., Torgay, A., Akpek, E., Colak, T., Karakayali, H., Arslan, G., & Haberal, M. (2004). Regional versus general anesthesia for donor nephrectomy: Effects on graft function. *Transplantation Proceedings, 36*(10), 2954-2958.

Schuster, M., Gottschalk, A., Berger, J., & Standl, T. (2005). A retrospective comparison of costs for regional and general anesthesia techniques. *Anesth Analg, 100*:786-794.

Sharrock, N. E., Fischer, G., Goss, S., Flynn, E., Go, G., Sculco, T., & Salvati, E. (2005). The early recovery of cognitive function after total-hip replacement under hypotensive epidural anesthesia. *Regional anesthesia and pain medicine, 30*(2), 123-127.

Sosis, M. B., Parnass, S. M., McCarthy, R. J., Braverman, B., Watson, G., & Halter, T. (1995). Spinal phobia: Survey results of patient attitudes and preferences regarding anesthesia. *Journal of Clinical Anesthesia*, 7(5), 389-393.

Vallejo, M. C., Mandell, G. L., Sabo, D. P., Ramanathan, S. (2000): Postdural puncture headache: a randomized comparison of five spinal needles in obstetric patients. *Anesth Analg, 91*:916-20.