

Regional Anaesthesia Techniques for Orthopaedic Surgery at Tertiary Care Teaching Hospital

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Abstract: Background: Regional anaesthesia has found its uses in many aspects of orthopaedic surgery including more recently, spine surgery. Neuraxial or regional anaesthesia are often the preferred techniques for surgical anaesthesia in patients with multiple comorbidities. For instance, osteoporosis-related complications such as hip fractures are common in the growing geriatric population. Orthopaedic surgery aims to recover functional capacity in patients but it carries a specific morbidity and mortality. Orthopaedic surgery conveys several challenges for the anaesthesiologist, including prevention of thromboembolic complications, reduction of peri- and postoperative bleeding and management of autologous blood transfusion and postoperative pain. **Material and Methods:** This is a prospective study was conducted in the Department of orthopaedic and Anaesthesia at Shadan Institute of Medical Sciences, Teaching Hospital and Research Center. Three hundred and ten consecutive cases posted for orthopaedic surgeries were taken up for study. Anaesthesia technique was decided based on the nature of surgery, willingness and medical status of the patient and experience of the anaesthesiologists. RA was planned whenever possible. In the morning of operation the RA technique was explained to the patients and intravenous (IV) access established. Preoperative medication was given using IV fentanyl and midazolam in titrated doses. Ketamine was used in children and appropriate block given using standard technique. Nerve stimulator was used wherever applicable **Results:** Age of the patients ranged from three months to 92 years. Maximum number of patients belonged to the age group of 21- 50 years (63.2%). As per the demographic data. In our study, Knee arthroscopy and repair was 28.38%, Femoral was 17.41%, Radius and ulna was 15.16% and least were Ankle and foot, Wrist and hand surgery was 1.93%. In our study Subarachnoid block was 40.96% followed by Combined spinal-epidural 17.09%, General anaesthesia 12.90%. **Conclusion:** In a conclusion, the use of regional anesthesia techniques for postoperative outcomes in orthopedic surgeries has been investigated in lots of clinical studies and case reports. Most of the authors proposed that regional anesthesia in orthopedic patients may be associated with better postoperative pain control and a reduction in intraoperative blood loss when compared with general anesthesia. In the future regional anesthesia techniques will be more preferable anesthetic technique in orthopedic surgeries

Keywords: Regional Anaesthesia, Orthopaedic Surgery, American Society of Anaesthesiologists

INTRODUCTION

Regional anaesthesia has found its uses in many aspects of orthopaedic surgery including more recently, spine surgery. Neuraxial or regional anaesthesia are often the preferred techniques for surgical anaesthesia in patients with multiple comorbidities. [1] For instance, osteoporosis-related complications such as hip fractures are common in the growing geriatric population. [2] These patients are often high-risk surgical candidates with limited cardiopulmonary reserve. [3] Successful central neuraxial block (CNB) or peripheral nerve block (PNB) may avoid complications associated with general anesthesia such as airway difficulties, postoperative respiratory impairment and haemodynamic instability. [4] Fewer systemic drugs may reduce postoperative delirium, nausea and vomiting, and improved blood rheology may reduce the incidence of deep vein thrombosis. [5]

Regional anaesthesia also has an important role in multimodal analgesia by providing excellent pain relief, reducing perioperative opioid consumption and their side effects, and improving patient satisfaction. [6] Recent development of motor-sparing regional anesthetic techniques such as the pericapsular nerve group (PENG) block may result in earlier mobilization and rehabilitation. [7] Orthopaedic surgery aims to recover functional capacity in patients but it carries a specific morbidity and mortality. [9]

Orthopaedic surgery conveys several challenges for the anaesthesiologist, including prevention of thromboembolic complications, reduction of peri- and postoperative bleeding and management of autologous blood transfusion and postoperative pain. [10] Orthopaedic surgery is the place where the most dramatic developments in regional anaesthetic techniques have occurred. [11]

These techniques have been evaluated in terms of advantages and drawbacks compared to general anaesthesia. [12] In addition, the techniques themselves have changed over the past years, the main trends being the development of peripheral blocks for the anaesthesia itself and the postoperative analgesia as well. [13] Thus, anaesthesia in orthopaedics is a very large topic, but this review will only focus on specific problems related to the use of regional anaesthetic techniques. [14]

MATERIAL AND METHOD

This is a prospective study was conducted in the Department of orthopaedic and Anaesthesia at Shadan Institute of Medical Sciences, Teaching Hospital and Research Center. Three hundred and ten consecutive cases posted for orthopaedic surgeries were taken up for study. Anaesthesia technique was decided based on the nature of surgery, willingness and medical status of the patient and experience of the anaesthesiologists. RA was planned whenever possible.

