Original Article

Regional Anaesthesia Techniques for Orthopaedic Surgery

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Abstract

Background : In recent years, there has been a significant resurgence of interest in regional anaesthesia techniques. Despite various advantages, regional anaesthesia is not used to its full potential in orthopaedic surgeries.
Methods : This study was conducted to evaluate the efficacy and safety of regional anaesthesia techniques in 400 consecutive patients, posted for orthopaedic surgeries in a tertiary care centre. Data was analysed for patient profile, type of surgery, nature of anaesthetic technique used, success rate, complications and satisfaction level of patients.
Result : Age of patients ranged from three months to 92 years with male preponderance (84.5 %). Regional anaesthesia was used in 85% cases. Most frequently used technique for upper limbs was supraclavicular brachial plexus block (12.05 %) followed by interscalene block (5.58 %) and intravenous regional anaesthesia or Bier's block (2.64 %). For lower limbs, subarachnoid block was used in 50 % cases followed by combined spinal-epidural technique (21.47 %) and paravertebral block (4.70 %). Less commonly used techniques like lumbar plexus block, popliteal fossa block, sciatic + femoral nerve blocks were found to be useful but incidence of partial blocks was high. Overall success rate was 96.17 %. In 22.05 % cases supplementation with analgesic / sedative was needed, whereas in 3.82 % cases, technique was converted into general anaesthesia. There was no major complication. Six patients had reversible sensory neuropathy. In 91.64 % cases, satisfaction level was good to excellent.
Conclusion : Skilfully performed techniques in regional anaesthesia can facilitate excellent surgical anaesthesia and postoperative pain management.

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Key Words : Regional anaesthesia; Orthopaedic surgery; Central neuraxial block; Peripheral nerve block

Introduction

Regional anaesthesia (RA) is an expanding subspeciality and is gaining increasing popularity worldwide due to its inherent advantages over general anaesthesia (GA). Though, isolated studies on role of individual RA techniques in different surgeries are available, data regarding pattern of RA techniques in orthopaedic surgeries in the Indian setting is sparse. The aim of this study was to assess the role of RA in orthopaedic surgeries and to generate awareness.

Material and Methods

This prospective study was conducted in an orthopaedic referral centre. Four hundred 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, SpO_2 and electrocardiograph was done. O_2 supplementation was given whenever SpO_2 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.

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 (57.75%). As per the demographic data (Table 1), there were more males (84.5%) than females and 13.5% patients belonged to ASA grade III and above. There was a preponderance of lower limb surgeries (64%) compared to upper limbs (Table 2). A total of 340 cases (85%) were operated under RA (Table 3). The central neuraxial block (CNB) techniques were most commonly used (67.05%) for lower limbs. Subarachnoid block (SA) and combined spinal-epidural (CSE) techniques were more popular. Among the peripheral neural blocks (PNB), most frequently used technique was supraclavicular brachial plexus block (12.05%), followed by interscalene block (5.58%) and paravertebral block (4.70%).

In 22.05% of patients of PNB, analgesic supplementation was needed whereas in 3.82 % cases technique was converted

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Table 1
Patient Data

Age group (years)	Male	Female	Total
< 5	2	2	04
5 – 20	67	6	73
21 – 35	146	7	153
36 – 50	69	9	78
51 – 65	34	21	55
66 – 80	15	13	28
> 80	4	5	09
Total			400
ASA Grade			
ASA - I			233
ASA – II			113
ASA – III			51
ASA – IV			03

Table 2
Nature of Orthopaedic Surgery

Type of surgery	Number of cases
Total hip arthroplasty	13
Total knee arthoplasty	34
Femoral	64
Knee arthroscopy and repair	98
Tibia and fibula	39
Ankle and foot	16
Humerus	23
Radius and ulna	57
Shoulder	09
Wrist and hand	16
Spine	06
Miscellaneous	25
Total	400

into GA due to unsatisfactory block. No serious complications were noted. Six patients had reversible sensory neuropathy after PNB, in the form of transient neurological symptoms following nerve injuries during paravertebral blocks, psoas compartment blocks and popliteal fossa blocks. Some patients (9.41%) complained of discomfort in the unblocked pressure areas due to positional problems during prolonged surgery. There was no case of haematoma, pneumothorax, infection or local anaesthetic toxicity. Satisfaction level was good to excellent in 91.64 % cases (Table 4).

