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Interscalene Brachial Plexus Block with Continues Catheter Insertion System and a Disposable Infusion Pump in Patients Undergoing Surgery for Fracture Head of Humerus by open Reduction and Internal Fixation

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Abstract
Introduction: *Interscalene brachial plexus block with continues catheter insertion system and a disposable infusion pump is a commonly employed technique for upper limb surgeries. Postoperatively these patients may be managed by various methods like rescue opioids depending upon VAS score, patient controlled analgesia or a combination of these two. Interscalene brachial plexus block with a continuous catheter insertion system and a disposable infusion pump through which local anesthetic drug is infused perineurally is an effective alternative for providing postoperative analgesia in patients who have undergone various upper limb surgeries. We conducted this comparative study to find out the efficacy of Interscalene brachial plexus block with a continuous catheter insertion system and a disposable infusion pump in providing postoperative analgesia in patients who have undergone open reduction and internal fixation for fracture head of humerus.*
Aims and Objectives: *To study the efficacy of Interscalene brachial plexus block with a continuous catheter insertion system and a disposable infusion pump in providing postoperative analgesia in patients who have undergone open reduction and internal fixation for fracture head of humerus.*
Materials and Methods: *This was a comparative study in which total 30 patients who have undergone open reduction and internal fixation for fracture head of humerus were included depending upon inclusion and exclusion criteria. All the patients were operated under interscalene block using 30 ml of 0.5% Ropivacaine. Patients were divided into 2 groups. Group R received 0.2% ropivacaine infusion while Group S received Normal saline infusion for 24 hours postoperatively through continuous catheter insertion system and a disposable infusion pump. Demographic details, duration of surgery, postoperative VAS score and requirement of rescue analgesics were compared in both the groups.*
Results: *Mean age and mean duration of surgery were found to be comparable in both the groups and there was no statistically significant difference between these 2 groups. Hemodynamic parameters were also found to be comparable for initial 24 hours of postoperative period. Patients in group R (Ropivacaine Group) had significantly less requirement of rescue analgesic doses in postoperative period. Moreover mean VAS scores were found to be significantly low in Group R.*
Conclusion: *Interscalene brachial plexus block with continues catheter insertion system and a disposable Infusion Pump was found to be an effective method for providing postoperative analgesia to patients undergoing upper limb surgeries.*
Keywords: *Interscalene brachial plexus block, continues catheter insertion system, Ropivacaine.*

Introduction

Patients attending orthopedics emergency department for shoulder injuries is a common occurrence in orthopedics practice[1]. These injuries may include fracture of head of humerus, Bony Bankart lesions, rotator cuff injuries and ligament tears. Many of these injuries will require open surgical interventions. After such major shoulder surgeries patients may have to remain hospitalized for a prolonged period of time for pain management[2]. These patients may require multiple doses of intramuscular opioids or intravenous narcotics for pain relief. Moreover inadequate analgesia may cause hemodynamic instability, prolonged recovery period and consequently increased hospital stay. There are many alternative methods for providing effective analgesia in these patients that may include epidural analgesia, single injection Interscalene brachial plexus block and supplemental analgesic doses[3]. Each of these techniques have its own advantages and disadvantages for instance while epidural analgesia may be very effective in pain management it may be associated with potentially devastating complications such as systemic toxicity and epidural hematoma[4]. Single injection interscalene brachial plexus block may be effective for rescue analgesia depending upon Visual analogue score but it's limited by the duration of action of the particular local anesthetic drug used for such a block. Interscalene brachial plexus block and continuous catheter insertion system and disposable infusion pump is a promising technique which may provide prolonged post operative analgesia[5]. This technique may significantly reduce requirement of postoperative opioids and consequently will be responsible for reduction in side effects of these drugs. The factors which may limit use of this technique include need of specialized training and need for patients to remain hospitalized because of in situ catheter attached to disposable infusion pump[6]. Despite these limitations many randomized controlled trials have demonstrated that use of Interscalene brachial plexus block with continuous catheter insertion system and disposable infusion pump is associated with better analgesic effect, reduced requirement of opioid analgesics and overall feeling of improvement in patients undergoing shoulder surgeries[7]. Popularity of this technique is increasing with point of care ultrasound (POCUS) using high frequency probes (5-15 MHZ). With the use of ultrasound imaging excellent gray scale images of brachial plexus and its trunks, cords and divisions can be well demonstrated which consequently greatly improve accuracy with which perineural catheter is placed. The side effects associated with this technique like catheter site infections and nerve injuries are uncommon and manageable conservatively[8]. Various methods used for Interscalene brachial plexus block with catheter insertion system and disposable infusion pump include rescue bolus doses, continuous infusion of analgesic drug or a combination of these two. Patient controlled analgesia is another possibility[9]. Many studies have reported a combination of a continuous background infusion and patient controlled analgesia is a better option than either patient controlled analgesia or continuous infusion alone and is associated with superior analgesia, reduced requirement of opioid drugs and faster recovery[10].

