"COMPARATIVE STUDY ON THE EFFICACY OF ULTRASOUND GUIDED CLAVIPECTORAL FASCIAL PLANE BLOCK VERSUS INTERSCALENE BRACHIAL PLEXUS BLOCK COMBINED WITH SUPERFICIAL CERVICAL PLEXUS BLOCK IN CLAVICLE SURGERIES- A RANDOMIZED CLINICAL TRIAL"

BY

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Dissertation submitted to

B.L.D.E (DEEMED TO BE UNIVERSITY), VIJAYAPURA

In partial fulfilment of requirements for

DOCTOR OF MEDICINE

IN

ANAESTHESIOLOGY

Under the Guidance of

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ABBREVIATIONS

IP No	Inpatient Number
USG	Ultrasonography guided
C.P.B	Clavipectoral Fascial Plane Block
S.C.P.B	Superficial Cervical Plexus Plane Block
I.S.B.P	Interscalene Brachial Plexus Block
MBS	Modified Bromage Scale
ACJ	Acromioclavicular joint
MCA	Mid Clavicular Joint
SCJ	Sternoclavicular Joint
Group C	Group C.P.B + S.C.P.B
Group I	Group I.S.B.P + S.C.P.B
B.P	Blood Pressure
HR	Heart Rate
SpO2	Saturation Of Peripheral Oxygen
ASA	American Society of Anaesthesiology
CVS	Cardiovascular System
RS	Respiratory System
COPD	Chronic Obstructive Pulmonary Disease
SD	Standard Deviation
VAS	Visual Analogue Scale
BMI	Body Mass Index
pValue	Probability Value
ERAS	Enhanced Recovery After Surgery
t 1/2	Half Life
P450	Cytochrome P 450
L.A	Local Anaesthesia
L.A.S.T	Local Anaesthetic Systemic Toxicity
G	Guage
ml	millilitres
mg	milligrams

ABSTRACT

AIMS AND OBJECTIVES

AIM: This study aims to compare the Efficacy Of ultrasound-guided clavipectoral Fascial Plane Block versus Interscalene Brachial Plexus Block Combined With Superficial Cervical Plexus Block Posted For Clavicle Surgery

PRIMARY OBJECTIVES:

- To assess the success rate of the block
- Ultrasonographic assessment of hemi diaphragmatic paresis by using sigh test
- Modified Bromage scale to assess the upper limb function

SECONDARY OBJECTIVES:

- Assessment of pain by using the VAS score
- Time for the first rescue analgesia
- Look for side effects, including local anaesthetic systemic toxicity and Horner syndrome

METHODS: A Total of 60 patients with unilateral clavicle fractures of ASA I & II, age between 18 to 55 who underwent elective internal fixation of clavicle fractures in our hospital, willing for proposed blocks were included in this study. Randomization was done by a computer-generated randomized table

Group C: Superficial Cervical Plexus Block and Clavipectoral Fascial Plane Block (S.C.P.B. and C.P.B.) in 30 patients

Group I: Superficial Cervical Plexus Block and Interscalene Brachial Plexus Block (S.C.P.B. and I.S.B.P.) in 30 patients

After informed consent, the blocks were given as per the standard protocol by the same anaesthetist under ultrasound guidance.

Group C (SCPB AND CPB): S.C.P.B. with 7ml of 0.5% Ropivacaine
C.P.B. with 20ml of 0.5% Ropivacaine

Group I (SCPB AND ISBP): S.C.P.B. with 7ml of 0.5% Ropivacaine
I.S.B.P. with 20ml of 0.5% Ropivacaine

At the beginning of the surgery, all patients were administered 0.05 mg/kg of midazolam.

The primary objectives were measured as the effect of the block was obsseved at 30 min in three areas: the sternoclavicular joint, mid-clavicle and acromioclavicular joint, Modified Bromage scale (M.B.S.) to assess upper limb movement function and Visual Analog Score(VAS). The diaphragmatic movement was evaluated by real-time M-mode using ultrasonography of the hemidiaphragm, and adverse reactions like local anaesthetic systemic toxicity, pneumothorax and haemothorax were also noted.

RESULTS: The study compared the Clavipectoral Fascial Plane Block with Superficial Cervical Plexus Block (Group C) and the Interscalene Brachial Plexus Block with the Superficial Cervical Plexus Block (Group I) across multiple parameters.

Both groups were demographically similar in age (32.83 ± 10.77 vs. 34.57 ± 9.58 years, $p = 0.347$) and height (1.673±0.053m vs. 1.684 ± 0.043m , $p = 0.382$), but Group C had a significantly higher weight (76.53 ± 6.12 vs. 69.80 ± 7.34 kg, $p = 0.00005$) and BMI (27.33 ± 1.28 vs. 24.67 ± 2.84, $p = 0.00003$).

Analgesic outcomes favoured Group C, with a longer duration of analgesia (23.23 ± 1.96 vs. 14.23 ± 1.33 hours, $p < 0.001$) and lower VAS pain scores at 6 hours (0.00 ±

0.00 vs. 0.87 ± 0.97, p < 0.001), 12 hours (0.87 ± 1.01 vs. 2.80 ± 0.61, p < 0.001), and 24 hours (2.93 ± 0.94 vs. 6.63 ± 0.81, p < 0.001), demonstrating superior and prolonged pain relief.

Respiratory function was better preserved in Group C, as diaphragmatic excursion at 30 minutes was significantly greater (5.79 ± 0.52 vs. 2.96 ± 0.60 cm, p < 0.001), with a lower percentage decrease (95.57%±4.25 vs. 50.21% ± 10.60, p < 0.001), suggesting reduced risk of respiratory impairment in Group C.

Sensory blockade was effective in both groups, with no significant differences in block success scores across the sternoclavicular (2.77 ± 0.43 vs2.60 ± 0.50 ,p = 0.171) , midclavicular (3.00 ± 00 vs. 2.90 ± 0.31, p = 0.083), and acromioclavicular (2.93 ± 0.25 vs. 2.87 ± 0.35, p = 0.398) regions. However, Group I resulted in significant motor blockade (MBS 2.47 ± 0.57 vs. 0.00 ± 0.00, p < 0.001), whereas Group C preserved motor function.
Additionally, Group I was associated with hemidiaphragmatic paresis (13%)and Horner syndrome (2%), complications that were absent in Group C.

CONCLUSION: The results indicate that Clavipectoral Fascial Plane Block had superior analgesic efficacy, with a significantly longer duration of pain relief and lower VAS scores at all time points compared to the Interscalene Brachial Plexus Block combined with Superficial Cervical Plexus Block Additionally, Clavipectoral Fascial Block was associated with no incidence of hemi diaphragmatic paresis or Horner syndrome**,** making it a safer alternative for patients at risk of respiratory complications.

KEYWORDS: Superficial Cervical Plexus Block, Clavipectoral Fascial Plane Block, Interscalene Brachial Plexus Block, Modified Bromage scale

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INTRODUCTION

"For all the happiness that mankind can gain it is not in pleasure but in relief from pain" - JOHN DYRDEN

"Pain, like pleasure, is passion of the soul, that is an emotion and not one of the senses" - PLATO and ARISTOLLE (ca 375 B.C)

Clavicle fractures are a prevalent type of shoulder injury among young males, constituting 2.6% - 4% of all fractures around the shoulder[1]. About 70% are predominantly adult males, with the mean age for sustaining fracture being 35 years[2]. It's bimodal, with one peak in the early age of 20 - 25 years (sports injuries) and the other in the age older than 55 years[3] . 69% -82 % of this occurs in the midshaft region because the junction of the outer third and middle third is the thinnest part of the clavicle bone, which is prone to fracture[4]. Moreover, this is the only area of clavicle bone that is not protected by muscles or ligamentous attachments. Compared with that of adults, adolescents have higher level of pain and greater meltdown. Therefore, appropriate and effective management should be done to treat post-surgical pain to prevent it from becoming chronic with additional psychological burdens[5]. Surgical treatment gives better functional outcomes than conservative treatment. General anaesthesia is preferred, but there is always a risk of postoperative complications[5]. So, Regional anaesthesia can be used, which meets the requirements for a satisfactory surgery, avoiding the complications of general anaesthesia and also good postoperative analgesia.

The clavipectoral fascial plane block (CPB) is a newer regional anaesthetic technique introduced by Valdés-Vilches in 2017[5]. He injected 10-15 cc of local anaesthetic agent under USG guidance into the Clavipectoral fascia outside the periosteum on both sides of the clavicle injury. Numerous case reports demonstrating the effectiveness of this block for clavicle surgery have been published since then. The clavicle has a more

complex and variable nerve supply as compared to the other sites of the upper limb, making it difficult to choose an optimum regional anaesthetic technique for clavicle surgeries with optimum postoperative pain management[6]. The supraclavicular nerve of the superficial cervical plexus (SCP) gives the sensory innervation to the skin over the clavicle[7]. The branches from the brachial plexus, like the subclavian nerve, long thoracic nerve, and suprascapular nerve also contribute to this[8]. Due to this uncertainty, various regional anaesthesia techniques have been used for clavicle surgeries, including the superficial cervical plexus block, interscalene block (brachial plexus block) or a combination of both. However, administering two or more separate ultrasound-guided injections can be time-consuming, and there is a potential risk of ipsilateral phrenic nerve palsy, vocal cord paralysis, Horner's syndrome, and serious complications like vertebral artery injection, total spinal anaesthesia, or pneumothorax are associated with this brachial plexus blocks[8.]

The clavipectoral fascial plane block has emerged as a safer and more effective alternative, particularly for patients with respiratory issues. Compared to interscalene brachial plexus blocks, which inhibit pain transmission at a more proximal level and are positioned near the neurovascular structures of the cervical spine, the clavipectoral fascial plane block offers a safety advantage[8]. This is because it involves a more superficial and lateral injection site, with the clavicle itself acting as a protective barrier. This block provides pain relief by targeting the terminal branches of these nerves as they pass in between the clavipectoral fascia and the clavicle[9]. In recent years, ultrasound-guided clavipectoral fascial plane block and interscalene brachial plexus block are used for analgesia and pain management in adults with midshaft clavicle fractures[10].

A few reports of successful USG guided CPB in paediatric cases also exist. But there isn't any comparative study on the effectiveness and safety spectrum of this novel technique with the pre-existing regional anaesthesia techniques . Here, we are doing

a comparative study between the effectiveness of ultrasound-guided Clavipectoral fascial plane block in combination with superficial cervical plexus block versus Interscalene brachial plexus block in combination with Superficial cervical plexus block and use the same as a surgical block for midshaft clavicle fractures.

The clavipectoral fascial plane block (CPB) is an emerging regional anaesthesia technique with promising applications in upper limb and clavicular surgeries. Despite its potential benefits—such as reduced opioid consumption, improved postoperative analgesia, and fewer complications compared to conventional brachial plexus blocks—there remains a significant gap in comprehensive clinical evidence. This study aims to bridge these gaps by systematically evaluating CPB's analgesic outcomes, procedural nuances, and complications. The findings will contribute to evidence-based pain management strategies, potentially offering a safer, opioid-sparing alternative for patients undergoing upper extremity surgeries. This research seeks to systematically evaluate CPB's analgesic efficacy, safety profile, and technical reproducibility in a controlled clinical setting

Given the rising emphasis on enhanced recovery after surgery (ERAS) and the need to minimize opioid dependence, this research holds significant clinical relevance, paving the way for wider adoption of CPB with SCPB in anaesthesiology practice. The clavipectoral fascial plane block (CPB) with superficial cervical plexus block (SCPB) stands out as a revolutionary, patient-centric analgesic technique—particularly for clavicular fractures—by addressing pain relief, safety, functionality, and recovery better than any existing alternative

Despite its anatomical precision and potential clinical advantages, CPB with SCPB remains one of the most understudied fascial plane blocks in regional anaesthesia. This gap is particularly striking in the context of clavicular fractures, where CPB's theoretical benefits—targeted analgesia, motor-sparing properties, and avoidance of phrenic nerve complications—have yet to be rigorously validated.

My research will be pivotal in establishing CPB with SCPB as the new standard of care—ensuring patients no longer have to choose between effective pain relief and safety.

CPB combined with SCPB is the Future of Patient-Centric Analgesia.

AIMS AND OBJECTIVES OF THE STUDY

AIM: THIS STUDY AIMS TO COMPARE THE EFFICACY OF ULTRASOUND-GUIDED CLAVIPECTORAL FASCIAL PLANE BLOCK AND INTERSCALENE BRACHIAL PLEXUS BLOCK COMBINED WITH SUPERFICIAL CERVICAL PLEXUS BLOCK POSTED FOR CLAVICLE SURGERY

OBJECTIVES

PRIMARY OBJECTIVES:

- To assess the success rate of the block
- Ultrasonographic assessment of hemi diaphragmatic paresis by using sigh test
- Modified Bromage scale to assess the upper limb function

SECONDARY OBJECTIVES:

- Assessment of pain by using the VAS score
- Time for first rescue analgesia
- Look for side effects, including local anaesthetic systemic toxicity and Horner syndrome.

REVIEW OF LITERATURE

The study by **Xu et al.**[10] (2023) evaluated the efficacy of ultrasound-guided superficial cervical plexus block (SCPB) combined with either the clavipectoral fascial plane block (CPB) or the interscalene brachial plexus block (ISBP) in clavicle surgeries. This randomised controlled trial included 50 patients undergoing internal fixation for clavicle fractures, divided into two groups: one receiving SCPB with CPB and the other with ISBP. The results demonstrated that the SCPB-CPB combination provided a longer duration of analgesia, preserving upper limb motor function and reducing the incidence of diaphragmatic paralysis when compared to SCPB-ISBP. The first use of analgesics in the CPB group was significantly delayed, indicating prolonged pain relief. However, while both techniques effectively blocked pain in the clavicle region, ISBP was associated with a high incidence (92%) of hemi diaphragmatic paresis, a major drawback that CPB successfully avoided. The study highlights CPB as a safer alternative to ISBP, especially for patients at risk of respiratory complications, making it a preferable choice for regional anaesthesia in clavicle surgeries.

ZHUO et al. (2022)[11,] explored the effectiveness of USG guided clavipectoral fascial plane block (CPB) combined with infraclavicular brachial plexus block (ICPB) for right midshaft clavicle fracture surgery. Their findings suggest that this technique significantly minimises the risk of hemi diaphragmatic paralysis while ensuring surgical anaesthesia with a fewer complication, such as a motor block. When compared to the interscalene brachial plexus block (ISBPB) combined with ICPB, the CPB with ICPB approach (CC group) demonstrated a lower incidence of hemi diaphragmatic paralysis (50% vs. 0%; $P < .001$) and improved pulmonary function measurements at the bedside. Both groups achieved a 100% success rate in anaesthesia, but the CC group had a lower motor block score and a significantly shorter procedure duration ($P < .001$). However, there is no significant difference in block onset time and other anaesthesia-related complications between the groups

KARTIK SONAWANE et al. (2021)[12], investigated the effectiveness of bilateral clavipectoral plane block (CPB) for patients requiring early intervention for bilateral clavicle fractures (CF). Their study suggested that CPB can be performed using anatomical landmarks in cases where ultrasound guidance is unavailable, making it a practical choice in emergencies or resource-limited environments. This technique has multiple benefits, including sparing the phrenic nerve and motor functions, reducing opioid use, and is tailored specifically for clavicle procedures. Additionally, CPB is a suitable alternative for regional anaesthesia in patients with suspected or confirmed brachial plexus injury. Unlike other methods, it does not carry a risk of pneumothorax or postoperative complications related to multiple drug use, such as nausea, vomiting, or cognitive dysfunction. CPB also aligns well with the Enhanced Recovery After Surgery (ERAS) protocol by promoting early mobility and quicker discharge

KUKREJA P et al. (2020)[13] conducted a case series on ultrasound-guided clavipectoral fascial plane block (CPB) for clavicle surgeries. Their findings suggest that CPB is an effective regional anaesthesia technique that avoids common complications such as motor blockade, pneumothorax and phrenic nerve paralysis in associated with other types of regional anaesthesia techniques. According to case series , the choice to use CPB alone or in combination with other methods, may depend on the location of the clavicle fracture and the variations in its innervation. This studies concluded with no complications during surgery under general anaesthesia, and pain scores remained zero in the post-anaesthesia care unit (PACU). No opioids were given in the PACU, and the patient was discharged home after a 90-minute of PACU stay. No additional analgesic medication was administered in the PACU. The patient reported 10/10 satisfaction with regional anaesthetic on the routine post-discharge

The study by **LABANDEYRA** et al. investigates the distribution of anaesthetic agent in the Clavipectoral Fascia Plane Block (CPB) in cadaveric models with midshaft clavicular fractures[14]. He aimed to assess whether the presence of a fracture alters the

diffusion pattern of the CPB-administered solution. Anatomical dissections revealed that methylene blue staining was present in the superficial muscular plane, particularly in the deltoid, trapezius, and pectoralis major muscles, but did not affect the deep muscular plane, including the subclavius and pectoralis minor. Furthermore, the solution was predominantly distributed to the anterosuperior region of the clavicular periosteum (57.3%) with minimal staining (6.5%) in the postero-inferior area. Importantly, the presence of a fracture did not significantly alter the distribution pattern of the injectate. These findings contradict previous assumptions that a fracture might enhance solution diffusion to the posterior periosteum, suggesting that CPB remains confined to specific anatomical regions. Although the study acknowledges limitations, such as the use of cadaveric models and potential variations from in vivo conditions, it provides significant anatomical insights into the effectiveness of CPB for regional anaesthesia in clavicular fractures.

