



Regional anesthesia for outpatient surgery

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Outpatient surgery has gained steadily in the United States, both in total numbers of procedures performed and as a percentage of the overall surgical experience. Outpatient anesthesia requires a shift in our goals for the recovery of patients. Outpatients must be alert; free of pain, nausea, and vomiting; and able to ambulate to leave the unit successfully. Most outpatient surgical centers incorporate a high volume and rapid turnover setting, so that these goals must be achieved within a limited time frame. This represents a challenge for the anesthesiologist, who usually relies on opioids to provide comfort in the recovery room. In the outpatient setting, excessive reliance on these drugs can be associated with drowsiness and nausea, which can delay discharge and sometimes lead to unplanned overnight admission. Failure to provide adequate analgesia, however, is also a major source of unplanned admissions. This triad of pain, nausea, and vomiting is also the most frequent and most undesirable outcome as perceived by patients and anesthesiologists [1].

In this setting, regional anesthesia techniques offer significant advantages for outpatient surgery. The use of local infiltration provides excellent analgesia without the side effects of opioids. The performance of peripheral nerve block for upper and lower extremity surgery provides intraoperative anesthesia and prolonged postoperative analgesia. Some of these blocks, especially in the lower extremities, can provide up to 24 hours of postoperative analgesia. This advantage of peripheral blockade can be extended further with the use of continuous perineural catheters, which are capable of providing analgesia for as long as 72 hours after major extremity surgery. Neuraxial blockade can also be useful in the outpatient setting. Spinal and epidural anesthesia can provide a high degree of alertness for surgery and a low incidence of nausea. Neuraxial techniques, however, provide no postoperative analgesia, and careful attention must be paid to the choice of drug and dose to provide a sufficiently rapid return

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of function to allow a competitive discharge time. All of these regional anesthesia techniques have significant usefulness in outpatient surgery, and multiple comparative studies have shown good pain relief, fast discharge, few complications, and high patient satisfaction.

Upper extremity blocks

Brachial plexus anesthesia is the ideal example of outpatient regional techniques. Blockade of the arm or shoulder can provide anesthesia for surgery and prolonged analgesia, and does not interfere with ambulation. For surgery on the shoulder itself, an interscalene technique produces reliable anesthesia of the shoulder girdle and good muscle relaxation. For procedures on the arm, the supraclavicular and infraclavicular approaches are more appropriate. For forearm and hand surgery, the axillary approach is simpler to perform and has less risk of side effects than the above techniques.

Interscalene anesthesia

Interscalene anesthesia is used primarily for shoulder surgery because of the inevitable spread of the local anesthetic to the lower cervical plexus, including the C4 nerve roots. There are multiple approaches to the brachial plexus in this area, including the traditional interscalene approach. With standard techniques, complications are rare, and acceptable anesthesia is normally achieved.

For most outpatient surgical procedures, the use of 1.5% lidocaine or mepivacaine will provide adequate surgical anesthesia and analgesia for 4 to 6 hours. This will usually be sufficient to allow a patient to be discharged home without discomfort, avoiding the problem of nausea and vomiting in the recovery room due to the use of opioid analgesics. For more painful procedures, longer analgesia can be obtained by the use of bupivacaine, levobupivacaine, or ropivacaine. These drugs all appear to provide 12 to 14 hours of analgesia, which might be more appropriate for more painful procedures, such as rotator cuff repair. Analgesia may be prolonged further by adding of opioids [2] or clonidine [3,4], although the efficacy of these additives is still controversial. With all of these blocks (but especially the longer-acting ones), the numb arm must be protected in a sling and the patient must be advised to avoid any injury or pressure to the extremity during the period of numbness. Written instructions should reinforce these directions. Even more prolonged analgesia can be provided by the insertion of a continuous catheter [5], allowing for use of more dilute anesthetic solutions, which may preserve motor and sensory function. This technique provides superior pain relief to traditional intramuscular or PCA morphine [6].

