Cervical epidural anaesthesia for shoulder arthroscopy and effective postoperative physiotherapy for a frozen shoulder: a case study

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Abstract

Shoulder arthroscopy is used to treat various diseases of the shoulder, including refractory adhesive capsulitis. Effective postoperative pain relief is critical for these patients, as the success of surgery largely depends on early and regular physiotherapy. Although traditionally, various methods of postoperative analgesia have been described, each has its own disadvantages. We report a case of adhesive capsulitis, for which arthroscopic capsular release was carried out under cervical epidural anaesthesia with general anaesthesia, resulting in excellent intraoperative and postoperative analgesia, with a better patient compliance for physiotherapy, and a significant improvement in the range of movement at the shoulder joint.

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Introduction

Shoulder arthroscopy is commonly used to treat various diseases of the shoulder, including subacromial impingement, acromioclavicular osteoarthritis, rotator cuff tears, a frozen shoulder (adhesive capsulitis), chronic tendonitis, partial tears of the long biceps tendon, superior labrum anterior-posterior (SLAP) lesions, and shoulder instability. Even minor shoulder surgery, such as rotator cuff repair, may lead to severe postoperative pain within the first 48-72 hours.[1] This not only causes discomfort for the patient, but also compromises the intensive postoperative physiotherapy that is essential to avoid recurrence of the problem.[2]

Many shoulder procedures can be carried out with regional anaesthesia alone, but a combination of regional and general anaesthesia may be more appropriate for prolonged major procedures, or where discomfort in other areas may limit comfortable positioning on the operating table.[3]

Currently, single-injection interscalene brachial plexus block,[4] suprascapular nerve block,[5] and intra-articular injection of ropivacaine,[6] are some of the modalities used for analgesia in shoulder arthroscopies, but none of them is effective in providing sustained postoperative analgesia.

Continuous epidural infusion represents a viable alternative that has the advantage of the addition of local anaesthetics to narcotics, to provide better intraoperative and postoperative analgesia, and improve the range of movement. The risks and complications of this approach can be avoided by careful titration of the infused medications, careful haemodynamic monitoring, and adequate patient and family education.[7]

We hereby report successful anaesthetic management of a case of a 50-year-old woman with a frozen shoulder, posted for capsular release surgery using cervical epidural anaesthesia, together with general anaesthesia.

Case study

A 50-year-old woman attended an orthopaedic outpatient department with a history of pain and stiffness in the left shoulder for the period of a year. There was no history of trauma to the joint, and no significant past medical or surgical history. On general examination, she was thinly built (a weight of 40 kg), with a regular pulse rate of 70 beats per minute, and blood pressure of 128/72 mmHg in the right arm, in a supine position. Her systemic examination did not reveal any abnormality. Her spine was normal, and her Mallampatti grade was I.

Local examination of her left shoulder revealed a stiff shoulder, with a reduced range of movement. Table I shows how severely her range of movement was reduced, as compared to normal values.

Table I: Patient's preoperative range of motion compared to normal range

Movement	Normal range (degree)	Patient's range (degree)
Forward flexion	160-180	20
Abduction	160-180	20
External rotation (side)	70-80	10
Internal rotation (side)	Reach D8-D10	Nil
External rotation:internal rotation	90:90	Not possible

A diagnosis of left adhesive capsulitis was made, and the patient was advised to undergo physiotherapy. The severe pain did not allow her to participate in regular exercise, and the stiffness was progressive. Therefore, she was posted for elective arthroscopic capsular release surgery.

Her haematological investigations and electrocardiograph (ECG) were unremarkable, and so she was classified as an American Society of Anesthesiologists (ASA) I patient, and posted for surgery. A decision was taken to administer cervical epidural anaesthesia with general anaesthesia, and the procedure was explained to the patient.

After written informed consent had been obtained, and overnight fasting status had been confirmed, the patient was taken into the operating room and routine non-invasive monitors, including a five-lead ECG, a non-invasive blood pressure monitor, a capnograph, a pulse oximetry probe, and a temperature probe, were attached.