The study by **Tsuji et al**.[15] (2024) explored the effectiveness of ultrasound-guided clavipectoral fascial plane block (CPB) combined with an intermediate cervical plexus block (ICPB) in managing pain for clavicular fracture surgeries, particularly in adolescent athletes. CPB, introduced by Valdés in 2017, has been increasingly used due to its ability to provide effective analgesia while reducing the risk of complications associated with interscalene brachial plexus block (ISBPB), such as phrenic nerve paralysis. The study reports a case where CPB and ICPB were successfully administered to a 16-year-old athlete undergoing open reduction and internal fixation of a displaced midshaft clavicle fracture, resulting in effective postoperative pain control with minimal opioid use. Compared to ISBPB, CPB preserves upper limb motor function and has been found to provide longer-lasting analgesia. Despite its advantages, recent cadaveric studies indicate that CPB does not achieve full anaesthetic coverage of the peri clavicular region, particularly in the posteroinferior area, which may necessitate additional analgesic techniques. Given the scarcity of research on CPB in paediatric populations, this study highlights its potential benefits

while emphasizing the need for further investigation into its efficacy and safety in younger patients.

The study by **Lee et al.**[16](2023) explored various regional anaesthesia techniques for clavicle fractures and surgeries, with a particular focus on the clavipectoral fascial plane block (CPB). The clavicle has a complex and debated innervation, primarily involving cervical and brachial plexus branches, including the supraclavicular, subclavian, and lateral pectoral nerves. Traditional anaesthetic techniques such as interscalene brachial plexus block (ISBPB) and superficial cervical plexus block (SCPB) have been widely used but come with complications such as hemi diaphragmatic paresis and upper limb motor blockade. The CPB has emerged as a promising alternative, targeting the sensory nerves of the clavicle while avoiding the adverse effects seen with ISBPB. Studies suggest that CPB effectively anaesthetises the caudal and dorsal surfaces of the clavicle by enveloping terminal sensory branches within the clavipectoral fascia. Additionally, CPB, when used as part of multimodal analgesia, has demonstrated efficacy in reducing postoperative opioid consumption and providing adequate surgical anaesthesia. Despite its advantages, research indicates that CPB alone may not completely anaesthetise the clavicular region, necessitating its combination with SCPB or selective nerve blocks for optimal analgesia. This study reinforces CPB's role as a valuable addition to regional anaesthesia techniques for clavicular surgery, advocating for further clinical trials to determine its efficacy as a standalone anaesthetic option.

ANATOMY

CLAVICLE

INTRODUCTION:

The clavicle is an elongated sigmoid or S-shaped bone with a convex surface on its medial side when seen from the cephalad end[17]. It lies horizontally between the axial skeleton and the appendicular skeleton. It connects the sternum with the acromion of the scapula. As a result, it transmits the weight of the upper limb to the axial skeleton. Clavicular attachments allow a range of motion of the upper limb as well as protect neurovascular structures posteriorly. Due to its subcutaneous position, thin midshaft, and the forces transmitted through it, the middle one-third area of clavicle is highly susceptible to injury and is one of the most commonly affected sites.[18] The mechanism of injury is usually a fall on an outstretched hand, which occurs commonly in younger people during contact sports[19].

EMBRYOLOGY:

The clavicle is the first bone to begin ossification during the embryogenic development. [20] It is a derivative of the lateral mesoderm. Both the clavicle's medial and lateral end undergo different ossification processes. The medial end is formed via endochondral ossification [21]. In contrast, the lateral end of the clavicle develops through intramembranous ossification. In both methods, the resulting structures are remodelled into lamellar bone. Although the clavicle is one of the first bones to initiate ossification, it is among the last to complete this process, with growth plates potentially remaining open until age of twenty to twenty-five.[20]

FEATURES OF CLAVICLE

• The shaft has two primary centres of ossification

• first bone in the body to begin ossification[21]

• Membranous ossification at lateral end and endochondral ossification at medial end

• Lies horizontally in the body

OSTEOLOGY OSSIFICATION:

• Clavicle ossifies with two primary centres and one secondary centre.

• The primary centres are medial and lateral, which appear in between 5- 6 weeks of the intrauterine period and fuses by the 45th day.

• A secondary centre appears by the age of 15 years in females and 17 years in males, which unites with the shaft at the 21st year in females and 22nd year in males.

• A secondary centre develops in the cartilage at the acromial end at 18-20 years and rapidly unites by 24th years.

• 80 % of the longitudinal growth is from the medial clavicular epiphysis.

OSSEOUS STRUCTURE

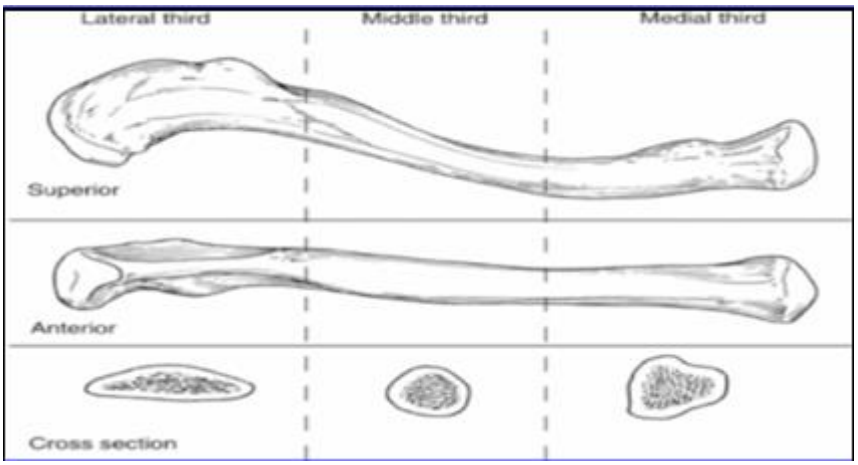


FIG: 1 showing the osseous structure of clavicle.

The medial end has a greater radius of curvature and is convex anteriorly, while the lateral curve is smaller and convex posteriorly[22].

ANATOMICAL RELATIONS

• The anterior surface of the clavicle is subcutaneous and is covered by the thin platysma and cervical fascia covering it.

• The supraclavicular nerves supply the skin over the clavicle and is lying, are deep to the platysma muscle layer.

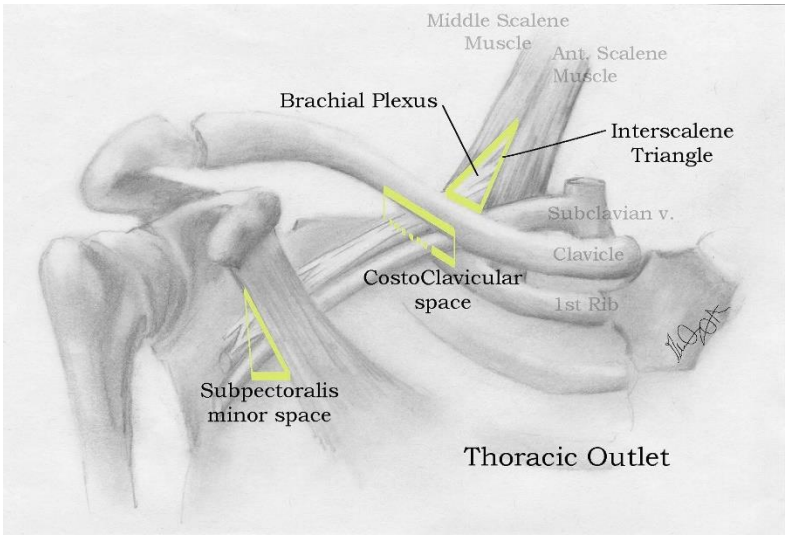
•The tubular middle parts of the clavicle are covered by the subclavius muscle on its underside and positioned above essential neurovascular structures. This anatomical arrangement may explain the relatively low occurrence of neurovascular injuries in clavicular fractures. However, in some cases, the subclavius muscle may become trapped in between the fracture fragments which potentially hinders the healing process[23].

• The sternoclavicular joint is covered by the sternocleidomastoid in front and sternohyoid and sternothyroid muscles behind.

• The medial anterior curve is commonly recognized as an adaptation to accommodate the subclavian vein, subclavian artery, and brachial plexus. Additionally, this curve serves as a key landmark for identifying the subclavian vein.

Costoclavicular Space: The costoclavicular space is the anterior portion of the superior thoracic aperture, located between the clavicle and the first rib. The subclavian vessels and brachial plexus traverse this space in relation to the scalene muscles. Proximally, the plexus passes through the scalene triangle, while distally, it courses through the subcoracoid space

A)



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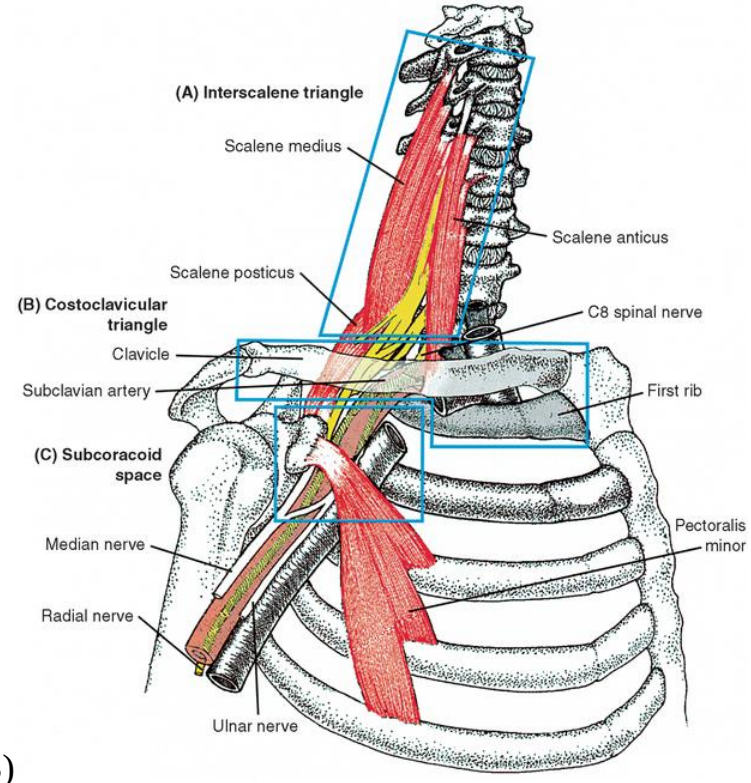


FIG: 2 A) showing the Costoclavicular space and B) Subcoracoid space

Superficial infraclavicular space: is formed by the pectoralis major muscle and deltoid portion of the clavicle.

Subclavian triangle: It is formed anteriorly by the posterior border of sternocleidomastoid muscle, posteriorly by the omohyoid belly and inferiorly by the clavicle. Here, the external jugular vein joins with the subclavian vein and then with the internal jugular vein[21].

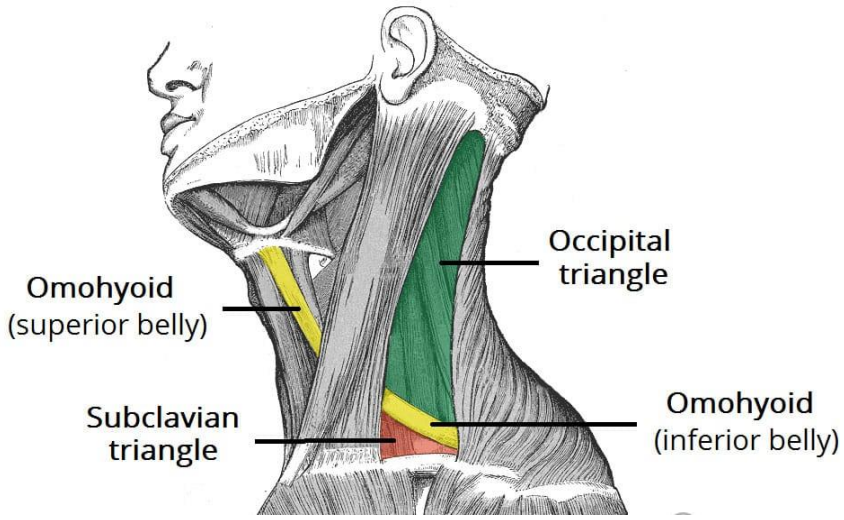


FIG: 3 showing relation of Subclavian Triangle

Neurovascular Anatomy: The supraclavicular nerves and branches of the cervical plexus that cross the superficial surface of the clavicle anteriorly deep to the platysma. It is recommended to identify and preserve these nerves during surgical procedures to the mid-clavicle[20].

INCIDENCE OF INJURY

Clavicle fractures make up around 2.6% of all fractures in adults(31), 10% to 15% of fractures in children(2), and approximately 30% to 40% of all shoulder girdle injuries.[23].

• The highest Annual incidence in males occurs in those under the age of 20.

• Clavicle fractures exhibit a bimodal distribution across different age groups..

• 80-85% of clavicle fractures occur in the middle 1/3rd part.

• 20% of fractures occur in the lateral 1/3rd part.

• only 5% of fractures occur in the medial end of the clavicle.

• Elderly - Lateral and medial 1/3rd fracture is common

• Children - middle third clavicle fracture and is usually undisplaced

• Adolescents and middle-aged - middle 1/3 rd clavicle fracture, and is usually displaced

BIOMECHANICS OF CLAVICLE FRACTURES:

The articulations and the muscle attached to the clavicle mainly contribute to the displacing forces during the fracture.

The displacing forces for a mid-1/3rd fracture of the clavicle are as follows:

• The sternoclavicular ligaments stabilise the medial end

• The sternocleidomastoid pulls the medial segment superiorly

• The lateral segment is pulled inferiorly and medially by the pectoralis major

• The lateral segment is pulled inferiorly by the arm's weight through the coracoclavicular ligaments. The trapezius provides a counterforce against this inferior displacement[24].