The advantages of interscalene block compared with general anesthesia have been confirmed in a number of studies. Brown et al found that when they compared interscalene anesthesia to general anesthesia for shoulder arthroscopy, there was less pain, less nausea, and faster discharge in their regional anesthesia group [7].

There was also a lower incidence of overnight hospital admission, which occurred in 48% of the patients having general anesthesia, primarily due to the need for more intensive pain control. D'Alessio et al found similar results in a comparison of interscalene and general anesthesia [8]. Not only was their overnight admission rate lower, they also found that their use of operating room time was less with the regional technique. They performed their block in an induction area, and thus were ready for surgery sooner after arrival in the operating room. They also found shorter discharge times in addition to this improved efficiency.

Pain relief can also be prolonged after shoulder surgery by the use of peripheral nerve blocks, specifically the suprascapular nerve block. Ritchie et al reported good pain relief and faster discharge when this block was used on patients that underwent shoulder surgery with general anesthesia [9]. The suprascapular nerve block is simple to perform and may represent an excellent analgesic alternative when either a general anesthetic or a short-acting regional technique is used. With bupivacaine, it can provide many hours of pain relief without significant impairment to the motor or sensory function of the distal arm, and thus might reduce the risk otherwise associated with a prolonged block of the upper extremities.

Supraclavicular and infraclavicular block

For procedures below the shoulder the most reliable anesthesia is produced by the supraclavicular approach. This injection occurs at the level of three trunks as they cross the first rib, and is most reliable at anesthetizing all major nerves of the arm. Unfortunately, the supraclavicular approach is also associated with the highest risk of pneumothorax, and thus is often avoided in the outpatient setting. There has been increasing enthusiasm for subclavian perivascular and the infraclavicular approach, which anesthetizes the branches of the brachial plexus distal to the point where they cross the first rib. One advantage of the infraclavicular approach is that it may be easier to secure continuous catheters to the skin in this area than in the neck [10].

Axillary block

For procedures of the hand, the terminal nerves of the brachial plexus can be conveniently anesthetized in the axilla. If supplemental injections are made for the nerves that have already departed the neurovascular bundle, this technique is also adequate for surgery of the forearm and the elbow. It is one of the simplest procedures to perform and is least likely to produce complications in the outpatient setting, and it is probably the most frequently performed technique. Unfortunately, the single-compartment injection that is so successful with the more a proximal approaches is rarely effective at this level, presumably because of the development of multiple septae, which divide the individual nerves within the neurovascular bundle at this level. Thus, multiple injection techniques are more frequently employed for axillary blockade and have a higher level of

success. Several techniques have been described, including transarterial, paresthesia, nerve stimulator, multiple nerve stimulation [11], and perivascular infiltration, all of which rely on deposition of local anesthetic solution on at least two opposite sides of the axillary artery.

The choice of drugs here is similar to the more proximal approaches, and the same risks of potential injury to the numb extremity must be conveyed to the patient. However, Davis et al at the Mayo Clinic found no serious complications in a series of over 600 patients receiving axillary block for outpatient hand surgery [12]. They found no neurologic complications, and only six patients in this group complained of nausea in recovery.

Intravenous regional

The simplest of all regional anesthetic techniques for the upper extremity is intravenous regional. This technique requires the use of an upper arm tourniquet, but this is frequently used for hand surgery and thus does not represent an increase in inconvenience to the patient. The technique is no faster in onset than the others, with each of them requiring 15 to 20 minutes to develop surgical levels of anesthesia. Intravenous regional does not produce as dense an anesthetic as a direct neural blockade, but it is adequate for most superficial procedures of the hand, including carpal tunnel release and excision of ganglia.

The standard technique will provide anesthesia for 20 to 40 minutes of surgery. After this point, tourniquet discomfort usually becomes the limiting factor. This can be reduced by the use of a double-tourniquet technique. For most outpatient surgical procedures, however, the duration of hand surgery is short and a single cuff is more than adequate. The simplicity and reliability of intravenous regional anesthesia makes it particularly desirable in the outpatient setting. Chan et al showed that it is the least expensive alternative when compared with general anesthesia or brachial plexus block [13]. Considering the cost of drugs and the cost of observation time in the recovery room, intravenous regional provides a less expensive alternative to more involved anesthetic techniques, and with equal patient satisfaction.

