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Efficacy of Clavipectoral Fascia Plane Block as Analgesic Modality in Clavicle Fractures: Exploring New Horizons

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ABSTRACT

Clavicle fractures are commonly encountered in orthopedic outpatient department but are often managed conservatively. Yet some clavicle fractures need surgical intervention which in turn demand adequate anaesthesia and analgesia. Due to complex sensory innervation there is no sole regional anaesthesia technique which could provide adequate analgesia for clavicle fractures. With the advent of ultra-sonography (USG) and the description of clavipectoral fascia plane block (CPB) by Dr. Valde a lot was simplified. Administration of CPB provides intra as well as postoperative analgesia, maintains hemodynamics, reduces opioid consumption and improvises postoperative recovery of the patients undergoing clavicle surgeries.

Introduction

Clavicle fractures are common fractures to orthopedicians but anaesthetist come across them less frequently as they rarely require surgical interventions. Earlier, the pain after clavicle surgeries was managed with a combination of interscalene and superficial cervical plexus (SCP) blocks [1].

However, since 2017 when Valdes described the newer technique of Clavipectoral fascia plane block (CPB), there have been new regional anaesthesia options available for managing postoperative pain after clavicle surgeries [2]. Valdes first described his technique in Annual European Society of Regional Anaesthesia and Pain Therapy (ESRA) Congress, Lugano, Switzerland; later only few cases have been reported describing the success of CPB.

The complicated innervation of clavicle makes it difficult for any regional technique to provide adequate anaesthesia and analgesia. Earlier a combination of techniques including SCP block and interscalene block have been tried for clavicle surgeries [3, 4]. Various studies have been reported using SCP and interscalene block either alone or in combination with each other. The results have been variable. Also, the technique of giving two different blocks using ultrasound guidance is cumbersome. While the interscalene block has its own adverse effects such as Horner's syndrome, unilateral phrenic nerve injury, accidental vertebral artery injection though rare has also been reported. There are also reports of total spinal anaesthesia while attempting interscalene block [5].

After the advent of CPB there's a ray of hope that all these adverse effects can be avoided. There is limited literature available regarding the efficacy of CPB. To the best of our knowledge this is the largest pool of cases to evaluate the efficacy of CPB. Our primary objective was to study the pain scores and duration of analgesia. The secondary objective was to look for total opioid consumption in the first 24 hours postoperatively and side effects if any.

Methods

After obtaining clearance from institutional ethical committee (SKNMC/Ethics/App/2021/827) we enrolled all patients posted for clavicle surgeries from Jan 2021 to Dec 2021. Patients were explained in detail about the block and their consent for procedure as well as for publishing their data was taken in written format. We had a total of 12 patients and all of them consented to participate in the study and none had any medical or surgical illness needing to cause exclusion from the study. All the 12 patients were aged between 25 to 55 years and belonged to American society of anesthesiologist (ASA) physical status I and II. Once the patient was received in the operation theatre all the vital

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monitors were attached in place and baseline parameters were recorded. A 20 G intravenous access was secured and a ringer's lactate solution was started at a rate of 4ml/kg/hour. Patients were induced with general anaesthesia as per the standardized institutional protocol and after induction patients received CPB. A CPB was performed using a high-frequency linear probe (Sonosite HFL38x/13-6 MHz; Fujifilm SonoSite, Bothell, WA) placed on the anterior surface of the clavicle. The CPB was administered using an in-plane technique to visualize an 8-cm, 22g short bevel needle advancing in a caudal to the cephalic direction; 10 cc 0.5% ropivacaine was injected in between the clavipectoral fascia and the periosteum on both sides of the clavicle fracture.

Follow-up data was obtained in the post- operative ward from the patient himself. Patients were monitored for intraoperative and postoperative hemodynamic parameters and VAS scores until the end of surgery and subsequently at 2hrs, 4hrs, 8hrs, 12hrs and 24hrs postoperatively. Total tramadol consumption in 24 hours was recorded. The side effects such as post-operative nausea vomiting (PONV), giddiness if any were noted until the first dose of rescue analgesic was given to eliminate bias due to any side effect by Tramadol administration. Patients' satisfaction score was also noted.