Discussion

Like all other fields of anaesthesia, RA has also undergone a remarkable advancement. With the use of refined techniques, nerve stimulator, ultrasound, elastomeric infusion pumps and stimulating catheters, a precise block can be given with a lesser dose and continuous postoperative analgesia ensured. Orthopaedic cases provide a maximum number of opportunities for utilisation of RA techniques in all age groups. A significant number of orthopaedic patients belong to older age group with various systemic diseases. Hence,

Table 3
Anaesthetic techniques used

Subarachnoid block	147
Combined spinal-epidural	73
Epidural	08
Supraclavicular block	41
Interscalene block	19
Paravertebral block	16
Bier's block	09
Three-in-one block	11
Popliteal+femoral block	07
Miscellaneous blocks	09
General anaesthesia	60

Table 4
Satisfaction level in adult patients (n=323)

Rating (%)	Satisfaction level	Number of patients
80 – 100	Excellent	176
60 – 79	Good	120
50 – 59	Fair	14
< 50	Poor	13

anaesthesia in some cases is demanding and needs a high degree of skill and attention. RA techniques can provide a safer alternative in compromised patients. A reduction in postoperative morbidity and mortality with RA in orthopaedic patients has been reported [1]. Choice of anaesthetic techniques varies from place to place depending on variables like patient's preference and health status, duration of surgery, expertise and experience of anaesthesiologist, surgeon's preference and practice pattern of the hospital.

Virtually all types of orthopaedic surgeries can be conducted using various RA techniques. In our centre only 15% cases were done under GA, mainly for surgeries of spine and for shoulder joints due to surgeon's preference and lack of experience of some anaesthesiologists. In some centers RA is the most favoured technique for emergency procedures as compared to GA [2]. Uguralp et al [3], found RA safer alternative to GA in paediatric surgery. In our centre, we also found that children tolerate RA techniques well, as the procedures were performed after adequate sedation and analgesia. In this category, SA and epidural anaesthesia were most commonly used. In recent years RA techniques have been exploited to their full advantages for anaesthesia and evacuation of battle field trauma patients [4,5]. Use of RA in out patient setting has also been found to be an attractive option [6]. Some of the distinct advantages of RA over GA are better postoperative pain relief without undue sedation, decreased stress response in compromised patients and avoidance of difficult intubation and postoperative complications associated with intubation. There is better

psychomotor profile [7] and with absence of nausea or vomiting on recovery. Seven of our patients who had undergone previous surgeries under GA, were more satisfied with RA. Total cost in terms of consumables and post-anaesthesia nursing care is also less.

CNB was used in 67.05% cases due to higher percentage of surgeries of lower limbs (77.64%). Use of adjuvants ensure adequate postoperative analgesia without much effect on motor function, thus facilitating better prophylaxis of deep vein thrombosis (DVT) and mobilisation [8,9,10]. Due to attenuation of stress response, there is reduction of increased coagulability observed postoperatively. It also maintains fibrinolysis and reduces platelet adhesiveness apart from increasing arterial and venous blood flow in lower limbs. It is estimated that a fifth of orthopaedic patients who died were found to have pulmonary embolism in postmortem examination [11,12]. We found continuous paravertebral block and psoas compartment block a suitable alternative for postoperative pain relief after hip and knee arthroscopy and femoral surgeries. They provide prolonged unilateral analgesia without any risk of epidural haematoma.

Rees et al [13], found 3 in 1 block unreliable, as it does not effectively block all the three nerves of lumbar plexus. Contrary to this, we found this block adequate for surgery over thigh and arthroscopy of knee with or without IV analgesics. This difference could be due to adequate premedication and use of nerve stimulator. However, for knee arthroplasty, additional sciatic block is needed. Bier's block (intravenous regional anaesthesia) could not be used in our centre due to non availability of double tourniquet system. Nevertheless, this technique has been used for knee arthroplasty in an elderly patient with poor left ventricular function [14].

Neuraxial haematoma and cardiac arrest are potential serious complications of CNB [15]. RA can result in delayed diagnosis of acute compartment syndrome [16, 17]. Permanent nerve injuries and paraplegia can also occur. Use of nerve stimulator during PNB can eliminate this serious complication. Ultrasound guided PNBs are helpful in difficult cases [18].

Adequate cushioning may be required in cases having positional discomfort. Inflatable axillary rolls can help in reducing discomfort in dependent shoulder [19]. Sedation to the level of verbal unresponsiveness can lead to cardiac arrest in unmonitored patients [15].

Conflicts of Interest

None identified

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