While 0.5% lidocaine has been the standard drug for this technique for the past 20 years, there is increasing interest in using longer-acting aminoamides, such as ropivacaine and levobupivacaine. Ropivacaine will produce a 20-minute “window” of analgesia following release of the tourniquet, in contrast to the lidocaine, which offers no residual analgesia [14].

Lower extremity blocks

Though anesthesia for lower extremity procedures is frequently provided by the use of spinal or epidural techniques, there are also excellent opportunities for the use of peripheral nerve blocks for these operations. The use of peripheral blockade can provide prolonged analgesia, which is not present following the

resolution of spinal or epidural techniques. Peripheral blocks require longer injection times to attain surgical anesthesia.

Femoral block

Blockade of the lumbosacral plexus has been used to provide adequate anesthesia for knee surgery in the outpatient setting. Patel and colleagues were the first to show that use of femoral nerve blockade could produce good anesthesia for knee arthroscopy with faster discharge than general anesthesia [15]. Casati et al had similar results with peripheral nerve blockade for outpatient knee surgery. In their practice, the use of sciatic and femoral block provided excellent anesthesia for the knee surgery, with adequate discharge time [16]. Neural blockade persists for a longer time in the lower extremity, and thus motor block may be present for almost twice as long as in the upper extremity.

Femoral and lateral femoral cutaneous nerve blocks have also been used for surgery for varicose veins [17]. Femoral nerve blockade can also be used as an adjunct to other anesthesia techniques to provide postoperative analgesia. This has been particularly effective following anterior cruciate ligament repair (ACL) in the outpatient setting. Injection of the femoral nerve with 0.25 or 0.5% bupivacaine provides 20 to 24 hours of postoperative analgesia [18].

Distal sciatic nerve block

The sciatic nerve can also be blocked at the knee, which significantly reduces the amount of motor blockade and thus limitation of motion associated with this technique. Rorie et al used blockage of the sciatic branches in the popliteal fossa to provide anesthesia for foot surgery and reported excellent analgesia results [19]. The nerves can be approached from either the classic posterior approach described by Rorie or the new lateral approach, which involves less changes in position of the patients [20]. With both of these, catheters can be inserted to provide prolonged postoperative analgesia. This type of blockade is particularly effective for foot surgery if a calf tourniquet is to be applied. Again, because of the slower resolution of neural blockade in the lower extremity, long-acting aminoamide drugs, such as bupivacaine and ropivacaine, may provide 18 to 24 hours of analgesia following foot surgery with these techniques.

Ankle block

For foot surgery, blockade of the nerves at the ankle is often adequate for surgical anesthesia and prolonged postoperative analgesia. The block is more tedious because it requires five separate injections to numb the entire foot, and there is again a delayed onset of the local anesthetic action for 20 minutes following the initial injections. An experienced anesthesiologist or podiatrist can perform this block quickly. The long-acting drugs may provide 12–24 hours of analgesia following major foot surgery.

Continuous catheter techniques

Though regional techniques have traditionally involved single injections, with pain relief dependent on the duration of the local anesthetic and the additives used, there has been increasing interest in using continuous infusion techniques that have been so useful in obstetrics and postoperative pain therapy, but on peripheral nerves rather than in a neuraxial application. This approach avoids any possibility of sympathetic block, which could limit ambulation, and also limits the potential motor blockade to a specific extremity, while making the duration of analgesia virtually limitless.

Continuous catheter can be inserted through a variety of approaches. Securing them to the skin seems a challenge. Frequent movement of the neck increases the potential for interscalene catheters especially to work themselves back out in the postoperative period. There are also a variety of infusion systems, and not a clear indication of the superiority of one over another. Simple elastomeric pumps are easy for the patient to use, and are disposable, but deliver a fixed rate, and are generally expensive. Mechanical battery-operated pumps offer more flexibility of programming and bolus dosing but are expensive initial purchases and require a mechanism for recovery. Several groups report success using these systems.