We conducted this prospective comparative study of patients undergoing open reduction and internal fixation of fracture of head of humerus under interscalene brachial plexus block and postoperatively received continuous perineural infusion of either normal saline (Group S) or 0.2 % Ropivacaine infusion (Group R).

Materials and Methods

This was a prospective comparative study of patients undergoing open reduction and internal fixation of fracture head of humerus. Total 30 patients admitted with fracture head of humerus and treated by open reduction and internal fixation were included in this study depending upon the inclusion criteria of the study. Patients having any exclusion criteria were excluded from the study.

Exclusion criteria included age less than 18 years, ASA grades III or higher and contraindication to regional anesthesia. Those who refused informed consent were also excluded from the study. Surgeries in all patients were performed using Interscalene Brachial plexus block (using 30 ml 0.5 % Ropivacaine in both groups). Fentanyl and propofol were used for supplemental sedation. IV diclofenac was administered at the end of surgery. After completion of surgery Patients were assigned to either group R or group S. Patients in group S were given perineural infusion of normal saline at the rate of 5 ml/hr and patients in group R were given infusion of 0.2% Ropivacaine at same rate. The infusion in both the groups was started at the beginning of surgical procedure using continues catheter insertion system and a disposable infusion pump and was continued up to 24 hours postoperatively. During postoperative period intramuscular diclofenac was given whenever VAS score was more than 4. The requirement of doses of intramuscular diclofenac was compared in both the groups. Quality of analgesia in both the groups was compared by analyzing mean VAS scores. The results were studied using appropriate statistical methods. P <0.05 was taken as statistically significant. Data analysis was carried out using Minitab version 17 software. Microsoft word and excel were used for generating charts and graphs

Inclusion Criteria

1. Patients undergoing open reduction and internal fixation for fracture head of humerus under interscalene brachial plexus block.
2. Age more than 18 years.
3. ASA I/ ASA II.
4. Those who gave informed consent to be part of this study.

Exclusion criteria

1. Those who refused informed consent.
2. Patients in whom surgery was done under general anesthesia.
3. ASA III or higher.
4. Age less than 18 years.

Results

There was a male preponderance in the studied cases. Out of 30 studied cases 18 (60%) were males and 12 (40%) were females with a M:F ratio of 1:0.66.

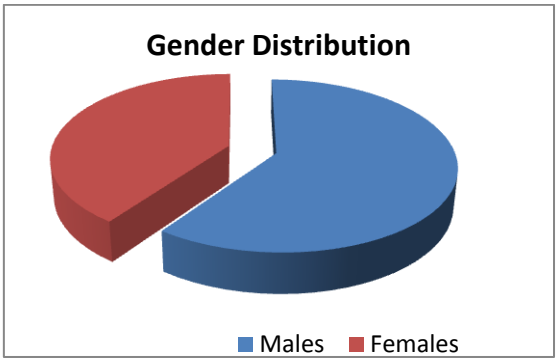

Figure 1: Gender Distribution of the studied cases

Out of the studied cases patients in Group R had a mean age of 32.64 years and Group S had a mean age of 31.78. The difference in age was not found to be statistically significant.