In the morning of operation, the RA technique was explained to the patients and intravenous (IV) access established. Preoperative medication was given using IV fentanyl and midazolam in titrated doses. Ketamine was used in children and appropriate block given using standard technique. Nerve stimulator was used wherever applicable. Patients having partial blockade were given IV fentanyl and propofol and if needed analgesic doses of ketamine. Technique was converted into GA if above measures did not help.

Routine monitoring of blood pressure, SpO₂ and electrocardiograph was done. O₂ supplementation was given whenever SpO₂ was below 95%. Patient data record included age, sex and American Society of Anaesthesiologist (ASA) grade. Record was also maintained of type of surgery, anaesthesia technique, failure rates and complications. Satisfaction level of adult patients (excellent, good, fair, poor) was also recorded 24 hours after surgery.

RESULT

Table 1: Distribution of Age of the patients

Age group (years)	Male	Female	Total
<5	2	1	3
5-20	49	4	53
21-35	131	2	133
36-50	58	5	63
51-65	35	5	40
66-80	6	4	10
>80	5	3	8
Total			310

Table 2: Distribution of ASA grade of the patients

ASA grade	Frequency	Percentage
ASA – I	203	65.48
ASA – II	83	26.77
ASA – III	21	6.77
ASA – IV	3	0.96
Total	310	100

Age of the patients ranged from three months to 92 years. Maximum number of patients belonged to the age group of 21- 50 years (63.2%). As per the demographic data (Table 1),

Table 3: Nature of Orthopaedic Surgery

Type of surgery	Number of cases	Percentage
Total hip arthroplasty	13	4.19
Total knee arthroplasty	24	7.74
Femoral	54	17.41
Knee arthroscopy and repair	88	28.38
Tibia and fibula	29	9.35
Ankle and foot	6	1.93
Humerus	13	4.19
Radius and ulna	47	15.16
Shoulder	9	2.90
Wrist and hand	6	1.93
Spine	6	1.93
Miscellaneous	15	4.83
Total	310	100

In our study, Knee arthroscopy and repair was 28.38%, Femoral was 17.41%, Radius and ulna was 15.16% and least were Ankle and foot, Wrist and hand surgery was 1.93% in table 3.

Table 4: Anaesthetic techniques used

Anaesthetic techniques	Frequency	Percentage
Subarachnoid block	127	40.96
Combined spinal-epidural	53	17.09
Epidural	8	2.58
Supraclavicular block	21	6.77
Interscalene block	14	4.51
Paravertebral block	11	3.54
Bier's block	9	2.90
Three-in-one block	11	3.54
Popliteal+femoral block	7	2.25
Miscellaneous blocks	9	2.90
General anaesthesia	40	12.90
Total	310	100

In our study Subarachnoid block was 40.96% followed by Combined spinal-epidural 17.09%, General anaesthesia 12.90%.

Table 5: Satisfaction level in adult patients (n=310)

Rating (%)	Satisfaction level	Number of patients
80-100	Excellent	171
60-79	Good	115
50-59	Fair	12
<50	Poor	12

DISCUSSION

Shoulder surgery is often associated with severe postoperative pain, particularly within the first 48 hours. Postoperative pain after shoulder surgery can cause patient discomfort as well as compromise functional recovery. Adequate pain relief after shoulder surgery is necessary both for the comfort of the patients and for an early use of rehabilitation exercise. In some clinical studies have been demonstrated that interscalene brachial plexus block is often used to provide anaesthesia and analgesia for shoulder surgery. [15] When prolonging the block with a patient-controlled interscalene analgesia (PCIA) infusion 0.15% bupivacaine or ropivacaine provide adequate pain control, and high patient satisfaction after shoulder surgery. [16]

In two clinical studies Borgeat and colleagues reported that the use of PCIA both with 0.15% bupivacaine and 0.2% ropivacaine were demonstrated to provide better quality of pain control, decreased incidence of side effects such as vomiting and pruritus than PCA with opioids after major shoulder surgery. [17] In Eroglu reported that the PCA techniques using subacromial ropivacaine or fentanyl i.v. provided similar and adequate pain relief and minimal side effects after open

acromioplasty surgery. But, the PCA using subacromial fentanyl was not as effective as either subacromial ropivacaine or i.v. fentanyl. [18]