Klein et al have reported excellent results of postoperative analgesia with interscalene catheters left in after shoulder surgery. They treated patients in their outpatient unit for 24 hours following surgery by keeping them in their overnight observation area with an infusion running, discharging them after reinjection of their catheters just before removal on the morning following surgery [21]. They report excellent analgesia compared with a group receiving a saline placebo. Ilfeld et al have had similar excellent results using infraclavicular catheters for arm and hand surgery [10]. They studied a group of patients receiving either ropivacaine or saline and found significantly better pain relief with the ropivacaine group, as measured by opioid sparing. More significantly, they found much better sleep patterns in patients receiving adequate analgesia in the postoperative period. Rawal et al have also used continuous catheters for axillary blocks and have compared the use of dilute solutions of bupivacaine or ropivacaine in this setting [22]. Both drugs work well, although the patients appear to have greater satisfaction in the early hours with ropivacaine because of the absence of motor blockade. The use of these dilute solutions in continuous infusions raises the possibility of allowing patients to have normal motor function and at least partial sensory functions in the presence of excellent analgesia. These groups left the catheters in for 48 to 72 hours, which raises hopes for a completely opioid-free recovery time after major upper extremity surgery.

Neuraxial techniques

Neuraxial anesthesia is an increasingly popular technique for outpatient surgery. Patients receiving either epidural or spinal anesthesia are more alert,

less nauseated, and more comfortable in the recovery room than those undergoing general anesthesia. Spinal anesthesia especially is rapid in onset and simpler to perform than almost all other regional techniques, and thus should be ideal for outpatients. Such benefits must be weighed against adverse events, such as postdural puncture headache (PDPH), back pain, voiding difficulties, and the rare potential for hematoma or infection. Recent clinical investigations have focused on which drug or drug combination would result in ample duration for surgery while providing the fastest recovery time with the lowest side effect profile.

Adverse events

Postdural puncture headache

In the past, the risk of PDPH limited the use of spinal anesthesia for outpatient surgery. The advent of the smaller-gauge, pencil-point needles have reduced the incidence of PDPH to less than 3%, even in younger patients [23]. Though a smaller gauge lowers the incidence, there is an increased failure rate with needles smaller than 27 gauge because of the procedural challenges, such as a slower return of cerebrospinal fluid. Thus, optimal balance between technical success and risk of PDPH can be achieved with needles of 24 to 27 gauge.

Back pain and neurologic symptoms

Back pain is another concern when using neuraxial anesthetics. Typically, patients will notice a focal tenderness at the site of injection as a result of local anesthetic infiltration. This tenderness is mild, resolves within a few days, and is of little concern to patients. Uncommon yet potentially severe forms of back pain include those described with 2-chloroprocaine (2-CP) use and those termed “transient neurologic symptoms” (TNS).

High doses of 2-CP have been associated with transient yet severe back pain that begins after resolution of the epidural block [24]. Doses of 25 ml of newer preparations do not appear to present a problem.

TNS is a newly described phenomenon comprised of significant back pain that radiates into the buttocks or legs that may or may not be associated with dysesthesias. This back pain typically lasts 3 to 4 days and is treated with NSAIDs and other pain medications. The incidence varies with the local anesthetic used and ranges from less than 1% with spinal bupivacaine to as high as 33% with spinal lidocaine [25]. Though the association with subarachnoid lidocaine is now widely accepted, its etiology remains unclear as well as the answer to why, after nearly half a century of use, it is only now being recognized. Although some have proposed a neurotoxic injury as the cause of TNS, this theory has not been proven. Potential contributing factors have been identified: patient positioning (such as with knee arthroscopy or lithotomy), early ambulation, and use of pencil-point needles [26,27]. The increase in ambulatory surgical patients over the past decade may be associated with its recent recognition. Efforts to minimize the risk for lidocaine have included manipulations in dose, baricity, concentration, and volume; none of these has proven effective. Alter-

native spinal anesthetics do not provide the efficacy and short duration of lidocaine. The most optimistic report is a reduction in frequency with the use of a low-dose dilute solution of lidocaine (20 mg with 25 mcg of fentanyl) [28], but further study is needed to confirm these results.