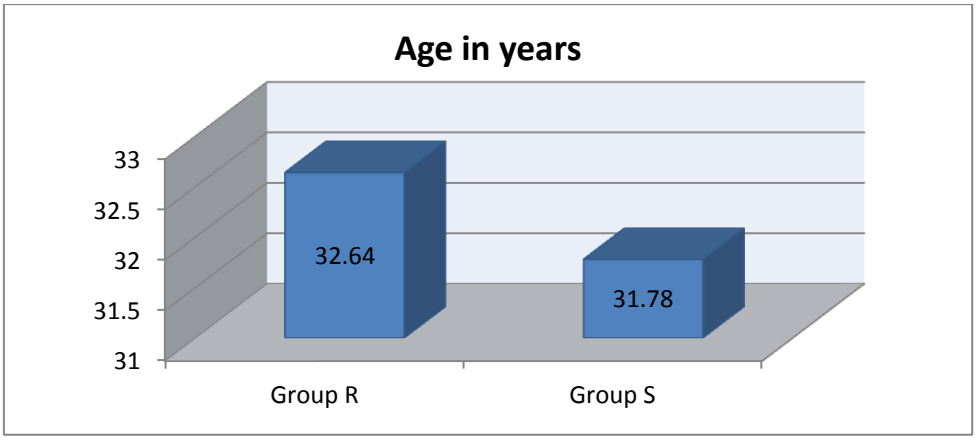

Figure 2: Age distribution of the studied cases

As far as mean age was concerned comparison of the demographic details of both the groups showed that there was no significant statistical difference in both the groups.

Table 1: Mean Age of the studied cases

Mean Age of the studied cases.	**Group R**	**32.64 +/- 2.12**	**P value = 0.34 Not significant**
	Group S	31.64 +/- 2.74	

The analysis of the ASA grades of the studied cases showed that in group R there were 8 (53.33%) patients in ASA grade I and 7 (46.66 %) patients belonged to ASA II while in group S 10 (66.66%) and 5 (33.33%) patients belonged to ASA I and ASA II respectively.

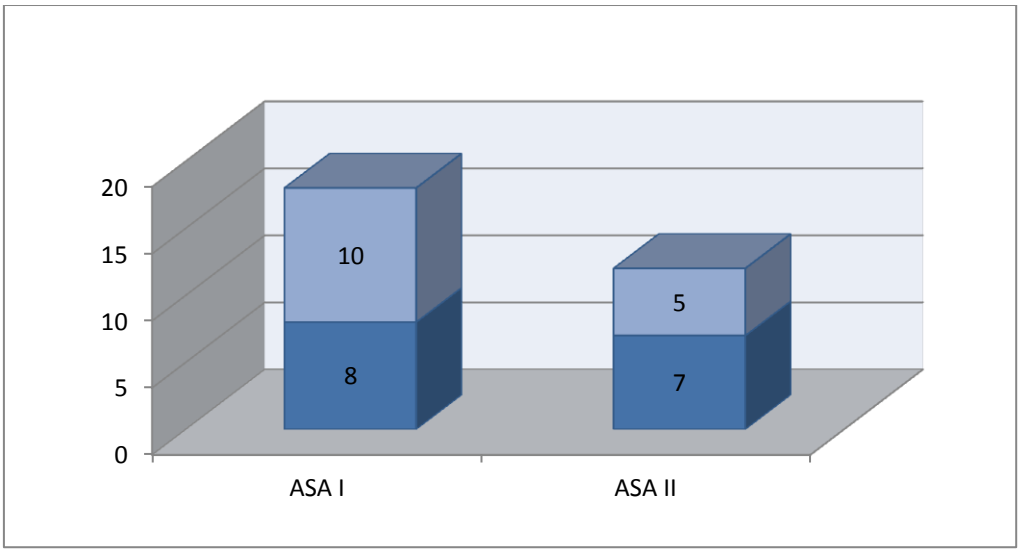

Figure 3: Mean Age of the studied cases

Comparison of mean duration of the studied cases showed that mean duration of surgery was 88+/- 12 minutes in Group R where as in Group S the mean duration was found to be 91 +/- 13 The difference in mean duration of surgery between these groups was not found to be statistically significant.