Peripheral wide-bore intravenous access was achieved on the right forearm, and lactated Ringer infusion was started.

Premedication given to the patient included intravenous glycopyrrolate (0.2 mg), intravenous ranitidine hydrochloride (50 mg), and intravenous ondansetron (4 mg).

The position given to the patient was that of sitting on a stool with a flexed neck, with her head resting on the operation table. The C7-T1 intervertebral space was infiltrated with 2 ml of 2% lignocaine. The epidural space was identified using an 18 G Tuohy needle by loss of resistance to air, and reconfirmed by the ability to inject saline without resistance. The distance of the epidural space from the skin was found to be 3.5 cm. An epidural catheter (18 G) was inserted and flushed, and after confirming negative aspiration of blood or cerebrospinal fluid (CSF), it was fixed at the 8 cm mark.

The patient was made supine, and an epidural test dose was given with 3 ml of 1% lignocaine with adrenaline. After confirming stable vitals, an epidural top-up dose was administered with 8 ml of 0.25% bupivacaine and 25 µg fentanyl citrate. Vitals remained stable. Twenty to 30 minutes later, when the patient was asked to reassess her pain, she confirmed an improvement in her symptoms in the form of reduced pain and stiffness. On checking passive movements by the orthopaedician, a significant improvement in the range of movements was noticed, as depicted in Table II.

Table II: Comparison of range of motion before, and after, epidural analgesia

Movement	Pre-epidural (degree)	Post-epidural (degree)
Forward flexion	20	40
Abduction	20	45
External rotation (side)	10	30
Internal rotation (side)	Not possible	Can reach sacral region (30)
External rotation:internal rotation	Not possible	30:30

Next, we sedated the patient with intravenous midazolam (1 mg) and intravenous fentanyl citrate (50 µg). After preoxygenation with 100% oxygen via a mask for three minutes, general anaesthesia was induced with intravenous propofol (100 mg), and endotracheal intubation facilitated with intravenous suxamethonium (100 mg). A polyvinylchloride cuffed number seven (07) endotracheal tube was used to intubate the trachea, and anaesthesia was maintained with 50% nitrous oxide and 0.8-1% isoflurane in oxygen. Intravenous vecuronium bromide (3 mg) was used for muscle relaxation.

Surgery was performed in the right lateral position and was uneventful. The patient's haemodynamics remained stable throughout the procedure. Intraoperative narcotic top-up doses were not required. Surgery was completed in one hour and 45 minutes, after which the patient was reversed, and her trachea extubated. An epidural top-up dose was administered containing 8 ml of 0.125% bupivacaine, and the patient was moved to the post-anaesthesia care unit.

Postoperatively, epidural top-up doses of 8 ml of 0.125% bupivacaine, with 25 mcg fentanyl citrate, were given eight hourly to keep the patient pain-free. Postoperatively, the patient's vitals were monitored using a multipara monitor (Phillips Suresign VM6®) in the postanaesthesia care unit. Vitals remained stable throughout the postoperative period. The visual analogue scale (VAS) scores were noted hourly in the postoperative period. The dynamic VAS score remained around 3-4, and the static VAS score remained around 2 in the postoperative period. The patient did not require any rescue analgesia in the postoperative period. Physiotherapy was started after 12 hours, and was conducted thrice a

day. The epidural catheter was removed after 72 hours, and the patient was discharged on the sixth day. At the time of discharge, her shoulder stiffness had decreased significantly, and the range of motion in her operated shoulder was as depicted in Table III.

Table III: Comparison of range of motion before and after surgery

Movement	Preoperative (degree)	Postoperative (degree)
Forward flexion	20	100
Abduction	20	110
External rotation (side)	10	40
Internal rotation (side)	Not possible	Can reach L5 (60)
External rotation:internal rotation	Not possible	60:60

The patient was discharged, fully satisfied with the treatment, with instructions to do shoulder exercises at home, and to return for a review and follow-up after four weeks.