Visual Analog Scale

0 - No Pain
1-3 - mild pain
4-6 - Moderate Pain
>6 - severe pain
Patient satisfaction score: (noted at 24 hrs.)
0: not satisfied
1: partially satisfied
2: highly satisfied

Results

Demographic characters were similar among all patients in terms of age, sex, ASA and are represented in (Table 1). Intraoperative vital parameters, duration of analgesia and dose of rescue analgesic consumed in 24 hours was noted and presented in (Table 2). The vital parameters were almost stable and near baseline readings in all the patients. Average duration of analgesia was around 10 to 13 hours with a VAS score from 2 to 4 until then in all the patients. The vital parameters were also stable throughout the postoperative period and the patients were comfortable and satisfied during physiotherapy after 18-20 hours. Out of 12, 1 patient complained of giddiness and 1 patient complained of PONV which may be attributed to the drugs administered during general anaesthesia. Postoperative characters are depicted in (Table 3).

Table 1: Demographic characteristics.

Patients	Age	Sex	ASA	DURATION OF SURGERY (MIN)	COMORBIDITIES
1.	23	M	I	60	NONE
2.	24	M	I	56	NONE
3.	35	F	I	78	NONE
4.	37	M	I	90	NONE
5.	32	F	I	125	NONE
6.	45	M	II	114	DIABETIC
7.	55	F	I	116	NONE
8.	29	F	II	120	EPILEPTIC
9.	33	M	II	134	DIABETIC
10.	42	F	I	90	NONE
11.	36	F	I	78	NONE
12.	37	M	I	84	NONE

Table 2: Clinical characteristics.

Patients	PR0	MAP0	PR1	MAP1	PR_E	MAP_E	DURATION OF ANALGESIA (hrs.)	DOSE OF tramadol consumed in 24 Hrs.(mg)
1.	78	68	76	70	80	76	10	75
2.	71	65	70	68	82	78	12	50
3.	70	78	75	79	88	88	11	50
4.	74	70	73	72	78	87	12	50
5.	63	65	65	68	70	80	14	50
6.	65	80	70	82	77	98	12	50
7.	68	76	60	78	65	90	11	75
8.	88	80	89	84	99	100	10	75
9.	90	78	80	80	88	99	12	50
10.	96	98	98	100	100	100	10	75
11.	68	80	64	88	98	98	13	50
12.	73	90	70	78	89	90	12	50

PR0: Baseline Pulse, MAP0: Baseline Mean Arterial Pressure, PR1: Pulse 1hour after Block, MAP: Mean Arterial Pressure 1hour after Block, PR_E: Pulse After Extubation, MAP_E: Mean Arterial Pressure after Extubation.

Table 3: Postoperative parameters.

Patients	PR2	MAP2	PR4	MAP4	PR8	MAP8	PR12	MAP12	PR24	MAP24	PATIENT SATISFACTION SCORE	SIDE EFFECTS PONV/SEDATION
1.	77	65	78	60	74	62	79	66	82	65	2	NONE
2.	73	66	74	71	77	78	75	75	88	78	2	NONE
3.	71	77	70	78	70	71	78	74	85	77	2	NONE
4	74	68	77	65	78	79	76	78	79	80	2	NONE
5.	65	63	66	66	65	65	63	66	69	70	2	NONE
6.	67	81	65	82	66	66	65	69	66	70	1	GIDDINESS
7.	89	78	88	74	75	85	74	90	78	100	2	NONE
8.	98	84	95	88	94	96	95	100	100	95	1	NONE
9.	92	79	95	78	77	91	78	92	86	99	2	NONE
10.	94	99	96	89	90	90	96	92	98	90	2	NONE
11.	66	83	62	85	66	88	77	87	78	88	1	PONV
12.	75	92	74	91	76	90	78	95	90	100	2	NONE

PR 2, 4, 8, 12, 24: Pulse at 2, 4, 8, 12 and 24 hours postoperatively.
MAP 2, 4, 8, 12, 24: Mean Arterial Pressure at 2, 4, 8, 12 and 24 hours postoperatively.

Discussion

Clavicle fractures are often managed conservatively and seldom require surgical intervention. As any other fracture intervened, clavicle fractures are also painful and need adequate postoperative analgesia. Due to lower incidence of surgically intervened clavicle fractures not much has been studied regarding regional blocks specific to the clavicle.

