SELECTION OF ANESTHESIA TECHNIQUES FOR LOWER EXTREMITY SURGERY

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There are a variety of anesthesia techniques available for podiatric surgery. The selection of an anesthetic technique depends on many factors including patient preference, patient health, expertise of the anesthesia team, procedure length, and surgeon preference.

GENERAL ANESTHESIA

The most common type of anesthesia administered nationwide is general anesthesia. General anesthesia may be defined as a combination of analgesia and amnesia sufficient to cause loss of consciousness and reflexes. Anesthetics may be subdivided into inhalational anesthetics administered by mask or endotracheal tube (e.g. Nitrous Oxide, Halothane, Isoflurane, Ethrane) and intravenous anesthetics used alone or in combination with other medications. Intravenous medications include Ketamine, Droperidol, benzodiazepines, and narcotics. A further subgroup of induction agents includes barbiturates (Pentothal), Propofol (Diprivan), Etomidate (Amidate) and occasionally benzodiazepines.

Benefits to general anesthesia include relaxation, better patient control and complete amnesia and analgesia. Disadvantages include loss of cardio-respiratory and other reflexes, increased stress responses, and the possibility of aspiration pneumonitis.

Longer, more complex podiatric cases are usually performed under general anesthesia where pharmacological control is preferred. Surgical cases lasting longer than three hours (e.g. Charcot reconstructions, midfoot/rearfoot fusions) also seem to run smoother with general anesthesia, as patient comfort is difficult to maintain for these periods. It is ideal to perform midfoot, rearfoot, and ankle procedures under general anesthesia where complete patient relaxation is preferred. Trauma situations where extensive distraction and manipulation of fracture fragments are required, benefit greatly from general anesthesia. Extremely anxious patients also do much better with general anesthesia techniques.

PATIENT POSITIONING

Proper patient positioning in long cases is paramount, as improper positioning may result in a multitude of problems. Abnormal stretching and malpositioning of the joints may account for a variety of postoperative discomforts. Prolonged direct pressure over bony prominences and pressure points may cause tissue ischemia and necrosis. Compression of neurovascular bundles may lead to circulatory or neurologic compromise. Not every candidate for surgery will tolerate extreme positioning. Certain patients with respiratory problems or congestive heart failure can only be approached safely in the supine position while awake. When proper positioning is paramount for exposure, the use of endotracheal intubation with general anesthesia will allow any positioning

required without respiratory compromise. Regardless of the medical condition, it is generally difficult to keep a prone patient completely comfortable while awake, therefore prone patients do much better under general anesthesia.

Approaches to the posterior rearfoot and leg (e.g. Haglund's deformity, tendo Achilles surgery) are best managed with the patient in the prone position. Care is taken to adequately pad the face and hips as well as the dorsum of the foot from ischemic pressure. Surgery involving the lateral rearfoot (e.g. fibular fractures, calcaneal fractures and lateral osteotomies, ankle stabilization procedures) should be performed in the lateral position. Proper padding is required between the legs as well as the arms. The use of a suction beanbag is helpful for medial and lateral stability. In certain situations, approaches to extreme medial/lateral regions may be achieved in the supine position with added tilt from the surgical table. Special care must be taken to prevent patient slippage in these cases.

Due to the high incidence of rheumatoid arthritis in podiatric patients, a special discussion of their anesthesia concerns is warranted. Most concerns tend to be technical even though rheumatoid arthritis is a multi-system disease. Flexion deformities and calcification of smaller vessels may hinder peripheral arterial or venous access. Cervical spine instability may complicate airway management and endotracheal intubation. Since the lumbar spine in these patients is usually not affected, selection of spinal-epidural techniques is a frequent consideration.

HEALTH CONSIDERATIONS

There are situations where the use of regional or local anesthesia may be mandated by the patients health. Patients exhibiting circulatory, pulmonary, cardiac, and endocrine problems may have trouble withstanding the stresses of general anesthesia. Local anesthesia may be administered by several routes: spinal, epidural, Bier block, local anesthesia with conscious sedation, or local anesthesia alone. All of these routes have been utilized with success, yet local anesthesia with conscious sedation techniques is the most popular. Although Bier blocks (intravenous regional anesthesia) and other esoteric nerve blocks are also alternative techniques, they are not common in podiatric surgery.

SPINAL/EPIDURAL ANESTHESIA

In a situation where more profound regional anesthesia is preferred, consideration of spinal or epidural anesthesia must be entertained. Both spinal and epidural anesthesia involve the use of local anesthetics administered in the lumbar spine. Commonly, the location is L3-L4, as the spinal cord ends at L1-L2. Anatomically, the needle passes through the skin, subcutaneous tissue, supraspinous ligament, interspinous ligament, then the flaval ligament and finally enters into the epidural space. Further penetration at this point will violate the integrity of the dura mater and enter the subarachnoid space. An epidural is administered with a blunt-tipped needle in an effort to stop just short of the dura. An epidural catheter is frequently threaded into the epidural space and the needle removed in order to titrate anesthetics and/or narcotics over a prolonged period. With a spinal anesthesia, a small bore, sharp needle is inserted through the dura into the cerebrospinal fluid. Observation of spinal fluid dripping from the hub of the needle assures correct positioning prior to injection of the local anesthetic.