Voiding difficulty

Voiding after neuraxial anesthesia had historically been a significant issue. It is well documented that the use of long duration spinal or epidural anesthetic drugs allows overdistension of the bladder, and thus bladder catheterization is often required following resolution to the block. In the outpatient setting, there has historically been a requirement that patients receiving spinal or epidural anesthesia demonstrate an ability to void before discharge [29]. Recent data suggests that this may not be necessary for patients receiving short-acting spinal or epidural anesthetics. Patients with short-acting blocks can be discharged home without voiding with no apparent increase in the incidence of urinary retention and apparently at no greater risk than following general anesthesia [29,30]. The exceptions to this are spinal anesthetics that contain epinephrine, which appear to be associated with a higher potential for retention. There are several surgical procedures associated with a high potential for urinary retention (rectal and inguinal hernia operations), and these patients should be required to void before discharge regardless of the type of anesthetic.

Neuraxial hematoma or abscess

The risk of epidural hematoma or abscess is rare. Outpatients are not commonly under treatment with anticoagulants, but hematoma does occur in the outpatient setting [31] and should be considered in the differential evaluation of postoperative back pain and weakness.

Spinal anesthesia

Spinal anesthesia can be quickly done with minimal supplies, making it a cost-effective technique with little delay in turnover. Matching surgical duration and having a low side effect profile are the challenge. Choice of local anesthetic is a key element, but addition of adjunctive drugs can be valuable in allowing lower doses to be used.

Lidocaine

Despite its strong association with TNS, lidocaine's short duration with rapid recovery is ideal for the ambulatory setting. Studies have shown that time to two-dermatome regression for 50 mg and 75 mg doses of hyperbaric 5% lidocaine are 50 ± 16 and 75 ± 4 minutes, respectively, and resolution of sensory block 123 ± 21 and 136 ± 6 minutes, respectively [32]. Adjunctive drugs can prolong the duration and reduce the failure rates of these lower doses. For example, adding epinephrine 0.2 mg to 50 mg of 5% hyperbaric lidocaine prolongs the duration of sensory anesthesia to pinprick by 30 minutes in the lumbar and sacral

regions; however, it also increases the time to void by more than an hour [32]. Fentanyl 20 mcg can prolong the anesthetic duration of the same dose of lidocaine by 181% without prolonging recovery time [33].

Recent investigations have studied minidoses of lidocaine with fentanyl in an effort to find an optimal balance between surgical duration and speedy recovery. Ben-David et al reported successful spinal anesthesia for knee arthroscopy with 20 mg of 0.5% lidocaine in dextrose plus 20 mcg fentanyl [34]. These patients were home-ready at a median time of 45 minutes (range 28–180 minutes). Lennox et al used 10 mg of 1% hypobaric lidocaine with 10 mcg sufentanil for successful spinal anesthesia for short duration outpatient laparoscopies [35]. These patients retained sensation to light touch, proprioception, and vibration as well as motor function, and most were able to ambulate at the end of surgery. Patient and surgeon must be motivated to tolerate these less dense, shorter duration blocks.

Bupivacaine

Bupivacaine has the lowest incidence of TNS reported (0–1.3%) [25], thus making it an attractive alternative to lidocaine for that reason. Its longer duration has impeded its adaptability to the ambulatory setting. For every milligram of hyperbaric bupivacaine, duration of surgical anesthesia at the knee increases by 13 minutes (range 9–17), but time until fulfilling discharge criteria increases by 21 minutes (range 17–25) [36]. Attempts to use lower-than-traditional doses can increase the failure rate of the block up to 25% [37–39]. Adding fentanyl can improve the success rates of low-dose bupivacaine without prolonging recovery; fentanyl 20 mcg added to 5 mg hyperbaric bupivacaine offered 100% success and significantly increased time to two-dermatome regression from 53 ± 14 minutes to 67 ± 19 minutes but did not significantly increase time to void (169 ± 52 versus 177 ± 53 minutes, respectively) [38]. One of the frustrating aspects of outpatient bupivacaine anesthesia, however, is the large standard deviations (and thus poor predictability) of this drug, as illustrated in this last report.