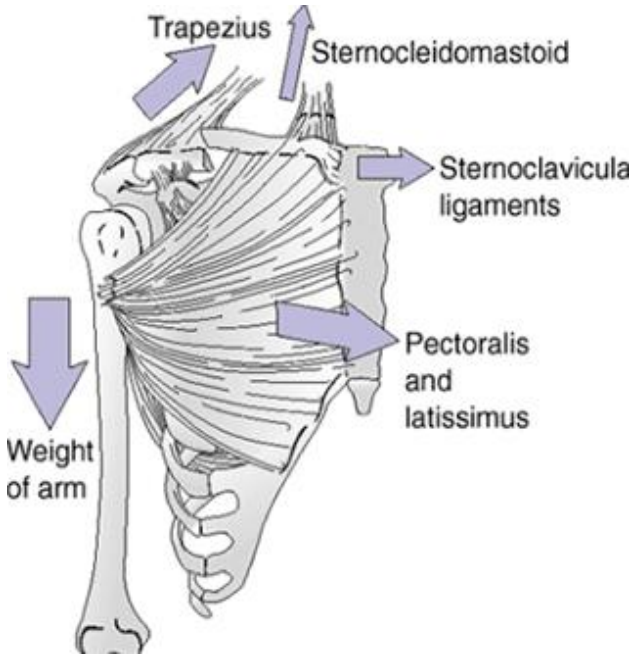


FIG: 4 showing biomechanics of clavicle fracture

A clavicle fracture disrupts the entire shoulder girdle structure, leading to a loss of function. The lateral fragment, along with the glenohumeral joint, is typically displaced downward and forward due to the combined effects of gravity, arm weight, and the muscular pull of the pectoralis major. Meanwhile, the sternocleidomastoid muscle pulls the medial fragment upward and backwards, resulting in shortening[24]

CLASSIFICATION OF CLAVICLE FRACTURE :

- ALLMAN CLASSIFICATION OF CLAVICLE FRACTURES [23]

GROUP I – Middle third fractures

GROUP II – Distal third fractures

- ROBINSON CLASSIFICATION OF MIDSHAFT CLAVICLE FRACTURE[25]

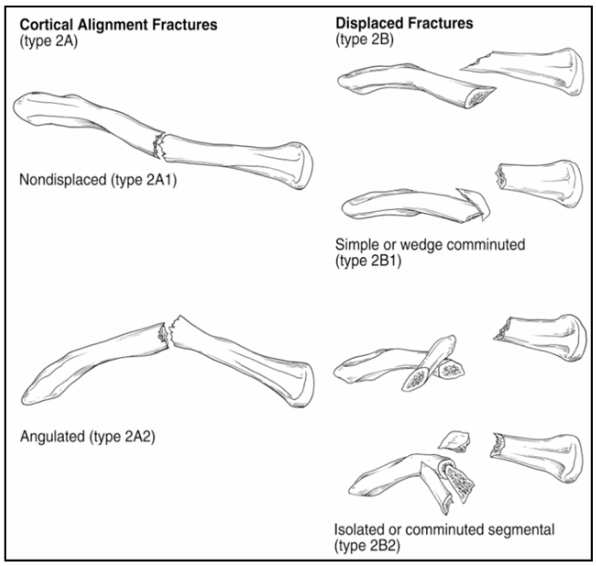


FIG: 5 Robinson classification of clavicle fracture

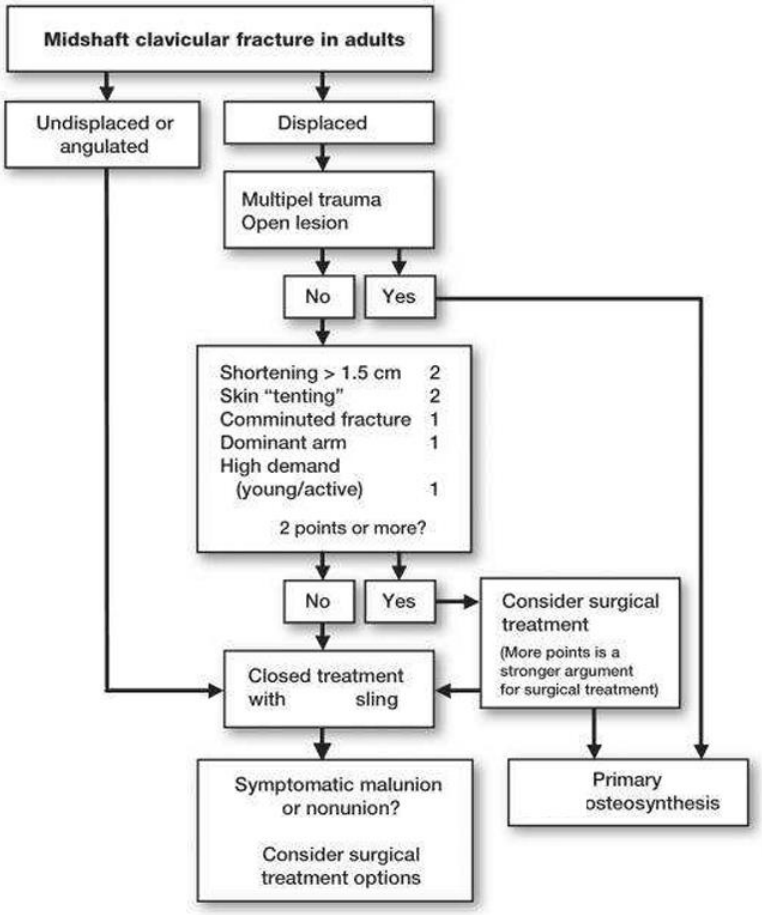


FIG:6 Algorithm of management clavicle fracture

General methods of treatment of fractures of the clavicle can be broadly grouped into the following [26]

• Conservative or non-operative treatment.

• Operative treatment.

BRACHIAL PLEXUS BLOCK

ANATOMICAL CONSIDERATIONS

Understanding the formation and distribution of the brachial plexus is crucial for the effective application of brachial plexus blocks in upper limb surgeries. A thorough knowledge of the vascular, muscular, and fascial relationships of the plexus during its formation and course is equally important for mastering different techniques of brachial plexus blockade [27].

Derivation of plexus :

The brachial plexus originates from the anterior primary rami of the C5, C6, C7, C8, and T1 nerves, with possible variations including contributions from the C4 nerve (prefixed) and the T2 nerve (post-fixed)[27].

COURSE:

After exiting the intervertebral foramina, the roots travel anterolaterally and inferiorly, positioning themselves between the anterior and middle scalene muscles, which originate from the anterior and posterior tubercles of the cervical vertebrae, respectively. At this point, they merge to form the trunks.[28]

C5, C6 — Upper Trunk

C7 — Middle trunk

C8, T1 — Lower Trunk

The prevertebral fascia envelops both the anterior and middle scalene muscles, merging laterally to form a fascial sheath around the brachial plexus. The trunks emerge from the lower border of the scalene muscles, travelling inferiorly and anterolaterally along the upper border of the first rib, where they are positioned cephaloposterior to the subclavian artery.

At the lateral margin of the first rib, each trunk splits into anterior and posterior divisions, traversing beneath the middle portion of the clavicle. These divisions later merge within the axilla to form the lateral, medial, and posterior cords, which are associated with the second part of the axillary artery. The lateral cord is specifically formed by the union of the anterior divisions of the upper and middle trunks.

The posterior cord is formed by the merging of the posterior divisions from all three trunks. Simultaneously, the anterior division of the lower trunk continues as

the medial cord. At the outer edge of the pectoralis minor, these three cords branch out into the peripheral nerves that supply the upper limb.

Divisions – Each trunk splits into anterior and posterior divisions posterior to the clavicle. These divisions extend into the axilla, where they form the cords based on their location relative to the axillary artery[27].

-Lateral – by anterior divisions of upper and middle trunks

-Medial – by anterior division of lower trunk

-Posterior – by posterior divisions of all three trunks

BRACHIAL PLEXUS COURSE

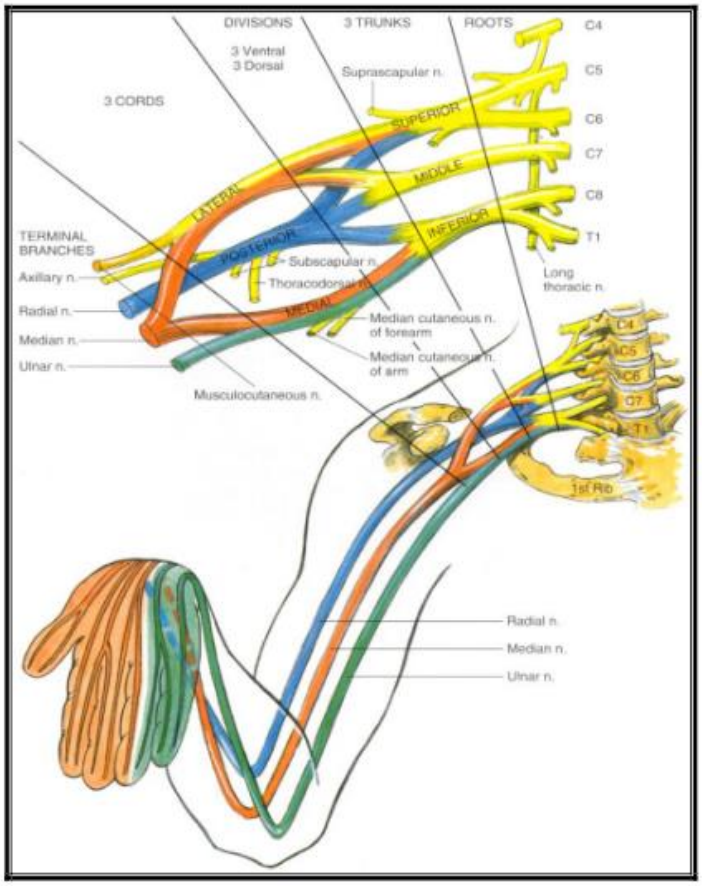


FIG:7 Brachial plexus course

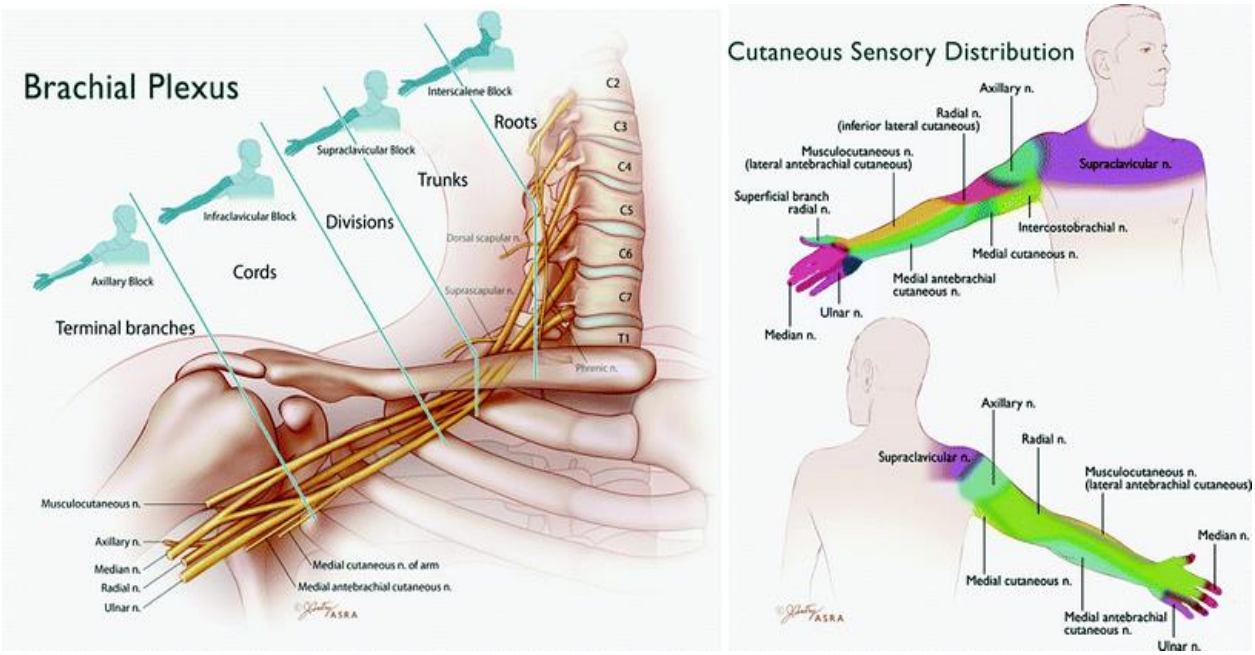


FIG:8 Division of Brachial Plexus and cutaneous innervation of upper limb

BRANCHES

Lateral cord

- Lateral root of median nerve
- Lateral pectoral nerve
- Musculocutaneous nerve

Medial cord

- Medial root of median nerve
- Medial cutaneous nerve of arm
- Medial cutaneous nerve of forearm
- Medial pectoral nerve
- Ulnar nerve

Posterior cord

- Radial nerve
- Axillary nerve
- Upper and lower subscapular nerve
- Nerve to latissimus dorsi

Branches from roots

- Dorsal scapular nerve to Rhomboid muscles (C5)
- Nerve to serratus anterior (C5, C6, C7)

Branches from trunk:

- Nerve to subclavius (C5-C6)
- Supra scapular nerve (C5-C6

Relations:

The brachial plexus originates between the scalene muscles, with its trunks in the posterior triangle of the neck, divisions located behind the clavicle, cords at the axillary level and the nerves extends beyond the axilla. Throughout its pathway, it remains superior and posterior to the subclavian artery. The pleural dome is positioned anteromedially to the lower trunk and posteromedial to the subclavian artery. The trunks pass through the fascia covering the anterior and middle scalene muscles.

PHYSIOLOGY OF PAIN

Pain is considered as an unpleasant sensory and emotional experience associated with ongoing or potential tissue damage[28]. Experience of pain is subjective and thus difficult to measure. The characteristic response to any surgical or traumatic injury is as follows: a. Flare, i.e., increased blood flow at the site of injury b. Wheal, i.e., tissue oedema c. Hyperalgesia, i.e., peripheral receptor sensitisation. Hyperalgesia is an alteration of the sense of pain. Here, discomfort is markedly increased with recurrent painful stimuli[74]. Primary hyperalgesia occurs within minutes of injury and is characterized by hyperresponsiveness to touch, heat and mechanical stimuli. This represents increased sensitivity of C and Aδ fibres or receptors[29]. Primary hyperalgesia leads to increased wound sensitivity, prolonged discomfort and delayed wound healing due to decreased regional blood flow. Secondary hyperalgesia is seen in the surrounding area of the injured site. It is a delayed variation in pain sensitivity that leads to increased pain, muscle splinting and prolonged disability. In addition to

secondary hyperalgesia, neural and glial remodelling leads to the development of chronic pain.

EFFECTS OF PAIN ON ORGAN SYSTEMS:

Increased release of catecholamines via sympathetic stimulation leads to decreased peripheral perfusion and tachycardia, hypertension and thus, a compensatory increase in blood flow to vital organs like the heart and brain. Increased peripheral vascular resistance leading to increased myocardial contractility and demand can precipitate myocardial ischemia and infarction in high-risk patients[30]. Decreased regional blood flow and increased cortisol levels delay wound healing. In chronic untreated pain, there is increased catabolism and decreased anabolism due to variation in the neuroendocrine functions leading to lipolysis and proteolysis, which results in decreased immunoglobulin synthesis and impaired phagocytosis leading to reduced immunocompetence.

To conclude, the consequences of poorly controlled pain are as follows:

- Reduced functional capacity
- Sleep disturbance
- Delayed wound healing
- Decreased quality of life
- Lengthened hospital stays and increased cost of care[30].

Therefore, in addition to providing anaesthesia, anaesthesiologists also play a significant role in pain management. Understanding the details of pain physiology is vital in the management of pain.

PAIN ASSESSMENT

Assessment of pain is a necessary component to achieve adequate pain control in the post-operative period. Few of the pain evaluation scales are used in an attempt to assess pain. Most of these scales can be used by the patients themselves to evaluate pain when the patient can express and communicate what pain feels like.

VISUAL ANALOGUE SCALE (VAS):

The visual analogue scale in measurement was introduced in 1966, before which it was used in psychology to measure mood disorders[30]. Since then, it has become a standard and a popular tool for pain assessment. It consists of a line, typically 100 mm long, with anchor descriptions like "no pain" and "worst pain imaginable" (in the context of pain). The distance in millimetres between the patient's mark and the left endpoint is measured after the patient creates a mark that represents their perception.

The WONG-BAKER pain rating scale and Visual Analogue Scale facial expressions:

It is a pictorial self-assessment tool that includes six faces. Each face conveys different emotions, which range from a face with a cheerful smile to a face with a crying one. It is popular among the population such as younger patients, elderly patients or patients with disorientation or even in patients who cannot comprehend local language or any difficulty in communication.

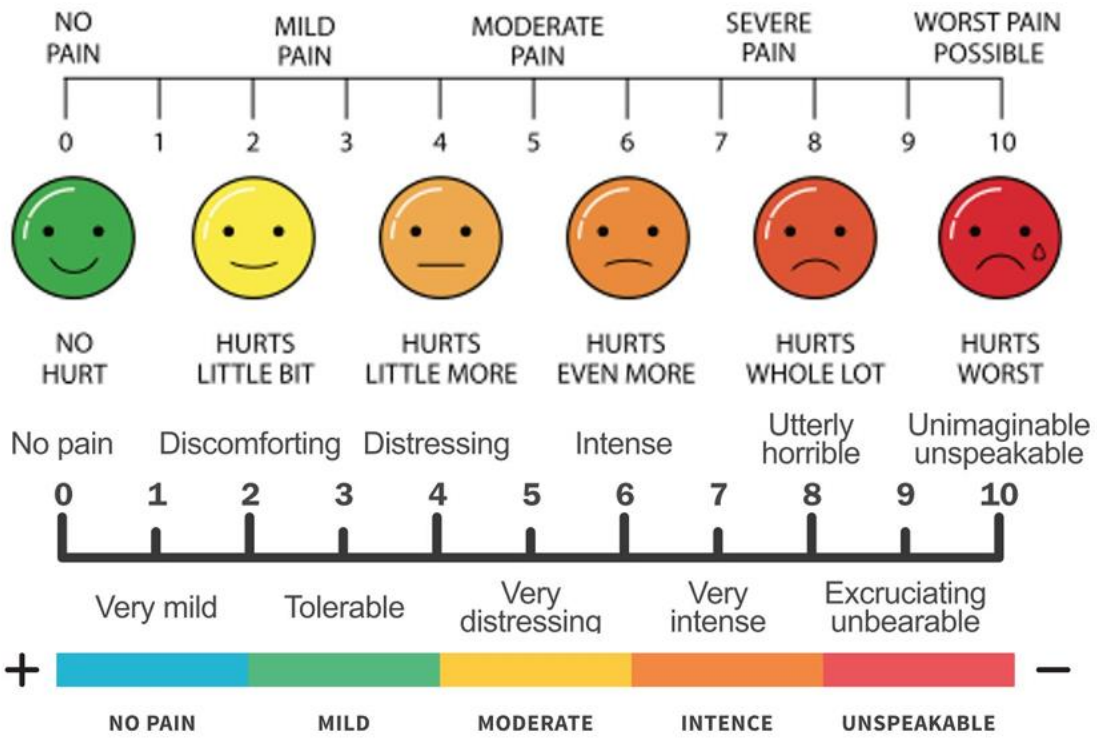


FIG:9 Visual Analogue Scale

CLAVIPECTORAL FASCIAL PLANE BLOCK

INTRODUCTION

Valdés-Vilches first introduced the Clavipectoral fascial block in the Symposium on Postoperative Pain Management for Orthopedic Upper and Lower Limb Surgery: Held at the 36th Annual European Society of Regional Anaesthesia and Pain Therapy (ESRA) Congress in Lugano, Switzerland, September 2017[31]. This block targets the clavipectoral fascia, which lies deep to the pectoralis major muscle and superficial to the Pectoralis minor muscle[32]. By anaesthetising the nerves that traverse this fascial plane, the CPFB can significantly reduce postoperative pain and opioid consumption, enhancing patient recovery and satisfaction. Its simplicity, safety, and effectiveness in reducing postoperative pain has gained popularity.[32]

ANATOMY

A thorough understanding of the clavipectoral fascia is essential for performing the CPFB. This fascia is a dense, fibrous layer extending from the clavicle to the axillary fascia. It envelops the pectoralis minor muscle and forms the base of the clavipectoral triangle, bordered by the clavicle, pectoralis major, and deltoid muscles[33].