Both of these central neural blockade techniques are attractive alternatives in patients fearful of general anesthesia, yet still requiring a profound block. Due to the increased stresses of general anesthesia, compromised patients (e.g. cardiovascular compromise, diabetics, obese patients) may also be more suited to spinal techniques. Spinal anesthesia has a quick onset, and produces a dense block of finite duration. Side effects may be precipitous in nature with hypotension and bradycardia. Spinal headache occurs with moderate frequency and is due to continued spinal fluid leakage after removal of the spinal needle. Epidural anesthesia has a slower onset, and is not as dense as a spinal block but it is usually adequate for podiatric surgery. An indwelling catheter for sustained postoperative pain relief is also an attractive advantage of the epidural technique. In both of these techniques, correction of clotting disorders must be affected prior to attempting anesthesia due to the potential of an epidural hematoma.

LOCAL ANESTHESIA

There are certain advantages to local anesthesia with sedation techniques versus general anesthesia. The patient is under a lighter plane of sedation and will generally avoid the nausea, vomiting, dizziness, lethargy, and sore throat that are frequent sequelae of general anesthesia.

The primary goals of conscious sedation include adequate sedation with minimal risk, relief of anxiety, amnesia, and relief from pain and noxious stimuli. Achieving an optimal balance between patient comfort and safety is the key. This requires careful titration of sedative and analgesic drugs, appropriate monitoring of body systems, and good communication with the patient and surgeon. In outpatient surgical centers today, supplemental sedation is achieved with a sedative-amnestic and narcotic agent. In the benzodiazepine class, Midazolam (Versed) has shown favorable sedative-amnestic properties with a fast onset. Although sedation and amnesia are very important in these situations, the addition of an opioid analgesic will frequently improve patient comfort during local anesthesia. Careful monitoring of cardio-respiratory function is still paramount in conscious sedation cases.

When properly administered, local injection can be successfully executed during patient sedation. Surgery of the forefoot and midfoot is commonly performed using this technique. Epinephrine is frequently utilized for hemostasis in the concentration of 1:200,000. A combination of a short-acting (Xylocaine with epinephrine 1:100,000) and long-acting (Marcaine plain) anesthetic can be utilized in a 50/50 mixture to achieve this concentration. Marcaine with epinephrine is provided in a 1:200,000 concentration. Manipulation of these anesthetic agents is easily performed for any local/epinephrine mixture preferred and avoids the ischemic effects of tourniquet usage. Knowledge of anatomic dissection is paramount in successful execution of forefoot and midfoot procedures utilizing local with epinephrine.

Local anesthesia alone is another popular option in podiatric surgery. In the proper setting, sedation may not even be necessary with a fully-cooperative patient. Communication with the patient is important in alleviating anxiety. This technique inherently possesses the least potential for peri-operative complications. Local anesthesia is widely used in forefoot surgery, however a complete ankle block if properly administered, will allow a surgical approach to any area of the foot.

Certain emergent situations (i.e. trauma) in which the patient recently ate can also be safely performed under local sedation techniques with a good anesthetic block.

TOURNIQUETS

Tourniquet use is another factor to consider in selecting anesthesia. Ankle tourniquets are most commonly used, yet thigh tourniquets have also gained popularity within podiatric surgery. Although dissection within a bloodless field is ideal, most procedures in the forefoot and even rearfoot can be performed effectively free of tourniquet use with proper anatomic dissection techniques. This is stressed as a reminder of the fact that tourniquet use is not entirely benign and should only be used when necessary.

The use of a thigh tourniquet usually necessitates the administration of either general or regional anesthesia to control ischemic pain. The non-sterile tourniquet is placed over webril at the proximal thigh prior to the surgical prep and generally inflated from 300-450 mm Hg for proper effect after the surgical draping. There is considerably more soft tissue at this level to avoid nerve compression injuries in contrast to the ankle region, yet the trade-off is the increased tourniquet pressure required for effective hemostasis. Surgical exposure in the rearfoot and ankle regions usually require the use of a thigh tourniquet for facilitation of dissection and proper hemostasis. Situations in which extensor and flexor mobility are important (i.e. tendon transfers) would also benefit from the use of a thigh versus an ankle tourniquet. With extensive dissection of the rearfoot region, it is advisable to release the tourniquet and carefully ligate active bleeders prior to wound closure. Failure to follow this technique may result in excessive postoperative hematoma and edema which may not be adequately controlled even by the use of a closed suction drainage system.

Ankle tourniquets, on the other hand, are amenable to local sedation techniques. Ankle tourniquets are much more easily tolerated with

only light sedation and rarely is general anesthesia required. These tourniquets are secured over webril at the level of the malleoli and generally inflated 100 mm Hg above, or two times the value of the systolic blood pressure.

A good indication for its use is in revisional surgery where tissue planes are less than ideal, and oozing from scar tissue is difficult to control. Dissection of the plantar foot also will benefit from tourniquet use due to the extreme vascularity of this region. Both thigh and ankle tourniquet use should not exceed two hours due to the potential for irreversible ischemic damage. A common guideline is five minutes of re-breathing time for every 30 minutes of tourniquet use (i.e. 20 minutes of reactive hyperemia for every two hours). Patients with previous vessel grafts should not be subjected to mechanical trauma from tourniquet use, and hemostasis must be controlled with epinephrine.

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