Table 2: Mean Duration Of the surgeries in Studied cases

Mean Duration Of Surgery	**Group R**	**88 + /- 12**	**P value = 0.51 Not significant**
	Group S	91 +/- 13	

Comparison of systolic blood pressure readings in group R and group S revealed that mean systolic blood pressure of both groups remain comparable in immediate postoperative period as well as during first 24 hours after surgery.

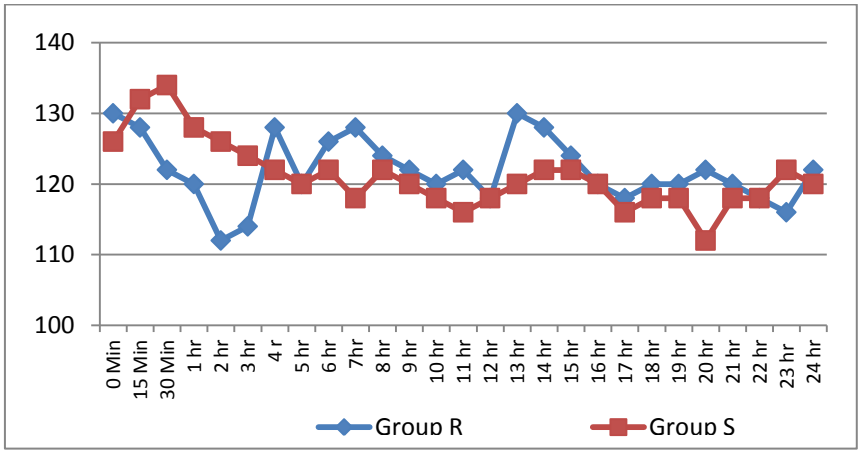

Figure 4: Mean systolic blood pressure in studied cases

Similarly comparison of Mean Diastolic blood pressure readings in group R and group S were found to be comparable in immediate postoperative period as well as during first 24 hours after surgery.

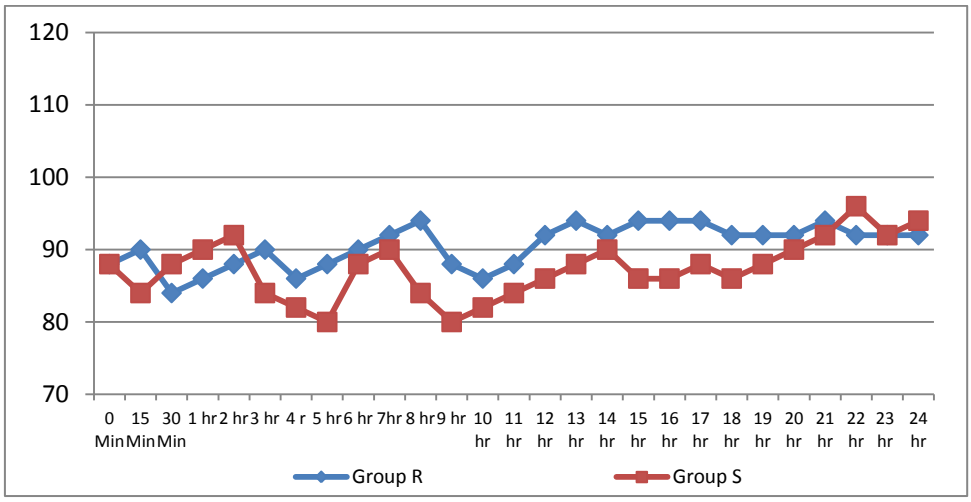

Figure 5: Mean Diastolic blood pressures in studied cases

The analysis of Mean VAS score in Group R and group S showed that there was statistically significant difference in mean VAS scores in 2 groups. Group S has significantly more mean VAS score than the group R.