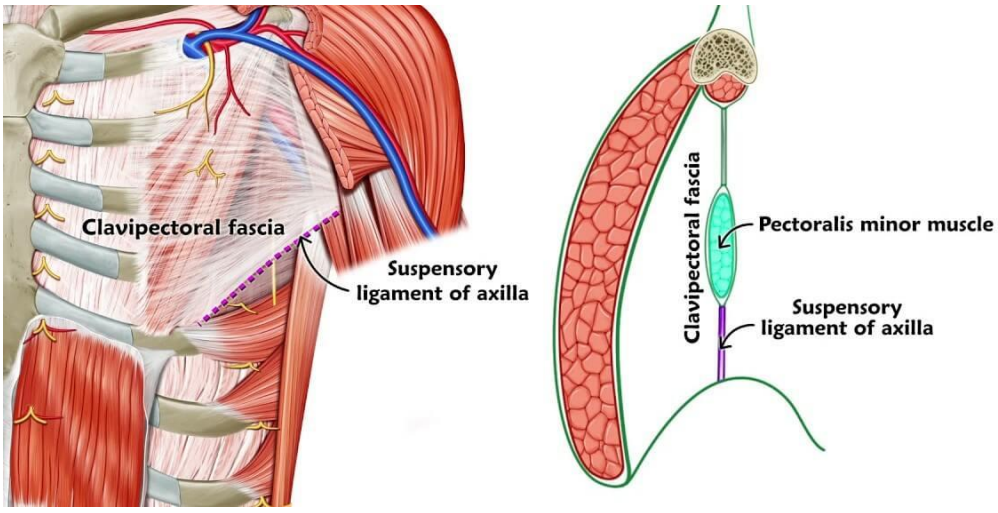


FIG 10: Anatomical illustration of the clavipectoral fascia

LOCATION AND EXTENT

The clavipectoral fascia lies deep to the pectoralis major muscle and superficial to the pectoralis minor muscle.

It extends from the clavicle above to the axillary fascia below.

Laterally, it blends with the fascia covering the deltoid muscle, and medially, it attaches to the sternum[32].

STRUCTURE AND LAYERS

The clavipectoral fascia consists of two main layers:

- Superficial Layer: Attaches to the clavicle and envelops the pectoralis minor muscle.
- Deep Layer: Extends downward to fuse with the axillary fascia and forms the suspensory ligament of the axilla, which supports the axillary structures.

KEY FEATURES

1. Clavipectoral Triangle (Deltopectoral Triangle):

A small triangular space bounded by:

- Clavicle (superiorly).
- Pectoralis major (medially).
- Deltoid muscle (laterally).
- The clavipectoral fascia forms the floor of this triangle.
- The cephalic vein passes through this triangle, piercing the clavipectoral fascia to drain into the axillary vein.

2. Thoracoacromial Artery:

It is the branch of the axillary artery that pierces the clavipectoral fascia and supply the pectoral muscles, deltoid, and clavicle.

3. Lymphatic Drainage:

The clavipectoral fascia contains the infraclavicular lymph nodes, which play a role in draining lymph from the upper limb and breast

STRUCTURES ASSOCIATED WITH THE CLAVIPECTORAL FASCIA INCLUDE[33]:

The clavipectoral fascia encloses or is closely associated with several important structures:

1. Pectoralis Minor Muscle:

- A thin, triangular muscle that originates from the 3rd to 5th ribs and inserts into the coracoid process of the scapula. It is positioned beneath the clavipectoral fascia.

2. Nerves:
   - Lateral Pectoral Nerve: Arises from the lateral cord of the brachial plexus and innervates the pectoralis major muscle.

- Medial Pectoral Nerve: Arises from the medial cord of the brachial plexus and supplies both the pectoralis major and minor muscles.

3. Vessels:

- Cephalic Vein: Passes through the deltopectoral groove and pierces the clavipectoral fascia to join the axillary vein.
- Thoracoacromial Artery: Supplies the pectoral muscles and deltoid.

4. Lymphatics:

- The fascia contains lymphatic vessels and nodes that drain the upper limb and breast

FUNCTIONS OF THE CLAVIPECTORAL FASCIA

- **Structural Support**: Provides mechanical support for the muscles of the anterior chest wall.
- **Protection**: Protects neurovascular structures in the axillary and pectoral regions.
- **Compartmentalization**: Separates the pectoralis major from deeper structures.
- **Facilitates Movement**: Allows smooth movement of muscles and vessels.

TECHNIQUE OF CLAVIPECTORAL FASCIAL BLOCK

PRE-PROCEDURE PREPARATION

- Patient Positioning: The patient is placed in a supine position with the head turned to the contralateral side, and the shoulder is padded with a small pillow [33]
- Equipment Required:
    - High-frequency linear ultrasound probe
    - Sterile gel and drapes
    - 22G or 25G block/spinal needle
    - Local anaesthetic (e.g., 0.25–0.5% ropivacaine or bupivacaine)

ULTRASOUND-GUIDED APPROACH

1. Probe Placement: Place the probe parallel to the clavicle, near the midclavicular point.

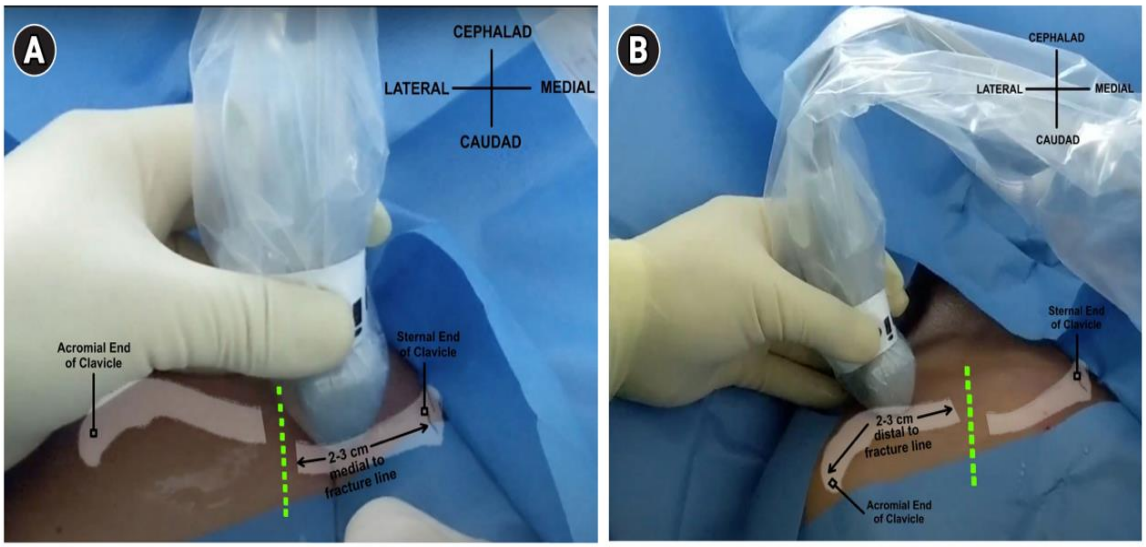


FIG 11: Scanning the clavicle medial and lateral to the fracture line.

2. Identify Structures: Locate the clavicle, subclavian vessels, and pectoralis major/minor muscles. The fascia appears as a hyperechoic layer beneath the pectoralis major muscle[34].

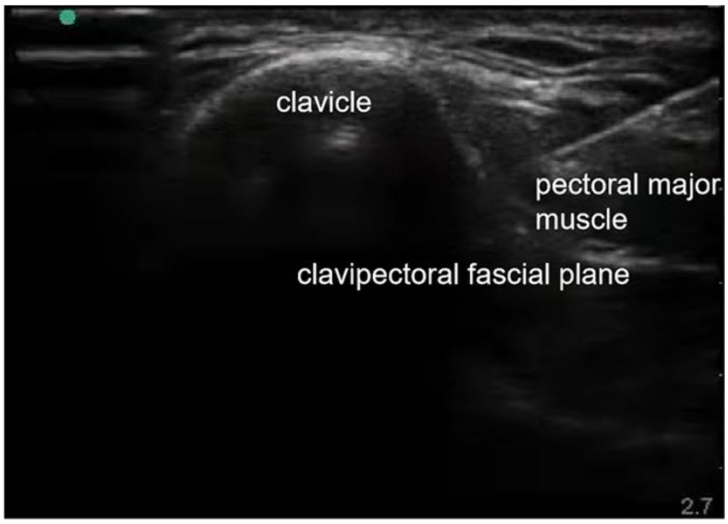


FIG: 12 Sonoanatomy of the clavicle and its surrounding structures

3. Needle Insertion: A 25-gauge spinal needle, is inserted in-plane from the lateral side of the probe. The needle is advanced through the pectoralis major muscle until it reaches the clavipectoral fascial plane[34].

4. Hydro dissection: Inject a small amount of saline to confirm correct fascial plane separation.

5. Local Anaesthetic Injection: Administer 10–20 mL of local anaesthetic within the clavipectoral fascial plane[34].

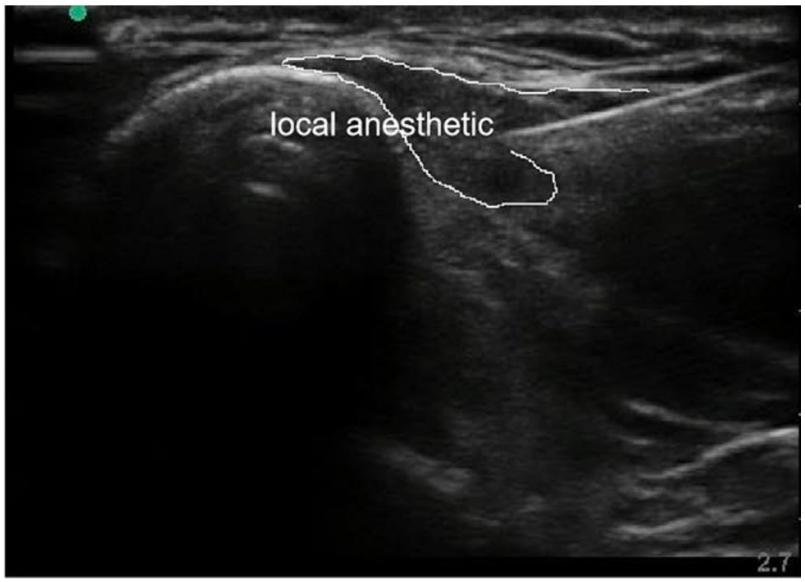


FIG: 13 Sonographic image showing the local anaesthesia deposition

6. Confirm Spread: Observe the anaesthetic spread under ultrasound, ensuring diffusion around the nerves.

FIG: 14 Sonographic image showing the local anaesthesia spread in clavipectoral fascia

COMPLICATIONS OF CLAVIPECTORAL FASCIAL BLOCK

1. LOCAL ANAESTHETIC SYSTEMIC TOXICITY (LAST)

Local anaesthetic systemic toxicity (LAST)[34] is a potentially life-threatening complication that occurs when the local anaesthetic is inadvertently injected into a blood vessel or if an excessive dose is administered. Symptoms of LAST include:

- Early signs: Metallic taste, tinnitus, perioral numbness, and dizziness.
- Progressive symptoms: Seizures, cardiac arrhythmias, and cardiovascular collapse.
- Prevention: Aspiration before injection, use of ultrasound guidance, and adherence to recommended dose limits.

There is no reported case of LAST in related to the clavipectoral fascial block

2. NERVE INJURY

Nerve injury is a rare but serious complication that can result from direct needle trauma or intraneural injection. The nerves at risk include the brachial plexus and its branches. Symptoms may include:

- Persistent numbness or weakness in the affected limb.
- Neuropathic pain or paraesthesia.

Prevention: Use of ultrasound guidance to visualize nerves and avoid direct needle contact.

4. HEMATOMA FORMATION

The clavipectoral region is highly vascular, with structures such as the cephalic vein and axillary artery in close proximity. Accidental puncture of these vessels can lead to hematoma formation. Symptoms include:

- Swelling, bruising, and pain at the injection site.

Prevention: Ultrasound guidance to identify and avoid vascular structures.

5. INFECTION

Although rare, infection at the injection site can occur, particularly if aseptic techniques are not followed.

Symptoms include:

- Redness, warmth, and swelling at the injection site.
- In severe cases, fever and widespread signs of infection may be present..

Prevention: Maintain strict sterility throughout the procedure.

6. ALLERGIC REACTIONS

Although rare, allergic reactions to local anaesthetics or additives (e.g., epinephrine) can occur.

Symptoms include:

- Skin rash, itching, and swelling.
- Anaphylaxis in severe cases (difficulty breathing, hypotension).

7. BLOCK FAILURE

Inadequate analgesia or complete block failure can occur due to improper needle placement, insufficient volume of local anaesthetic, or anatomical variations.

Symptoms include:

- Patient discomfort or pain during surgery.
- Need for supplemental analgesia or conversion to general anaesthesia.

8. VASOVAGAL REACTION

A vasovagal reaction can occur due to patient anxiety or pain during the procedure.

Symptoms include:

Bradycardia, hypotension, and syncope.

SUPERFICIAL CERVICAL PLEXUS BLOCK

HISTORY:

Halsted, in 1884, performed the first cervical block. Two main approaches to cervical plexus anaesthesia were introduced in the early 20th century[35]. The posterior approach to the cervical plexus was described for the first time in 1923 by Kapis, which targeted the nerves at the point of their emergence from the vertebral column[35]. In 1914, the lateral approach was described by Heidenhein, which became the basis for the development of present techniques of cervical plexus block. In 1920, Victor Pauchet added to the description of the lateral technique and recommended it over the posterior technique. The lateral approach was restudied by Winnie in 1975 and described as a simple single-injection technique[36]. Currently, the most commonly performed is the lateral approach.

ANATOMY OF CERVICAL PLEXUS :

The cervical plexus is composed of superficial and deep branches. The superficial branches provide sensory innervation to the skin, while the deep branches contribute to motor function by supplying muscles. It originates from the ventral (anterior) rami of the C1, C2, C3, and C4 cervical nerves[36]. The superficial cervical plexus includes the four sensory terminal branches[48], which include:

1. Lesser occipital nerve (C2) - supplies occipital region and upper neck. The lesser occipital nerve rarely arises as a branch of the greater occipital nerve.
2. The greater auricular nerve (C2 and C3) - supplies the skin over the parotid gland and posterior auricle.
3. Transverse cervical nerve (C2 and C3) - supplies the skin of the anterior triangle of the neck
4. Supraclavicular nerves (C3 and C4) - supply the skin over the shoulder and upper pectoral region.

These superficial branches form at the lateral edge of the sternocleidomastoid muscle and lie posterior to the same.