Discussion

Arthroscopic surgery, being a minimally invasive surgery, reduces recovery time, and may increase the rate of surgical success due to less trauma to the connective tissue. In their study of patients with frozen shoulders, Warner et al[8] concluded that in patients experiencing loss of mobility, refractory to closed manipulation arthroscopic capsular release improves motion reliably, with little operative morbidity.

Frozen shoulder surgery may be associated with severe postoperative pain that needs to be effectively controlled to encourage early physiotherapy, which is critical for the success of the surgery.[9]

Although idiopathic adhesive capsulitis is usually self-limiting, 10% of patients who receive non-operative therapy never fully recover normal shoulder activity.[10] Our patient had a significantly reduced range of motion in her left shoulder that was progressive, and accordingly, she was posted for arthroscopic capsular release surgery.

Evelin et al[11] have reported venous air embolism during shoulder arthroscopy, and concluded that although rare, it should always be kept in mind. Therefore, proper monitoring is essential. Ichai et al[12] have reported death due to cerebral oedema, caused by intravascular absorption of glycine in shoulder arthroscopy. With these complications in mind, we attached the necessary monitors to our patient, including an ECG, a non-invasive blood pressure monitor, a pulse oximetry probe, a capnograph, and a temperature probe.

A decision was taken to conduct the surgery under general anaesthesia with cervical epidural anaesthesia. Brown[9] has quoted the innumerable advantages of regional anaesthesia for shoulder surgery, including better postoperative analgesia, less intraoperative blood loss, localised muscle relaxation, reduced recovery room stay, and cost effectiveness. Although some of these advantages may be lost by using the combined technique, the overall comfort of the patient in the lateral decubitus position for almost two hours, may be best served by the use of a combined-anaesthesia technique.[9] Brown has mentioned that interscalene brachial plexus block is better, and technically easier, than cervical epidural anaesthesia. Continuous interscalene brachial plexus block, using a catheter, can be an effective mode of analgesia, but catheter insertion and threading can be really difficult in interscalene block.[13]

Single-injection interscalene brachial plexus block and suprascapular nerve block are both effective anaesthetic modalities for intraoperative analgesia, but are limited by the duration of action of the local anaesthetic, and readmission for pain control is common in the postoperative period.[4,5]

Intra-articular injection of ropivacaine can also be used for postoperative analgesia after arthroscopic surgeries, but its use after shoulder arthroscopy is still under investigation.[6]

We used a cervical epidural catheter for intraoperative and prolonged postoperative analgesia, by using a combination of bupivacaine and fentanyl citrate.

Cervical epidural anaesthesia, although a safe technique if performed by an experienced anaesthesiologist, has several known complications, including inadvertent dural puncture, inadvertent subdural puncture, inadvertent intravenous needle and catheter placement, haematoma and ecchymosis, infection, neurological complications, respiratory compromise, bilateral phrenic nerve palsy, and urinary retention. These complications should always be kept in mind while performing a cervical epidural anaesthetic technique.

Narouze et al[7] studied 25 patients with frozen shoulders, posted for shoulder arthroscopy. They used a tunnelled cervical epidural catheter for postoperative analgesia, and noted a statistically significant increase in range of motion. They concluded that this method was an effective alternative to oral pain medications for analgesia in the rehabilitative phase of a refractory frozen shoulder.

Zablocki et al[14] have reported the successful use of cervical epidural anaesthesia in controlling postoperative pain following shoulder surgery, but they have warned that it may be risky in inexperienced hands.

Conclusion

We conclude that cervical epidural anaesthesia, together with general anaesthesia, can be a safe and effective method of conducting shoulder arthroscopic surgery, and providing analgesia for postoperative physiotherapy. However, it should be performed by an experienced anaesthesiologist, and careful monitoring of the patient should continue in the intraoperative and postoperative period, bearing in mind the abovementioned complications.

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