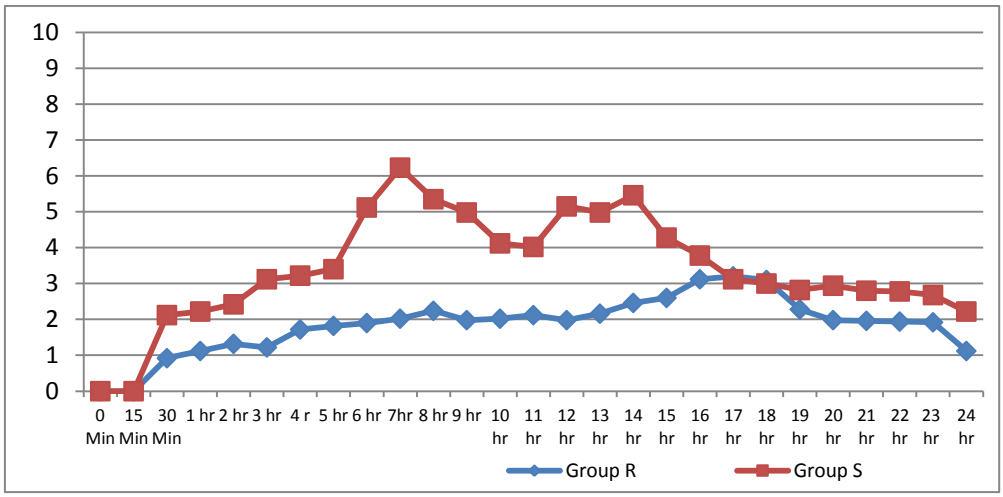

Figure 6: Mean VAS scores in studied cases

The analysis of rescue doses of diclofenac IM required showed that there was statistically significant difference amongst these 2 groups in requirement of analgesic doses in initial 24 hours after surgery. Group S required more rescue analgesic doses as compared to group R.