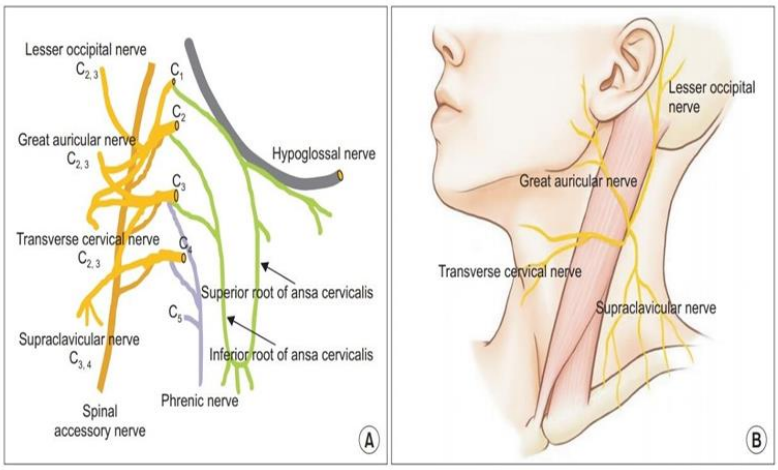


FIG: 15 Formation and distribution of superficial cervical plexus

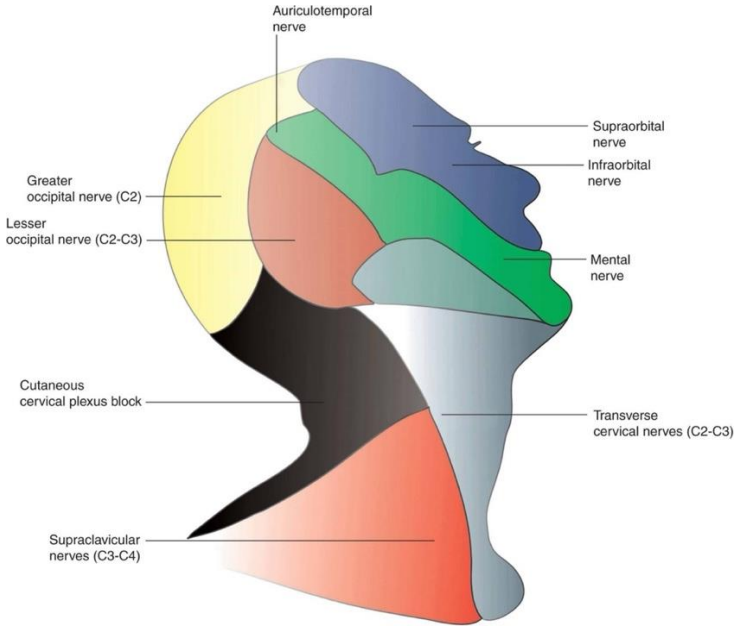


FIG: 16 Cutaneous nerve supply of neck

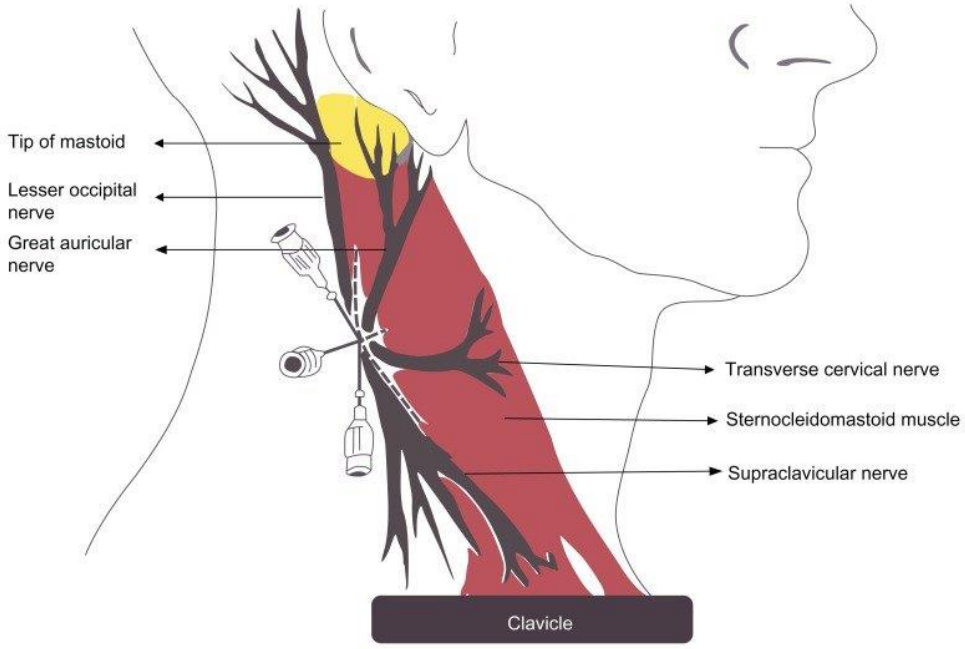


FIG: 17 Superficial Cervical Plexus Block Landmark Technique

Indications:

- SCPB is used as a single block or alongside deep cervical plexus block for complete anaesthesia in various procedures including[37]:

1. Carotid endarterectomy
2. Lymph node biopsy
3. Internal jugular cannulation.
4. For thyroid and parathyroid surgeries in high-risk patients.

- As an analgesic modality in:

1. Carotid surgeries
2. Thyroid surgeries
3. Tracheostomy
4. Mastoid and ear surgeries
5. As a supplement to brachial block in shoulder surgeries.

-For chronic pain management in conditions like:

1. Cervical radiculopathy
2. Cervicogenic headache

Benefits of Superficial Cervical Plexus Block:

a. SCPB is an excellent modality for analgesia for neck and shoulder surgeries.

b. As the analgesia is taken care of, the use of opioids is reduced, hence minimizing the adverse effects of opioids such as respiratory depression.

c. It augments patient comfort, thus avoiding the need for GA in many procedures.

TECHNIQUE OF SCPB

Landmark technique:

Landmarks:

a. The posterior border of the clavicular head of the sternocleidomastoid muscle
b. Cricoid cartilage (at the level of C6) or midpoint of the sternocleidomastoid muscle.

Patient position: Lying supine with the head turned to the opposite side. Skin is prepared and cleaned with aseptic precautions. Landmarks, as described above, are identified. A small-gauge needle is inserted at the midpoint of the posterior border of the SCM muscle and directed superficially to the investing fascia of the neck. Aspiration is performed to confirm the needle is not in any vascular compartment. A local anaesthetic is injected fan-shaped in the subcutaneous plane along with the posterior border of the SCM muscle. 10-15 ml of local anaesthetic is adequate to block superficial sensory branches[38].

USG GUIDED SCPB

- Position: supine or semi-recumbent position with patient's head turned to contralateral.
- Skin is prepared and cleaned. Over the lateral side of the neck, the ultrasound probe is placed horizontally or in transverse orientation at the midpoint of the posterior border of the sternocleidomastoid muscle or at the level of the cricoid cartilage[39].
- Carotid artery, IJV and SCM muscle are located.
- The tapering end of the SCM muscle is identified and is focused.

The needle is introduced from the side of the probe through the skin and platysma and advanced in the guidance of ultrasound, ensuring that the tip of the needle is beneath the investing fascia of SCM[39].

Once the needle tip placement is confirmed with the negative aspiration, 10-15ml of local anaesthetic is injected and spread of the same is observed.

Complications of superficial cervical plexus block:

a. Local anaesthetic toxicity: intravascular accidental deposition of local anaesthetic can lead to systemic toxicity.
b. Nerve injury: rare, but chances of nerve injury are present with improper needle placement.
c. Formation of hematoma: accidental vascular puncture can cause hematoma at the injection site.
d. Infection: if proper aseptic precautions are not taken, it is possible to introduce infection as it is an invasive procedure

Advantages of USG

a. Easy to perform.
b. Improved accuracy and increased success rate of the block.
c. Improved safety: blood vessels can be identified on USG and avoided, hence decreasing the risk of intravascular LA injection.
d. USG ensures the spread of LA is effective in all locations and hence requires less volume of local anaesthetic.
e. Reduced complication

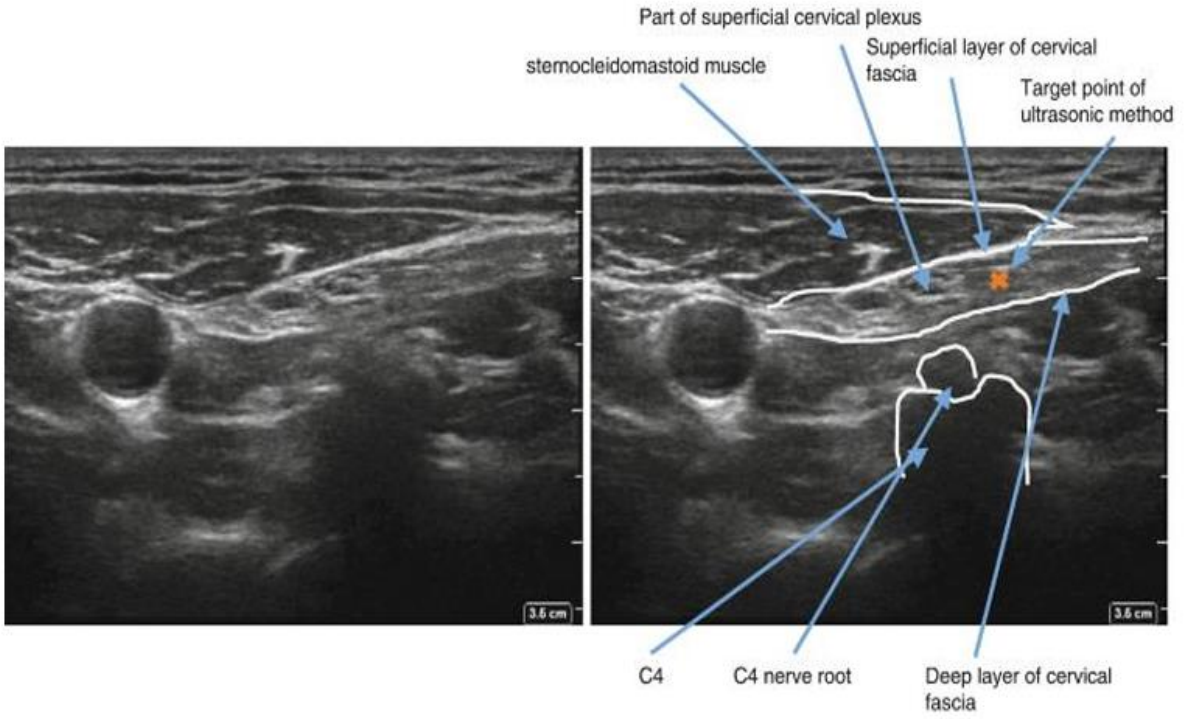


FIG: 18 Anatomy of Superficial Cervical Plexus on USG

INTERSCALENE BRACHIAL PLEXUS BLOCK

HISTORY

The interscalene brachial plexus block was used with varying success rates throughout the 20th century before it was officially credited to Alon Winnie in 1970. He introduced a percutaneous technique for the block, with 90% effectiveness. Winnie's method involved a single injection, relying on volume for its efficacy[40].

An interscalene block provides complete anaesthesia for shoulder surgery. It also facilitates catheter placement, which can be used to prolong surgical anaesthesia or to deliver medicine for extended postoperative pain relief if needed.

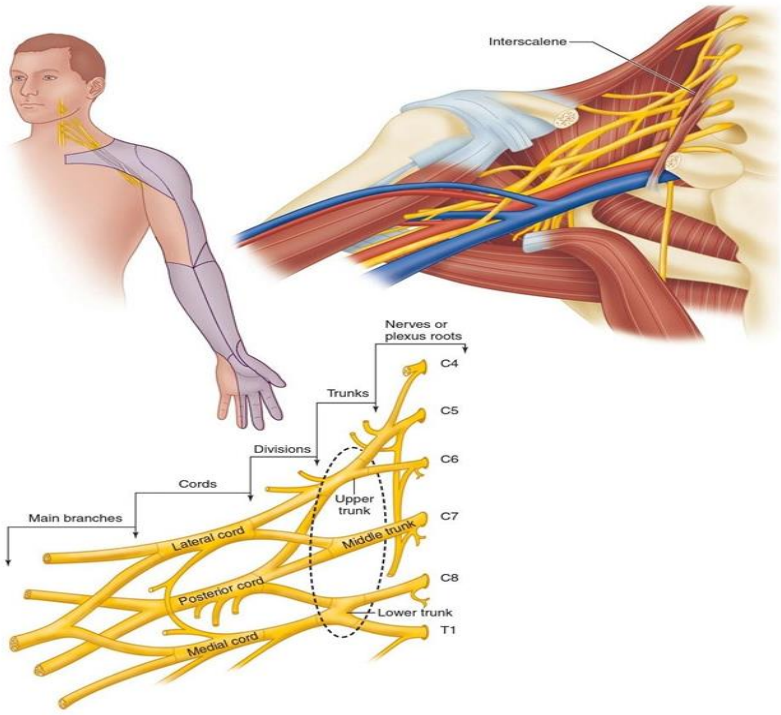


FIG 19: Level of blocking in ISBP

PATIENT PREPARATION

Patients posted for upper limb surgeries are considered for Interscalene block. This can be used as primary anaesthesia or as an adjuvant to general anaesthesia for extended postoperative analgesia. A patient's firm refusal of regional anaesthesia is a contraindication to the procedure. Other contraindications include severe systemic coagulopathy and local infection[40]. Preexisting neurological conditions can also be a concern, as performing the procedure may complicate the assessment of postoperative neuropathy. Some suggest that regional techniques may still be suitable if there is a clear distinction between the existing condition and potential surgical injury[41]. Additionally, patient anxiety should be considered—those with extreme apprehension may require deep sedation, which could diminish the benefits of regional anaesthesia, such as quick recovery, maintained alertness, and preserved airway reflexes.

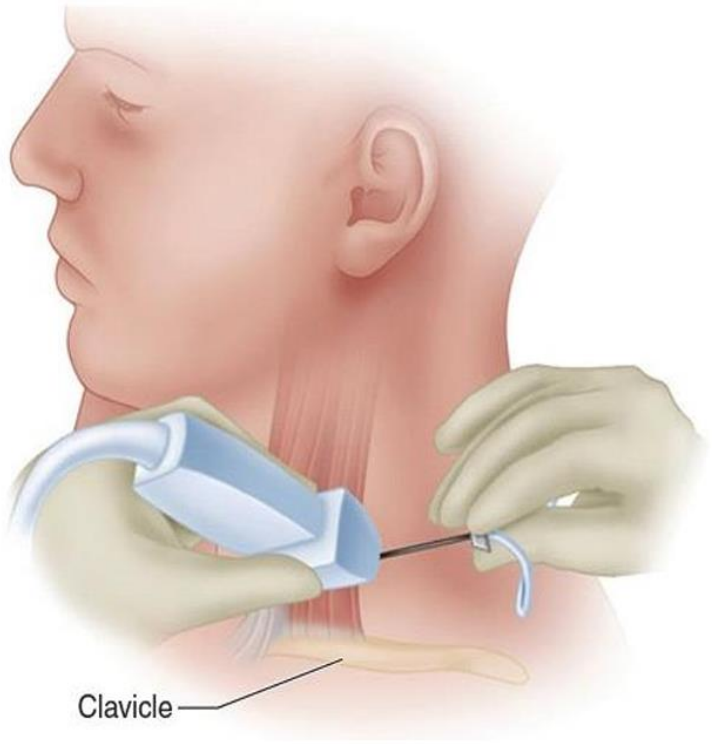


FIG: 20 Technique of the interscalene brachial plexus block.

ULTRASOUND-GUIDED INTERSCALENE BLOCK

The interscalene block can be performed using either an in-plane or out-of-plane approach, depending on the anaesthetist's experience and preference. In the in-plane technique, the needle is inserted from a posterolateral to the anteromedial direction along the long axis of a high-frequency linear transducer, ensuring visualisation of both the needle shaft and tip. The anterior and middle scalene muscles should be identified, with the hypoechoic nerve roots typically appearing in a cephalocaudal arrangement[42]. The anaesthetic agent should be administered while observing its real-time spread within the brachial plexus sheath, ensuring separation of the cross-sectional nerve roots. The transducer is placed distal to the conventional interscalene block injection point just above the clavicle for an out-of-plane approach[42]. The transducer's longitudinal axis is aligned in a posterolateral to anteromedial direction, with the centre of the probe overlying the interscalene space to visualise the nerve

roots. The needle is introduced in a slightly dorso-medial and distal direction to get into the space. Additionally, a nerve stimulator can be used to confirm the position of the needle tip[43]

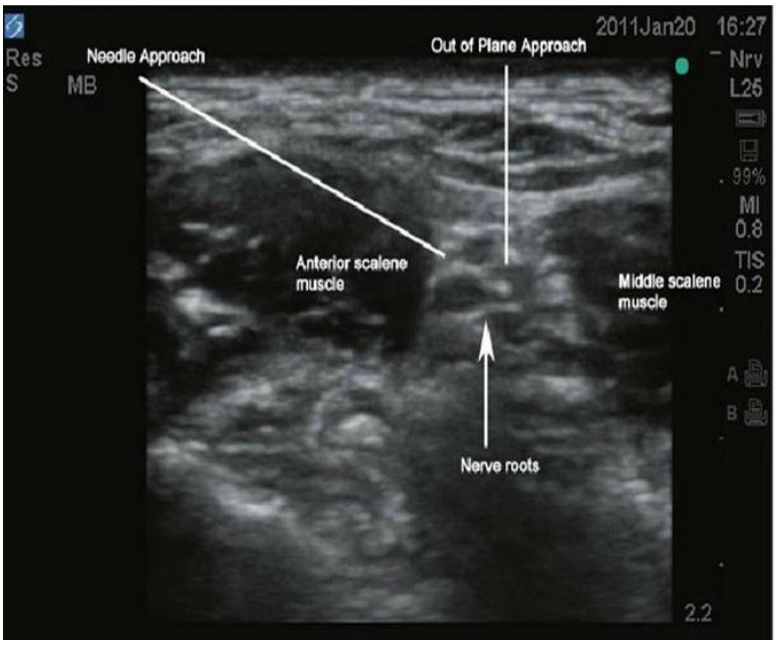


FIG: 21 USG picture of the interscalene approach of the brachial plexus block.