Procaine

Procaine can provide a shorter-acting spinal anesthetic, but its side effect profile is less desirable than bupivacaine. The risk of TNS with procaine is not as low as bupivacaine, with reports ranging from 0.9% to 6% incidence [40,41]. For an unclear reason, procaine has been associated with a high incidence of postoperative nausea (17%) [41]. Furthermore, there appears to be an unfavorable failure rate of 14% to 17% with 100-mg doses if no adjuvants are used [41]. Adding fentanyl may reduce the risk of failed block, but significant pruritus may be the trade-off, at a higher incidence and severity than when fentanyl is added to lidocaine or bupivacaine [42]. No dose-response data is yet available for procaine; therefore its optimal administration may yet be described.

Other local anesthetics

Ropivacaine is a new local anesthetic. Dose-response data in volunteers and clinical studies have shown its potency to be approximately half of that of

bupivacaine [43,44]. It offers no advantage over bupivacaine in its anesthetic, side effect, or recovery profile. TNS and nonradiating back pain have also been reported [44,45]. Levobupivacaine, the isolated S-enantiomer of bupivacaine, appears to have equivalent clinical efficacy to racemic bupivacaine and thus offers no particular advantage over its less expensive counterpart [46]. Mepivacaine has been used for spinal anesthesia since the 1960s, but its place in ambulatory spinal anesthesia appears limited.

Adjuncts

Adjuncts such as fentanyl, epinephrine, and clonidine can prolong the duration of local anesthetics or allow lower drug doses. Side effects of such adjuncts must also be considered.

Fentanyl can prolong surgical anesthesia without prolonging recovery time. The potential for respiratory depression was once a concern, given that patients were being discharged home and unmonitored. Studies have consistently shown that doses less than 25 mcg are not associated with respiratory depression, even in the elderly. Pruritus is a dose-dependent phenomenon. The addition of fentanyl has not been shown to decrease the incidence of TNS [26].

Epinephrine also prolongs surgical anesthesia and the time to meet discharge criteria, especially time to void, thus limiting its use in the outpatient setting [47]. It has not been implicated as a contributing factor for TNS [27].

Clonidine, an alpha-2 agonist, can also act synergistically to increase the duration and intensity of spinal anesthesia. Although it does not confer the pruritus of fentanyl or the urinary retention of epinephrine, it has its own side effect profile of sedation and hypotension that may limit its usefulness in the ambulatory setting. Recently, a study investigating minidoses of clonidine showed that 15 mcg clonidine added to 8 mg ropivacaine improved the quality of the block without prolonging the block's duration and without causing significant sedation or hypotension [48].

Epidural anesthesia

Though the single-shot technique for spinal anesthesia has the advantage of simplicity and rapid onset, it is limited by a fixed duration and thus runs the risk of requiring intravenous or inhalational anesthetic supplementation if the duration is too short or the risk of prolonged stay in the PACU if too long. Epidural anesthesia, on the other hand, is titratable. Thus, shorter acting local anesthetics may be used with the option of reinjection through the epidural catheter if necessary and the potential for rapid recovery if not necessary. A number of studies have shown that recovery from epidural anesthesia can be significantly faster than with general or spinal anesthesia. Also, the risk of PDPH and TNS are lower with epidural versus spinal anesthesia. The trade-off appears to be a more technically difficult procedure that takes longer to perform and longer for the block to develop.