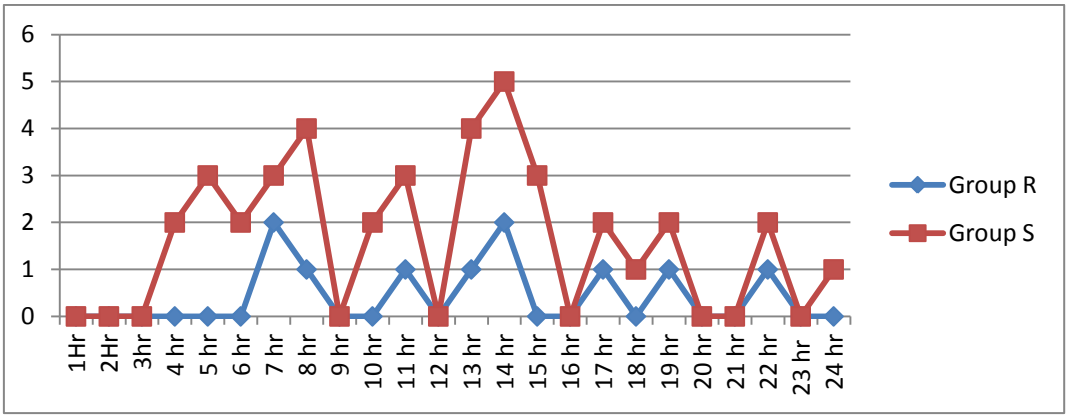

Figure 7: Requirement of analgesic doses in studied cases

Discussion

This study successfully demonstrate efficacy of Interscalene brachial plexus block with continues catheter insertion system and a disposable infusion pump in patients undergoing surgeries for fracture head of humerus by open reduction and internal fixation. The fact that patients in group R (receiving 0.2% Ropivacaine at 5ml/hr) required significantly less number of analgesic doses led us to conclude that it is preferable for patients undergoing these surgeries to have continues catheter insertion system in place that may be used for continuous perineurial infusion of drugs decreasing the requirement of postoperative analgesics. Moreover statistically significantly reduced VAS scores seen in group R further proved that the continuous perineurial infusion of local anesthetic drugs in these patients in post operative period is associated with higher degree of analgesia. The hemodynamic parameters were found to be comparable in both the groups.

Stephen M Klein et al in their study of 40 patients scheduled for unilateral, open rotator cuff repair or biceps tendonesis found that Interscalene Brachial Plexus Block with a Continuous

Catheter Insertion System and a Disposable Infusion Pump was associated with decreased morphine requirement in postoperative period. The authors divided the patients into 2 groups. Group A received Ropivacaine infusion and Group B received Saline infusion. In this study the authors gave a higher dose of infusion (10 ml/kg) as compared to other similar studies in which 0.2% Ropivacaine infusion rate is usually kept at 4-6 ml/hr. The authors in this study found that the ropivacaine group showed less pain than the placebo group between 12 and 24 h after the initial injection of local anesthetic. In addition, initial interscalene blockade was successful in all patients and all catheters were functional after 24 h with the continuous catheter insertion system. The authors concluded that it is possible to achieve a high rate of successful catheter placement and analgesia by using the continuous catheter insertion system and a disposable infusion pump in the ambulatory setting[11].

Ilfeld BM et al conducted a study to determine if the basal rate of an Interscalene perineural ropivacaine infusion could be decreased by 50% with a concurrent 200% increase in patient-controlled bolus dose without compromising infusion benefits in ambulatory patients undergoing moderately painful orthopedic shoulder surgery. The authors found that following moderately painful ambulatory shoulder surgery, decreasing an interscalene perineural ropivacaine 0.2% basal rate from 8 to 4 mL/h provides similar baseline analgesia and lengthens infusion duration, but compromises other infusion benefits[12].

There are other authors who have studied continuous perineurial infusion of local anesthetic as an alternative to postoperative systemic analgesic drugs[13]. Bertoglio S et al conducted a randomized controlled multi-centric study to find out analgesic efficacy of continuous wound infusion compared to epidural continuous infusion with local anesthetics after colorectal cancer surgery. The authors found that continuous wound infusion analgesia with ropivacaine 0.2% continuous infusion at 10 mL/h during 48 hours after open colorectal surgery provided effective postoperative pain relief comparable to epidural analgesia[14].

C W Yang conducted a prospective, double blind study to compare two different basal rates of 0.2% ropivacaine for a continuous interscalene brachial plexus block after shoulder surgery. The continuous interscalene brachial plexus block was performed using a modified lateral technique with 30 ml of 0.5% ropivacaine. Surgery was carried out under an Interscalene brachial plexus block or general anesthesia. After surgery, the patients were divided randomly into two groups containing 32 each. During the first 48 h after surgery, the patients were divided into 2 groups depending upon whether they received 0.2% ropivacaine at 8 ml/h or 6 ml/hr. The pain scores at rest and on movement, supplemental analgesia, motor block,

adverse events and patients' satisfaction were recorded. The authors found that The pain scores, supplemental analgesia, motor block, adverse events and patient's satisfaction were similar in the two groups and hence they concluded that decreasing the basal rate of CISB to 6ml/hr is desirable and appropriate considering the toxicity of local anesthetics [15].

Conclusion

Interscalene brachial plexus block with continues catheter insertion system and a disposable Infusion Pump was found to be an effective method for providing postoperative analgesia to patients undergoing upper limb surgeries. It is associated with significantly reduced requirement of rescue analgesic drugs and significantly lower mean VAS scores in postoperative period.

Conflict of Interest: None

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