ADVANTAGES AND DISADVANTAGES

The most important benefit of the interscalene block is the superficial positioning of the interscalene space, making it easily accessible with ultrasound guidance. Administering a sufficient amount of local anaesthetic into it provides effective anaesthesia and analgesia for shoulder surgeries[44]. If needed, a catheter can be placed at this site for postoperative pain management. Furthermore, the axillary nerve supplying the deltoid and the musculocutaneous nerve innervating the biceps brachii are also blocked, giving reasonable muscle relaxation. This contributes to optimal surgical exposure and helps in the dislocation of the humeral head from the glenoid socket.

A drawback of this technique is the absence of blood vessels in the interscalene space, which makes perivascular techniques impossible. Additionally, the proximity of the

phrenic nerve or marginalisation of nerve root fibres involved in its formation of the phrenic nerve root may lead to permanent phrenic nerve palsy[45].

Administering a large volume of anaesthetic agent can leads to a 100% occurrence of ipsilateral hemi diaphragmatic paresis. A landmark study by Bergmann[54] documented four cases of permanent cervical spinal cord injury following interscalene blocks in patients under general anaesthesia. The postoperative MRI imaging of cervical spine shows spinal cord vacuolisation or syrinx formation in these patients. Experimental studies have shown that the intraneural injection under pressure can spread along the nerve's longitudinal axis, potentially affecting the spinal cord[46].

Performing an interscalene block on an anesthetised patient poses risks, as they cannot report painful paraesthesia or sensory disturbances. Sudden severe pain during injection is a sign of neural injury, necessitating immediate needle repositioning. Notably, nerve contact does not always elicit a motor response during electrical stimulation, and intraneural injections have been reported even with ultrasound guidance[47]. Since no technique guarantees complete safety, interscalene blocks should be avoided in heavily sedated or anaesthetised patients.

COMPLICATIONS

RESPIRATORY COMPLICATIONS

Ipsilateral hemi diaphragmatic paresis is a common side effect of the interscalene block, and is significant in patients with respiratory comorbidities such as contralateral diaphragmatic dysfunction, severe COPD, neuromuscular disorders, or conditions restricting rib cage movement like ankylosing spondylitis. In these cases, it may lead to atelectasis or respiratory failure[48].

Hemidiaphragmatic paresis occurs in all cases, regardless of anaesthetic drug volume or concentration. Even 5 mL of local anaesthetic agent, which is insufficient for

surgical anaesthesia, can result in hemi diaphragmatic paresis in 45% of cases[49]. The ultrasound-guided supraclavicular blocks have a reported lower incidence, but they still cause substantial phrenic nerve involvement. This occurs due to motor blockade of C3-C5 nerve roots before forming the phrenic nerve[50].

PHARMACOLOGY OF ROPIVACAINE

Local anaesthetics are chemical compounds that can reversibly block the transmission of nerve cell impulses.

CLASSIFICATION

Mainly classified into two groups based on the bond between the aromatic part and the intermediate chain. Procaine, chloroprocaine and methocaine belong to the amino-ester group, that have an ester link. Lignocaine, bupivacaine, mepivacaine, prilocaine and ropivacaine belong to amino-amide group having an amide bond between the aromatic head and the intermediate chain[51].

PHARMACOLOGY OF ROPIVACAINE

It is a single enantiomer molecule formed by the substitution of the a propyl group by a butyl side chain of levobupivacaine.

STRUCTURAL FORMULA [52]

C17H26N2o.Hcl
S-(-)-1-propyl-2',6'-pipecoloxylidide hydrochloride monohydrate

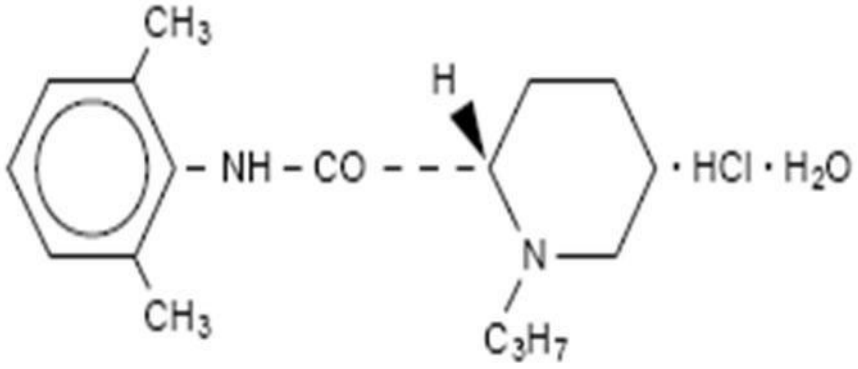


fig 22. Structural formula of ropivacaine hydrochloride

PHYSICOCHEMICAL PROPERTIES

PRESENTATION

20-ml ampules containing a colourless, transparent solution of 0.2%, 0.5%, and 0.75% ropivacaine hydrochloride.

MECHANISM OF ACTION

By reversibly inhibiting sodium ion influx, ropivacaine prevents impulse conduction in nerve fibres. Potassium channel blockage that is dosage-dependent amplifies this effect. Compared to bupivacaine, ropivacaine is less lipophilic and a lower propensity to penetrate large myelinated motor fibres[53]. As a result, it acts only on the A-beta and C neurons that transmit pain, not on the A-beta fibres that are involved in motor function.

\

PHARMACOKINETICS OF ROPIVACAINE

1. ABSORPTION

The total dose given, administration routes, patient hemodynamics, circulatory state and vascularity of the site can affect the degree to which ropivacaine is absorbed. Up to 80mg, pharmacokinetics are dose-proportionate and linear. Complete and biphasic absorption of 150mg of ropivacaine from the epidural space has occurred. The mean half-life of the initial phase is 14 minutes, followed by a mean absorption t ½ of 4.2 hours[53].

2. DISTRIBUTION

Ropivacaine has plasma proteins binding of 94%, primarily to alpha-1 acid glycoprotein. An increased protein binding capacity and a corresponding decrease in plasma clearance are the reasons for the increased total plasma concentration while using the drug[54].

3. METABOLISM AND EXCRETION

Ropivacaine primarily metabolises in the liver,by aromatic hydroxylation to 3'-hydroxy-ropivacaine by cytochrome P450 1A2 and N-dealkylation to 2',6'pipecoloxylidide by CYP3A4[53]. 86% of the drug excretion is by kidneys via urine [53]

4. TOXICITY OF ROPIVACAINE

If used at the recommended dosage, it has very few adverse effects. Compared to bupivacaine, it is less neurotoxic and cardiotoxic.

CENTRAL NERVOUS SYSTEM

The risk of central nervous system toxicity from an accidental intravascular ropivacaine injection is minimal. Objective symptoms are often excitatory in character and include tremors, shivering and twitching of the muscles; initially, the muscles of the face (perioral numbness) and part of the extremities are affected[54]. The threshold for convulsive episodes following an unintentional intravascular injection is higher with ropivacaine[55].

CARDIOVASCULAR SYSTEM

Intravascular ropivacaine injections can have considerable cardiovascular effects, such as alterations to contractility, conduction time and QRS width, although these effects are considerably less pronounced than those of bupivacaine[56].

AUTONOMIC NERVOUS SYSTEM

Preganglionic myelinated fibres, have a quicker conduction time and are more susceptible to the effects of ropivacaine[57].

MATERIALS AND METHODS

SOURCE OF DATA

This study will be conducted in the Orthopaedic Operation Theatre Complex, B.L.D.E.U.'s Shri. B.M. Patil Medical College, Hospital and Research Center, Vijayapura

METHOD OF COLLECTION OF DATA:

STUDY DESIGN: A Randomized Clinical Trial

STUDY PERIOD: One and a half years from June 2023 to November 2024

STATISTICAL ANALYSIS:

SAMPLE SIZE

- **The anticipated Mean ± S.D. of Duration of Analgesia in clavipectoral fascial plane block group 20±5.8 and group Interscalene brachial plexus block 13±4.3, respectively. The required minimum sample size is 30 per group (i.e., a total sample size of 60, assuming equal group sizes) to achieve a power of 99% and a level of significance of 5% (two-sided) for detecting a true difference in means between two groups.**

- $N = 2\left[\frac{(Z_{\propto}+z_{\beta})*S}{d}\right]^2$

$Z_{\propto}$ Level of significance=95%

Z_{β}--power of the study=90%

d-clinically significant difference between 2 parameters

SD= Common standard deviation

Statistical Analysis

- The data obtained will be entered into a Microsoft Excel sheet, and statistical analysis will be performed using a statistical package for the social sciences (Version 20).
- Results will be presented as Mean ± S.D., Median and IQR, counts and percentages and diagrams.
- For normally distributed continuous variables between two groups will be compared using the Independent t-test for not normally distributed variables, Mann Whitney U test will be used.
- Repeated ANOVA/Friedman test measures will be applied for follow-up results.
- Categorical variables between the two groups will be compared using the Chi-square test.
- $p<0.05$ will be considered statistically significant. All statistical tests will be performed in two-tailed.

Randomization: It is done by a computer-generated randomized table

Group C: Superficial Cervical Plexus Block and Clavipectoral Fascial Plane Block (S.C.P.B. and C.P.B.) in 30 patients
Group I: Superficial Cervical Plexus Block and Interscalene Brachial Plexus Block (S.C.P.B. and I.S.B.P.) in 30 patients

STUDY POPULATION

The subjects were patients with unilateral clavicle fractures who underwent elective internal fixation of clavicle fractures in our hospital and were willing for the proposed blocks.

INCLUSION CRITERIA:

- A.S.A. grades I and II
- Age 18 to 55 years

EXCLUSION CRITERIA

- ASA Grade III and IV
- Cardio-cerebrovascular diseases (history of heart failure, poor control of hypertension, coronary heart disease and cerebrovascular history)
- Respiratory insufficiency (More than four rib fractures, obstructive lung disease like emphysema, C.O.P.D., etc.)
- Abnormal blood coagulation
- Puncture site infection
- Allergy to local anaesthetics
- Not willing to participate

The effect of the block will be measured at 30 min in three areas: the sternoclavicular joint, the midclavicular and the acromioclavicular joint. If the effect were poor, the patient would be changed to general anaesthesia and withdrawn from the study.

METHODOLOGY:

Pre-anaesthetic evaluation:

- Pre-anaesthetic evaluation will include the following:

HISTORY:

History of underlying medical illness, previous history of surgery, anaesthetic exposure, and hospitalization were elicited.

PHYSICAL EXAMINATION

- The general condition of a patient.
- Vital signs -heart rate, blood pressure, respiratory rate, oxygen saturation
- Height and weight
- Examination of the respiratory, cardiovascular, central nervous, and vertebral systems.
- Airway assessment by Mallampati grading.

The procedure was explained to the patient and patient attendees.

INVESTIGATIONS /INTERVENTIONS

Routine investigations include CBC, H.I.V., HCV, HBsAg, and Random Blood Sugar, Bleeding Time, Clotting Time, Bleeding Time and Clotting Time.

Procedure:

- All patients undergoing clavicle surgery and willing for regional anaesthesia in B . M .PATIL Medical College and Hospital were considered. The patients were evaluated to consider whether they fit into the inclusion criteria.
- Written informed consent was obtained from all the patients included in the study

PROCEDURE OF BLOCK

1. **Superficial cervical plexus block (S.C.P.B.):** The patient was placed in a supine position and under all aseptic precautions, with the head turned to the contralateral side, for adequate exposure of the neck and the upper chest, a linear high-frequency

ultrasound probe (6–13 MHz, Sonosite) was placed at the lateral side of the neck over the midpoint of the sterno-cleido-mastoid muscle at the level of the cricoid cartilage, which corresponds with the C6 transverse apophysis and its characteristic anterior tubercle. The superficial cervical plexus (S.C.P.) was visualized just superficial to the prevertebral fascia overlying the interscalene groove. Using the posterior in-plane technique, a five cm block needle was then introduced from lateral to medial until its tip is placed near the S.C.P. above the prevertebral fascia. After careful negative aspiration to exclude intravascular placement, 7 mL of 0.5% ropivacaine was deposited.

2. **Clavipectoral fascial plane block (C.P.B.):** The patient will be supine with the head turned to the contralateral side. Under sterile aseptic conditions, a 6- to 13-MHz linear array probe was used for regional anaesthesia. A local anaesthetic solution of 20 mL 0.5% ropivacaine was used. During C.P.B., using the in-plane technique, an ultrasound probe was placed on both the inner and outer one-third of the anterior surface of the clavicle. A 22-gauge needle was then inserted and advanced into the space between the periosteum of the clavicle and clavipectoral fascia in a caudal to cephalad direction, and a total of 20 mL of 0.5% ropivacaine was equally injected medially and laterally with the help of ultrasound landmarks and the in-plane needle path.

3. **Interscalene brachial plexus block (I.S.B.P.):** The patient will be supine with the head turned to the contralateral side under sterile aseptic conditions, and a 6 to 13 MHz linear array probe will be used for regional anaesthesia. To perform I.S.B.P., a high-frequency probe will be positioned at the level of the cricoid cartilage to visualize the brachial plexus between the anterior and middle scalene muscles.

Participants will be randomly assigned to 2 groups:

Group C (SCPB AND CPB): S.C.P.B. with 7ml of 0.5% Ropivacaine
C.P.B. with 20ml of 0.5% Ropivacaine

Group I (SCPB AND ISBP): S.C.P.B. with 7ml of 0.5% Ropivacaine
I.S.B.P. with 20ml of 0.5% Ropivacaine

- The same anaesthesiologist group performed all procedures to eliminate any possible effects of the anaesthetic technique.

- Standard monitoring of hemodynamic parameters were applied

- At the beginning of the surgery, all patients were administered 0.05 mg/kg of midazolam. Blocks were performed using a Sonosite ultrasound machine, and it was given 30 minutes before the start of surgery.

Block Success Score

The **Block Success Score** is a numerical measure used to assess the effectiveness of nerve block administered. The score evaluates how well the nerve block covers the targeted anatomical region and provides adequate blockade The effect of the block will be measured at 30 minutes in these three areas:

1. The sternoclavicular joint,
2. Mid-clavicle
3. Acromioclavicular joint.

- Four levels to be established:
    0: No decreased sensation
    1: Decreased sensitivity to puncture
    2: No sensitivity to puncture
    3: No tactile sensitivity

Values of 2 and 3 will be considered as successful blocks.

Modified Bromage scale (M.B.S.) scores wi used to assess upper limb movement function.

Scores

- 4: Full muscle strength in relevant muscle groups
- 3: Indicated reduced strength but the ability to move against resistance
- 2: Indicated the ability to move against gravity but not against resistance
- 1: Indicated discrete movements (trembling) of muscle groups
- 0: indicated a lack of movement.

- Blood pressure, heart rate, and SpO2 was monitored and recorded. The pain was evaluated with VAS.
- The Visual Analog Scale (VAS) score (0, no pain; 10, most serious pain) The VAS scores of the patients at 6, 12 and 24 h after surgery was recorded.

Respiratory Function/ Diaphragmatic Excursion

- The diaphragmatic excursion refers to the movement of the diaphragm during respiration. It is the vertical displacement of the diaphragm between **inspiration (breathing in) and expiration (breathing out)**. The diaphragmatic movement will be evaluated by real-time M-mode using Sonosite ultrasonography of the hemidiaphragm. The range of diaphragmatic movement from a resting expiratory position to deep inspiration (sigh test) was recorded before and 30 min after the block.