The common regional anesthetic techniques for hip arthroplasty are combined spinal-epidural block, epidural block and catheter, and spinal block with sedation. Mauermann [19] performed a metaanalysis to test the hypothesis that elective total hip replacement (THR) under neuraxial block was associated with improved outcomes compared with the surgery under general anesthesia. They focused their analysis on elective THR to reduce many confounding factors, such as blood loss before the procedure, in patients with hip fracture and trauma. [20]

Their analysis of this large nationwide sample provided evidence of the superior comparative effectiveness of neuraxial versus general anesthesia in the setting of primary hip and knee arthroplasty. Multiple outcomes including perioperative complications and length of hospital stay were positively affected by the choice of neuraxial versus general anesthesia. Many outcome benefits were reduced, but still significant when combining general with neuraxial anesthesia. They also reported that their data therefore offer evidence of benefit associated with neuraxial anesthesia and support further research to study the mechanisms by which beneficial effects may be exerted. [21]

Some regional anesthetic techniques (for example low dose of spinal anesthesia, combined spinal epidural anesthesia have been used for femur fracture surgeries in some case reports. Low dose of spinal anesthesia was successfully used in elderly and critically ill patients for open reduction of femur neck fracture. [22]

In another article, Onal. [23] presented a case report with a geriatric patient at the age of 105 undergoing operation due to fracture in femur neck. They performed low dose of spinal anesthesia with 12.5mg izobaric bupivacaine. They conclude that in geriatric patients, respiratory difficulty associated with the weakening of muscles, decrease in lung capacity, increased probability of postoperative atelectasia and aspiration due to decrease in reflexes makes general anesthesia risky.

Gupta. [24] presented an anesthetic management of a patient with dilated cardiomyopathy for fracture femur surgery under combined spinal epidural anesthesia (CSA). They reported that CSE using low-dose intrathecal bupivacaine and fentanyl with sequential epidural bupivacaine provided the advantages of spinal and epidural blockade, whilst avoiding some of their respective limitations. This sequential CSE technique may be particularly helpful in high risk cardiac disease patients in whom a slower onset sympathetic blockade is required. [25]

Total knee arthroplasty (TKA) is a common procedure and it may cause significant pain in the acute postoperative period. Poor postoperative analgesia may effect mobilization, duration of discharge, patient satisfaction, morbidity and mortality. The studies evaluating the effects of regional anesthesia (RA) on functional outcome after TKA were conducted. The results of some studies have suggested that Regional anesthesia seems to improve the outcome of patients undergoing total hip or knee replacement when compared with general anesthesia. [26]

Mulroy. [27] reported that epidural anesthesia with chloroprocaine and general anesthesia with propofol-nitrous oxide provided equally effective intraoperative conditions and PACU discharge times in our outpatient center. Spinal anesthesia with 75 mg of procaine with fentanyl in this setting was associated with an average of 42 to 54 minutes longer discharge times than the other two techniques, and a higher incidence of side effects.

In conclusion, they reported that patients undergoing ambulatory knee arthroscopy had equal likelihood of meeting fast-track criteria and discharge times after SSA with 4mg of hyperbaric bupivacaine and after endotracheal GA with desflurane. However, those patients receiving SSA had lower pain scores and need of postoperative opioids, less PONV, and somnolence in the hospital. [28]

Some authors compared with periarticular analgesic injections and peripheral nerve blocks like femoral nerve block (FNB) for postoperative analgesia after knee arthroplasty. They reported that multimodal periarticular soft tissue injection provided comparable analgesia to continuous FNB after total knee arthroplasty. They also concluded the analgesic effects of PAI and PNB are similar. And, PAI may be considered superior to PNB because it is easier to perform. [29]

Some types of lower extremity peripheral nerve blocks were used for foot and ankle surgery. Lollo L & Stogicza A compared the postoperative analgesic properties of combined femoral and sciatic nerve blockade with those of combined saphenous and sciatic nerve blockade in patients that underwent foot and ankle surgery. They reported that combined saphenous-sciatic nerve blockade was superior to femoral-sciatic nerve blockade for postoperative analgesia following foot and ankle surgery. And they also reported that combined popliteal sciatic and saphenous nerve blockade resulted in lower immediate postoperative pain scores in opioid naïve females and reduced immediate postoperative rescue opioid analgesic dosages in all patient groups. [30]

CONCLUSION

In a conclusion, the use of regional anesthesia techniques for postoperative outcomes in orthopedic surgeries has been investigated in lots of clinical studies and case

reports. Most of the authors proposed that regional anesthesia in orthopedic patients may be associated with better postoperative pain control and a reduction in intraoperative blood loss when compared with general anesthesia. In the future regional anesthesia techniques will be more preferable anesthetic technique in orthopedic surgeries.

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