Choice of drugs

2-Chloroprocaine (2-CP) has the shortest duration, followed by lidocaine and mepivacaine (133 ± 28 minutes, 182 ± 38 minutes, and 247 ± 42 minutes, all with epinephrine) [49]. Mepivacaine and bupivacaine probably are not suitable for outpatient surgery. Neal et al demonstrated that 2-CP provided excellent surgical anesthesia with shorter discharge times and similar side effect profile to lidocaine for knee arthroscopy [50]. Epidural 2-CP provides competitive discharge times compared with propofol general anesthesia for knee surgery [51].

Epidural adjuncts

The addition of opioid to local anesthetic has a synergistic effect, allowing for longer duration of anesthesia and prolonged analgesia postoperatively [52]. Addition of fentanyl to lidocaine epidural anesthesia may accelerate the onset of the block [53]. The short-acting narcotics, such as fentanyl and sufentanil, are preferred. Morphine should be avoided in the ambulatory setting because of the risk of delayed respiratory depression. Pruritus is a common side effect that may be dose dependent.

The addition of sodium bicarbonate adjusts the pH of the local anesthetic solution closer to its pK value, thus allowing more of the lipid-soluble base form to penetrate the nerve membrane. This alkalinization should, therefore, shorten the onset and increase the intensity of the block. The clinical applicability of this pH adjustment has been debated. Capogna et al demonstrated that alkalinization of epidural lidocaine shortens the onset time at L2 from 7.1 ± 1.4 minutes to 5.5 ± 1.4 minutes and produced a denser motor block [54]. Alkalinization is achieved by adding 1 ml 8.4% sodium bicarbonate to 10 ml lidocaine or mepivacaine. Disadvantages to alkalinization include potential for precipitation of local anesthetic solution if mixed improperly.

Another method that has become increasingly popular is a combined spinal-epidural technique. It offers the advantages of spinal anesthesia (rapid onset, profound block) with those of epidural anesthesia (titratability, ability to use lower doses). While the needle-through-needle technique remains the most popular, commercial kits such as the “back-eye” Touhy and double-barrel needles are available. Because this technique’s use has grown tenfold in the past decade [55], future studies may further define the optimal spinal drug and dose for use with the combined method [56].

Clinical efficacy of neuraxial techniques

Newer, shorter-acting general anesthetics such as propofol, desflurane, and sevoflurane provide rapid recovery and more rapid discharge times than spinal or epidural anesthesia with traditional drugs and doses. Pavlin showed that the discharge times for neuraxial block in her practice were longer than general anesthesia overall [57]. Local anesthesia or general anesthesia have been shown to provide faster discharge than conventional spinal anesthesia for hernia [58] or rectal [59] surgery. Appropriate choices of techniques and drugs, however, can

make neuraxial anesthesia competitive. For knee arthroscopy, spinal anesthesia can provide more rapid early recovery profile [60]. Spinal and epidural anesthesia (with 2-chloroprocaine) can provide a side effect and discharge profile similar to the general anesthesia with propofol [51]. A similar comparison of propofol anesthesia to longer-acting epidural (mepivacaine) or spinal (lidocaine) drugs showed longer discharges with the neuraxial techniques, but higher costs and more pain with the general anesthesia techniques [61]. The choice of drug and dose is important. Low-dose lidocaine spinal anesthesia (20–25 mg) has been compared with desflurane general anesthesia for outpatient laparoscopy and found to provide equally rapid recovery with less analgesia requirements [35] at a cost savings over the general anesthetic [62]. Similarly, the low-dose technique for laparoscopy also provides faster attainment of recovery markers than propofol general anesthesia [63]. For knee arthroscopy, low-dose lidocaine spinal anesthesia is equivalent in recovery time to local anesthesia with propofol sedation [34].

Summary

In summary, regional techniques offer significant advantages in the outpatient setting. They can avoid the side effects of nausea, vomiting, and pain that frequently delay discharge or cause admission. They can also provide prolonged analgesia as well as offer, with the use of continuous catheters, the promise of a pain-free perioperative period. The choice of drugs must be carefully adjusted, especially with neuraxial techniques. Despite frequently requiring some additional time at the outset, regional techniques have consistently been shown to provide competitive discharge times and costs when compared with general anesthesia. They deserve a prominent place in outpatient surgery.

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