- A **higher excursion** indicates better diaphragmatic function.
- A **lower excursion** suggests impaired movement

Percentage Decrease In Diaphragmatic Excursion

The **percentage decrease in diaphragmatic excursion** measures how much the diaphragm's movement has reduced after a certain time i.e. 30 minutes post-intervention. It is calculated as:

$$\text{Percentage Decrease} = \frac{(\text{Baseline Excursion} - \text{Excursion at 30 min})}{\text{Baseline Excursion}} \times 100$$

This metric **quantifies the degree of diaphragmatic impairment** over time.

- If the **percentage decrease is minimal**, it means their diaphragmatic function remains almost the same.
- If the **percentage decrease is higher**, indicates a **significant loss of diaphragmatic function**

- Adverse reactions of local anaesthetic systemic toxicity, pneumothorax and haemothorax were to be noted.

RESULTS

Data collected from the study was entered in a Microsoft Office Excel sheet and was analysed by standard statistical software.

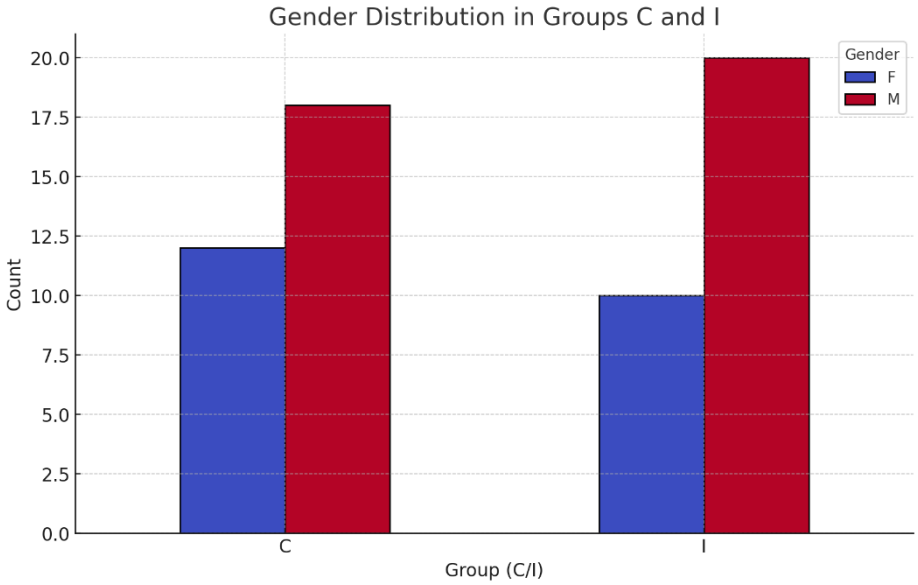
The results were summarised by descriptive statistics like mean and standard deviation for numerical variables and counts and percentages for categorical variables. Numerical variables are compared between groups by the Mann-Whitney U test. The chi-square test was employed for intergroup comparison of categorical variables. Analysis was done, and a p-value <0.05 was considered statistically significant.

GENDER DISTRIBUTION

Of the total 60 participants in this study, the sex distribution among groups is as follows.

Group	Female (F)	Male (M)
C	12	18
I	10	20

Table 1: Gender Distribution



Graph 1: Gender Distribution

- **Group C**: 12 females and 18 males.
- **Group I**: 10 females and 20 males.

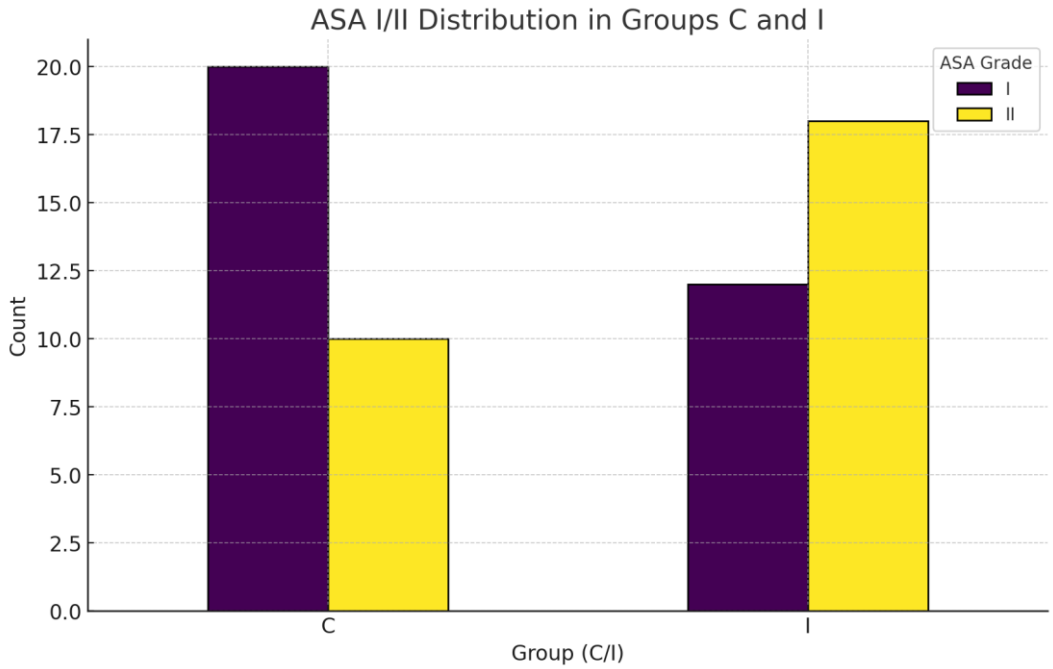
The calculated **p-value (0.789) is much greater than 0.05, and there is no statistically significant difference** between groups C and I in the distribution of males and females.

ASA GRADING

Of the total 60 participants in this study, the ASA grading among the study groups is

	Group C	Group I
ASA I	20	10
ASA II	10	18

Table 2: showing the distribution of patients classified as ASA I and ASA II



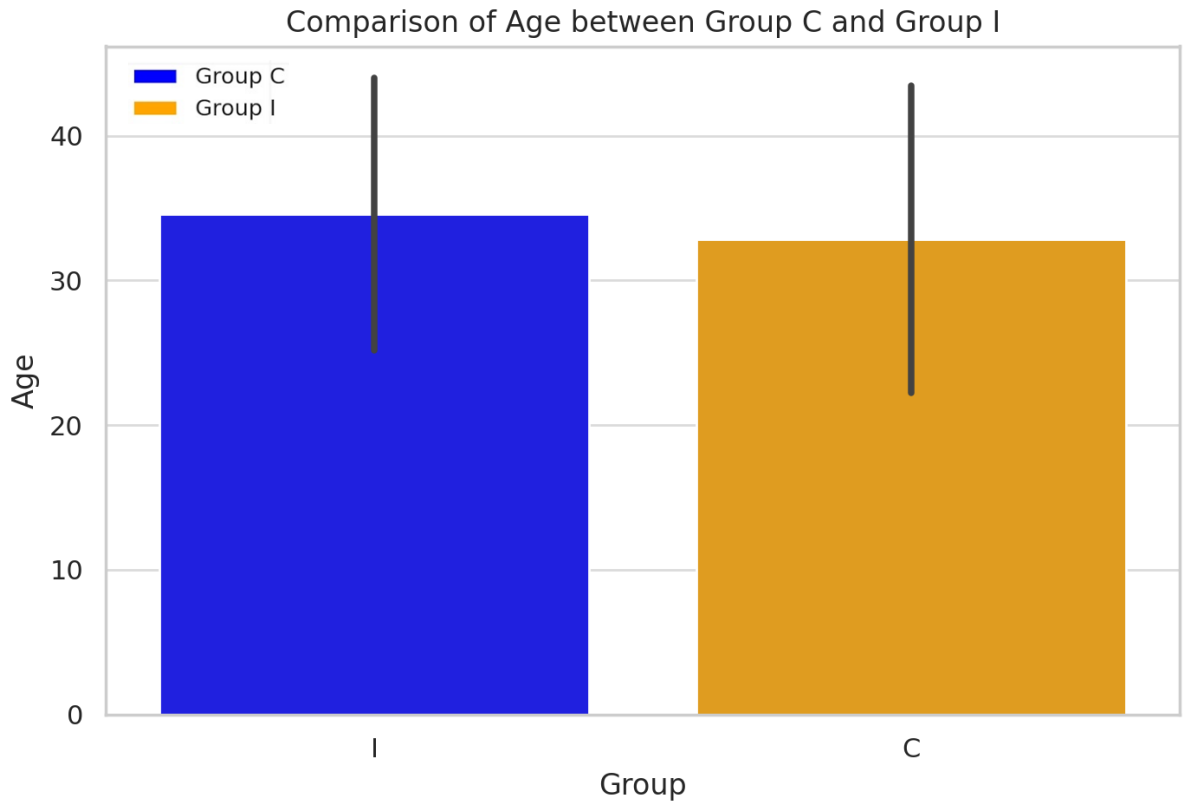
Graph 2 shows the distribution of patients classified as ASA I and ASA II.

- The calculated **p-value (0.070) is above 0.05**, **and there is no statistically significant difference** between groups C and I in the distribution of ASA grading

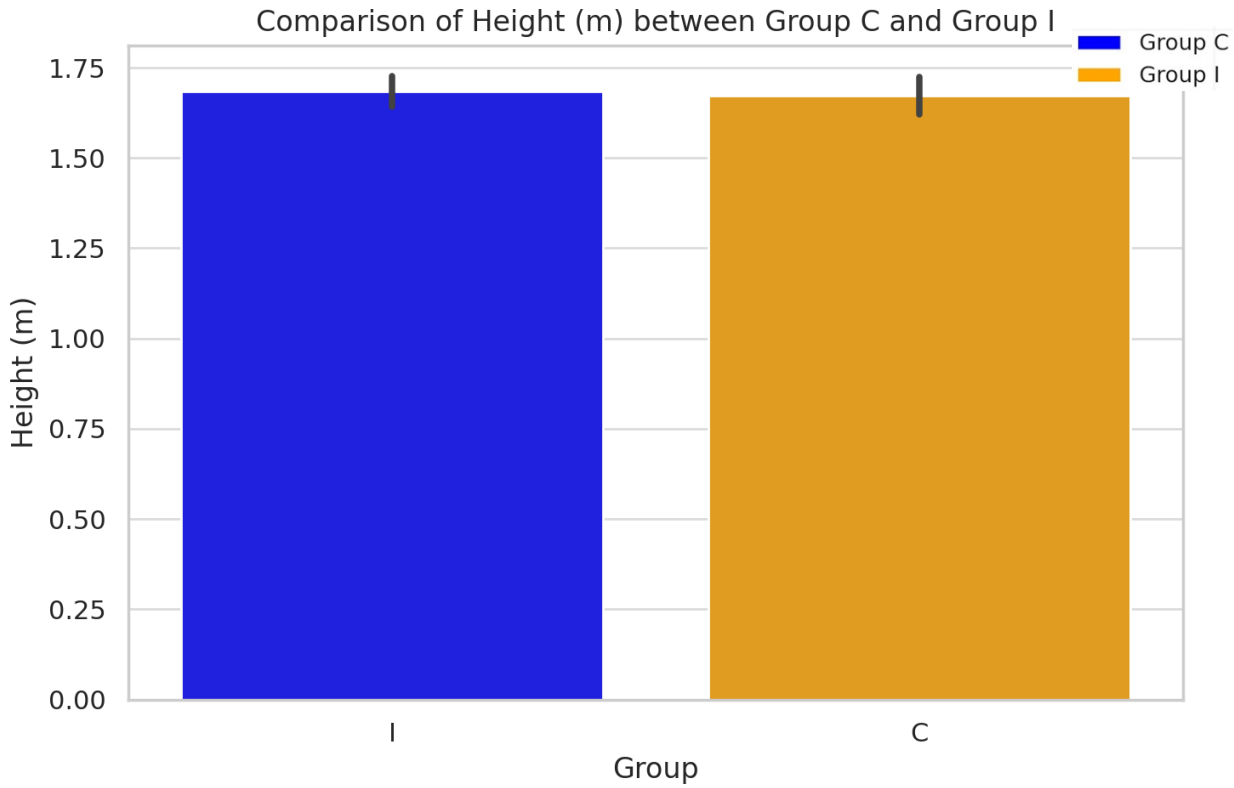
DEMOGRAPHIC PARAMETERS

Parameter	Group C (Clavipectoral Fascial Block)	Group I (Interscalene + Superficial Cervical Plexus Block)	p-value
Age (years)	32.83 ± 10.77	34.57 ± 9.58	0.347
Height (m)	1.673±0.053 m	1.684±0.043 m	0.382
Weight (kg)	76.53 ± 6.12	69.80 ± 7.34	0.00005
BMI	27.33 ± 1.28	24.67 ± 2.84	0.00003

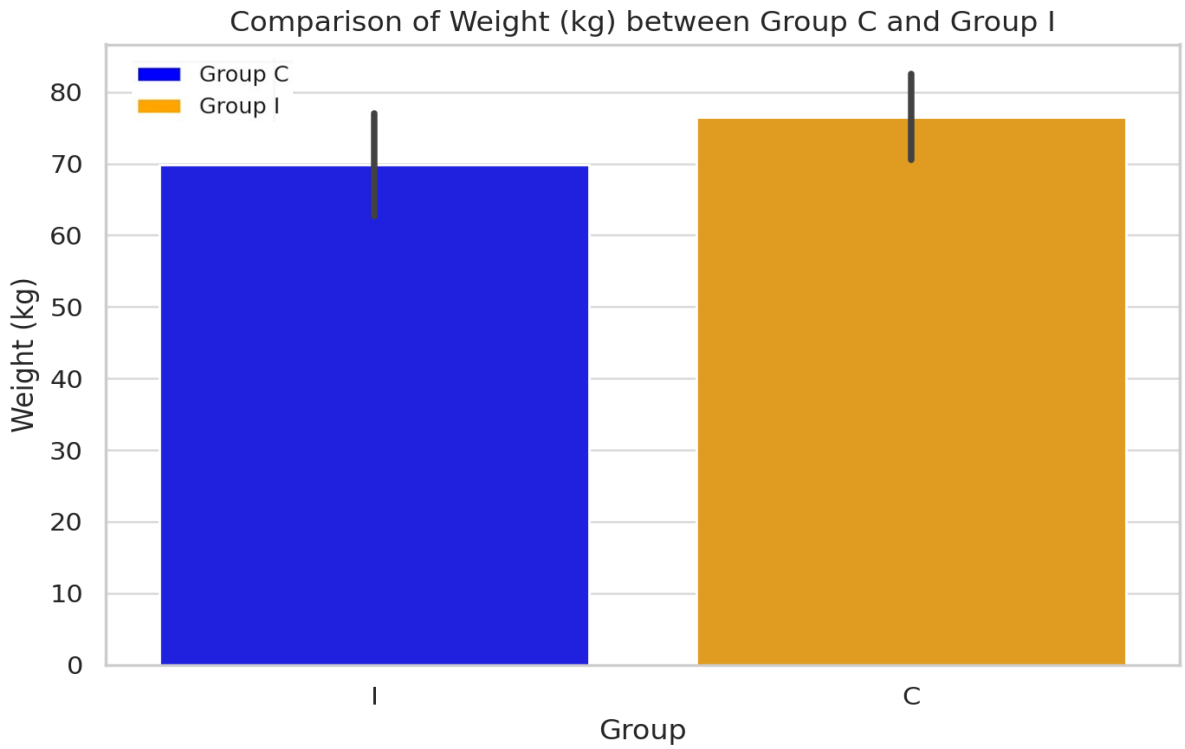
Table 3: Demographic parameters



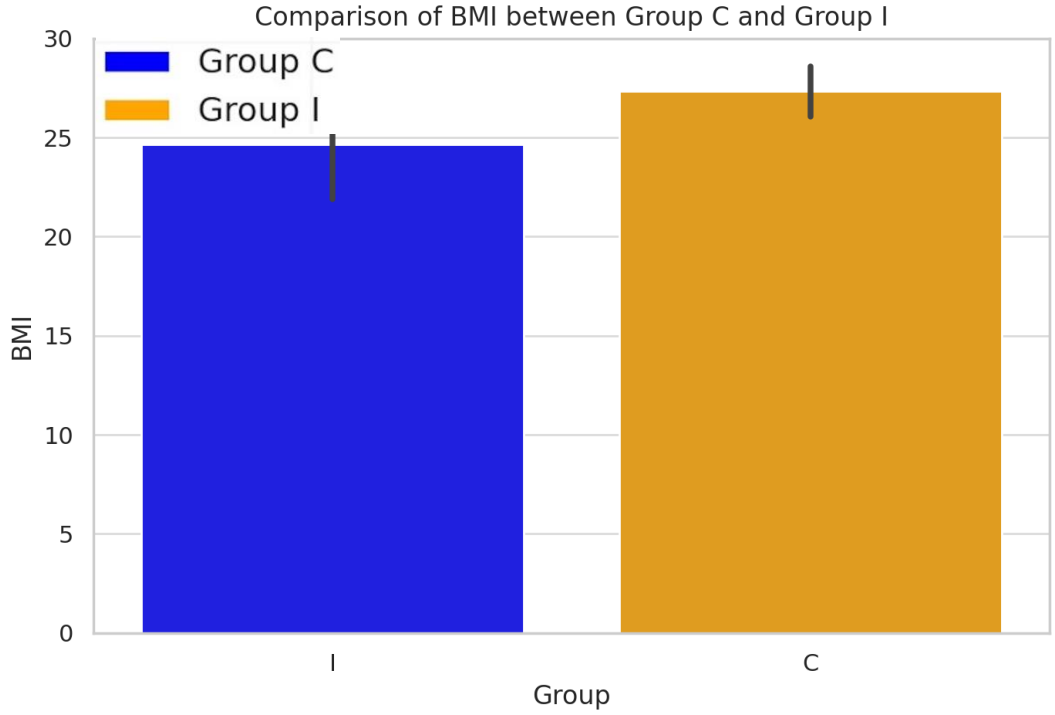
Graph 3: Comparison of Age **(p = 0.347- statistically insignificant).**



Graph 4: Comparison of Height **(p = 0.382 statistically insignificant).**



Graph 5: Comparison of Weight - **Group I (69.80 ± 7.34 kg, p = 0.00005).**



Graph 6: Comparison of BMI - **Group I (24.67 ± 2.84, p = 0.00003)**

Age and Height

The mean age of patients undergoing Clavipectoral Fascial Block (Group C) (32.83 ± 10.77 years) and those receiving Interscalene Brachial Plexus Block (Group I) (34.57 ± 9.58 years) combined with Superficial Cervical Plexus Block showed no statistically significant difference ($p = 0.347$). Similarly, the mean height of Group C is 1.673±0.053 m and Group I is 1.684±0.043 m, and there is no statistically significant difference between the groups ($p = 0.382$). This indicates that the two groups were comparable in terms of baseline demographic characteristics.