There is limited data, rather only 2 to 3 reports presenting series of cases where the CPB has been administered and found to be effective [6-8]. We present this largest pool of patients with clavicle fractures who were administered CPB, to highlight the efficacy of CPB and its aid in enhancing patients' post-operative recovery. All these years the postoperative pain after clavicle surgeries has been managed with conventional opioids and non-steroidal anti-inflammatory drugs (NSAIDS). After the advent of use of ultra sound guidance in latter times, SCP and interscalene blocks have been used in combination or as single technique to provide some degree of postoperative analgesia.

In 2017 Valdes presented his paper regarding CPB and it proved to be an effective and promising technique to relieve pain after clavicle surgeries [9]. The nerve innervation of clavicle seems to be very complicated and has been less studied or rather reported. There is no single nerve supply to the clavicle and hence no single block can effectively be used to provide anaesthesia and analgesia to patients with clavicle fractures undergoing surgeries. The clavicle is supplied by both SCP and brachial plexus upper trunks. The sensory innervation of the clavicle occupies the gap between the pectoralis minor and the region below the clavicle, enclosing both muscles within two layers at the highest point. Both the layers of fascia are attached to the clavicle, forming the pectoral fascia [10]. A circular structure surrounding the entire clavicle and the corresponding nerve endings reach the clavicle through the pectoral fascia.

Dillane D *et al*. used ultrasound guided SCP and interscalene blocks for clavicle fractures which required open reduction and internal fixation and reported it to provide suboptimal postoperative analgesia and also associated with partial motor blockade of shoulder and upper arm [1].

Paul AA *et al.* used ultrasound guided SCP and superior trunk interscalene block for acromio- clavicular joint fixation and reported adequate analgesia while surgical anaesthesia was insufficient [2]. Thus, a combination of two techniques is cumbersome while administering as well as associated with certain adverse effects like phrenic nerve palsy, Horner's syndrome and motor blockade of the ipsilateral upper limb. The use of ultrasound has brightened the future of regional anaesthesia. It enhances the precision and accuracy also reducing the incidence of complications. Another advantage of using ultrasound is that the volume of local anaesthetic can be minimized. Singh *et al*. concluded in their study that larger volumes of local anaesthetics used for interscalene block also caused SCP blockade [11].

Valdes Vilches *et al*. reported, a combination of low dose brachial plexus block and supraclavicular nerve block provides adequate analgesia for clavicle surgeries [9]. The sensory supply to clavicle is through a bundle traversing around the clavicle except for the supraclavicular nerve traversing alone and supplying the skin over the clavicle. Hence it is needed to block it separately but the reported cases and, in our study, also we found that CPB when administered provides adequate analgesia presenting no further need to block supraclavicular nerve separately. This may be attributed to the superficial deposition of drug in CPB which might also block the supraclavicular nerve.

With the advent of ultrasound guided CPB the regional anaesthesia for clavicle fractures has gained new horizons. Use of regional techniques leads to better postoperative recovery in terms of early ambulation due to reduced pain and early discharge. Also, the minimal consumption of opioids reduces postoperative complications like PONV and dizziness improving the overall postoperative outcome. Another advantage of

CPB is that it can be utilized in patients with trauma having occult pneumothorax where administering general anaesthesia may aggravate the pre-existing pathology of pneumothorax and further complicate the condition [12]. The major limitation of our study is the low sample size. We recommend more studies with larger sample size to further strengthen the evidence regarding the efficacy of CPB.

Conclusion

USG guided CPB is a good regional anaesthesia technique that provides safe and precise postoperative analgesia for clavicle surgeries without any adverse effects. It is easy to administer and provides adequate analgesia even with lower volumes of local anaesthetics.

Author Contributions

Dr. Jyoti P. Deshpande: Helped in designing the concept of study, understanding the technique, implementation of technique and patient selection and writing the manuscript; Dr. Neha A. Panse: Helped in review of literature, patient selection, conducting the cases, writing manuscript

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Ethical Approval

Permissions – Institutional ethical committee approved at SKNMC Registration No. ECR/275/Inst/MH/2013/RR-19, Ref. SKNMC/Ethics/A pp/2021/827.

Conflicts of Interest

None.

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