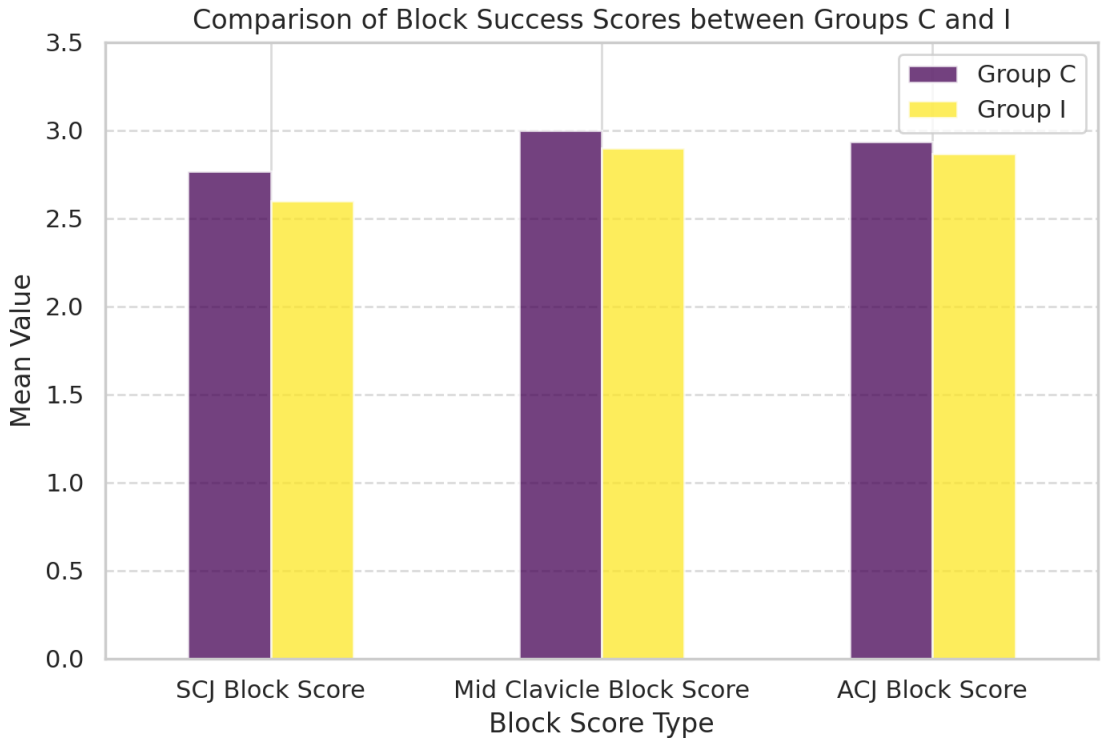
Weight and BMI

Group C had a significantly higher mean weight (76.53 ± 6.12 kg) compared to Group I (69.80 ± 7.34 kg, $p = 0.00005$). Additionally, BMI was significantly higher in Group C (27.33 ± 1.28) than in Group I (24.67 ± 2.84, $p = 0.00003$). The differences in weight and BMI suggest a potential baseline variability that may influence other physiological responses.

BLOCK SUCCESS SCORES

SITE	Group C Mean (±SD)	Group I Mean (±SD)	P-Value
SCJ Block Score	2.77 ± 0.43	2.60 ± 0.50	0.171
Mid Clavicle Block Score	3.00 ± 0.00	2.90 ± 0.31	0.083
ACJ Block Score	2.93 ± 0.25	2.87 ± 0.35	0.398

Table 4: Comparison Block Success Scores



Graph 7: Comparison of block success scores across different clavicular regions between Group C and Group I. **(SCJ p-value- 0.171, Mid clavicle p-value- 0.083, ACJ p-value- 0.398)**

Block Success Scores

The efficacy of the nerve blocks was assessed at three anatomical locations: Sternoclavicular Joint (SCJ), Midclavicular area, and Acromioclavicular Joint (ACJ). The mean block scores were slightly higher in Group C (Clavipectoral Fascial Block) **compared to** Group I (Interscalene Brachial Plexus Block with Superficial Cervical Plexus Block) **at all three sites, though the differences were not statistically significant (p > 0.05).**

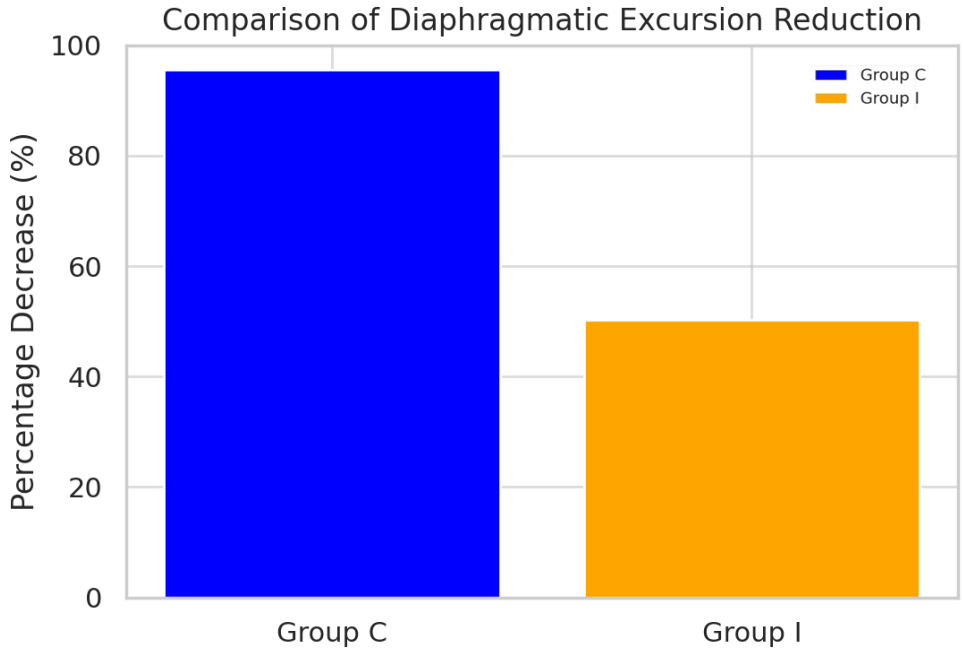
- The SCJ block score was **2.77 ± 0.43 in Group C** and **2.60 ± 0.50 in Group I** (p = 0.171).
- The Midclavicular block score was **3.00 ± 0.00 in Group C** and **2.90 ± 0.31 in Group I** (p = 0.083).
- The ACJ block score was 2.93 ± 0.25 **in Group C** and **2.87 ± 0.35 in Group I** (p = 0.398).

These findings indicate that **both blocks provided excellent sensory blockade**, with no major differences in their effectiveness across clavicular regions. The slightly higher scores in Group C may suggest a **more homogenous spread of the local anaesthetic agent**, though this did not translate into statistical significance.

RESPIRATORY FUNCTION (DIAPHRAGMATIC EXCURSION)

Parameter	Group C	Group I	p-value
Baseline Diaphragmatic Excursion (cm)	6.05 ± 0.40	5.93 ± 0.38	0.223
Diaphragmatic Excursion at 30 min (cm)	5.79 ± 0.52	2.96 ± 0.60	0.0012
Percentage Decrease in Diaphragmatic Excursion	95.57% ± 4.25	50.21% ± 10.60	0.0014

Table 5: Comparison of Diaphragmatic Excursion Reduction



Graph 8: Comparison of Diaphragmatic Excursion Reduction

Group C (95.57% ± 4.25, p = 0.0014)

Baseline Diaphragmatic Excursion

There was no significant difference in diaphragmatic excursion at baseline between Group C (6.05 ± 0.40 cm) and Group I (5.93 ± 0.38 cm, p = 0.223), indicating that both groups had similar diaphragmatic function before intervention.

Diaphragmatic Excursion at 30 Minutes

After 30 minutes, Group I showed a significantly greater reduction in diaphragmatic excursion (2.96 ± 0.60 cm) compared to Group C (5.79 ± 0.52 cm, p 0.0012). This suggests that the Interscalene Brachial Plexus Block had a greater impact on diaphragmatic function, likely due to increased blockade of the phrenic nerve.

Percentage Decrease in Diaphragmatic Excursion

- **Group C**- The **percentage decrease is minimal** (~4.43%), meaning their diaphragmatic function remained almost the same.
- **Group I** The **percentage decrease is much higher** (~49.79%), indicating a **significant loss of diaphragmatic function** after 30 minutes.

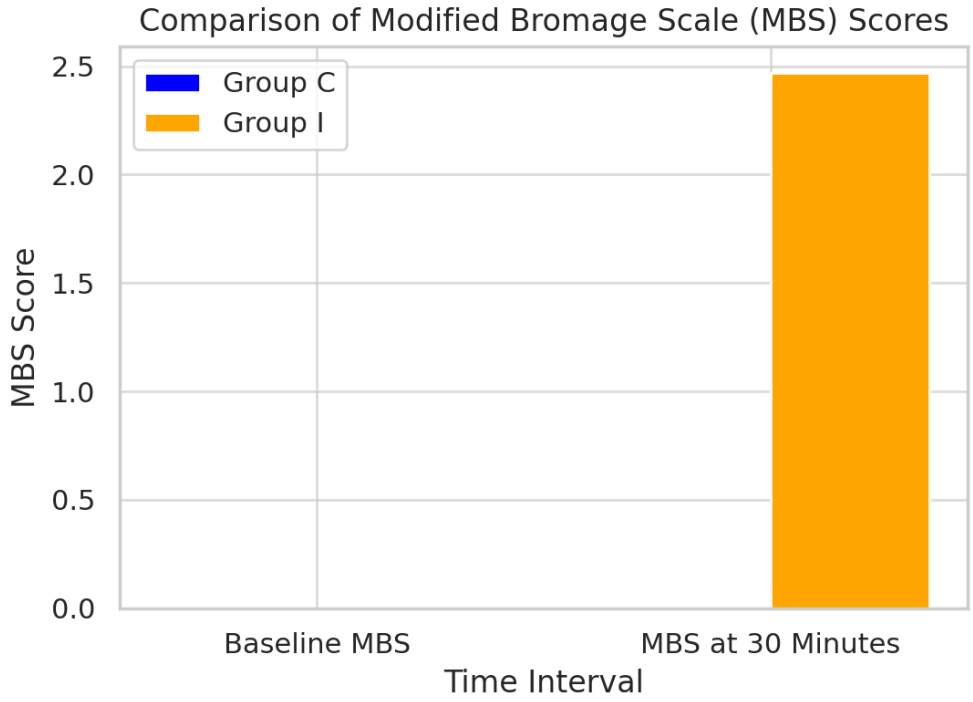
The percentage decrease in diaphragmatic excursion was significantly higher in Group I (50.21% ± 10.60) compared to Group C (95.57% ± 4.25, p = 0.0014). This indicates that the Interscalene Brachial Plexus Block caused **more pronounced diaphragmatic impairment**, which may lead to a higher risk of respiratory complications compared to the Clavipectoral Fascial Block.

MODIFIED BROMAGE SCALE (MBS) SCORES

Time Interval	Group C (Clavipectoral Fascial Block)	Group I (Interscalene + Superficial Cervical Plexus Block)	p-value
Baseline MBS	0.00 ± 0.00	0.00 ± 0.00	N/A

Time Interval	Group C (Clavipectoral Fascial Block)	Group I (Interscalene + Superficial Cervical Plexus Block)	p-value
MBS at 30 minutes	0.00 ± 0.00	2.47 ± 0.57	0.0013

Table 6: Comparison of Modified Bromage Scale Score



Graph 9: Illustrating the Modified Bromage Scale (MBS) scores, highlighting a significant increase at 30 minutes in Group I, while Group C showed no motor blockade.
MBS group I (2.47 ± 0.57, p = 0.0013)

Motor blockade was assessed using the **Modified Bromage Scale (MBS)** at baseline and **30 minutes after block administration**.

- At baseline, **both groups had an MBS score of 0.00 ± 0.00**, indicating normal motor function.
- At 30 minutes, **Group C maintained an MBS of 0.00 ± 0.00**, whereas **Group I showed a significant increase in MBS (2.47 ± 0.57, p = 0.0013)**.

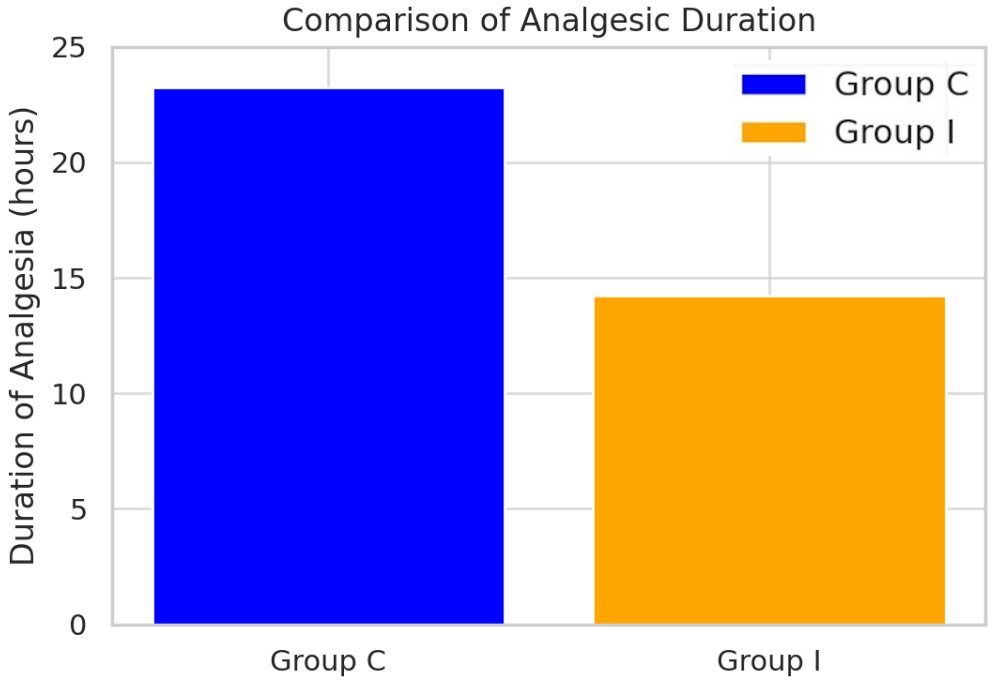
This difference suggests that the **Interscalene Brachial Plexus Block (Group I) resulted in significant motor blockade**, likely due to its influence on motor fibers of the brachial plexus. In contrast, **the Clavipectoral Fascial Block (Group C) provided effective analgesia without affecting motor function**, making it a more

favourable choice for **patients requiring postoperative mobility and respiratory function preservation**.

ANALGESIC OUTCOMES

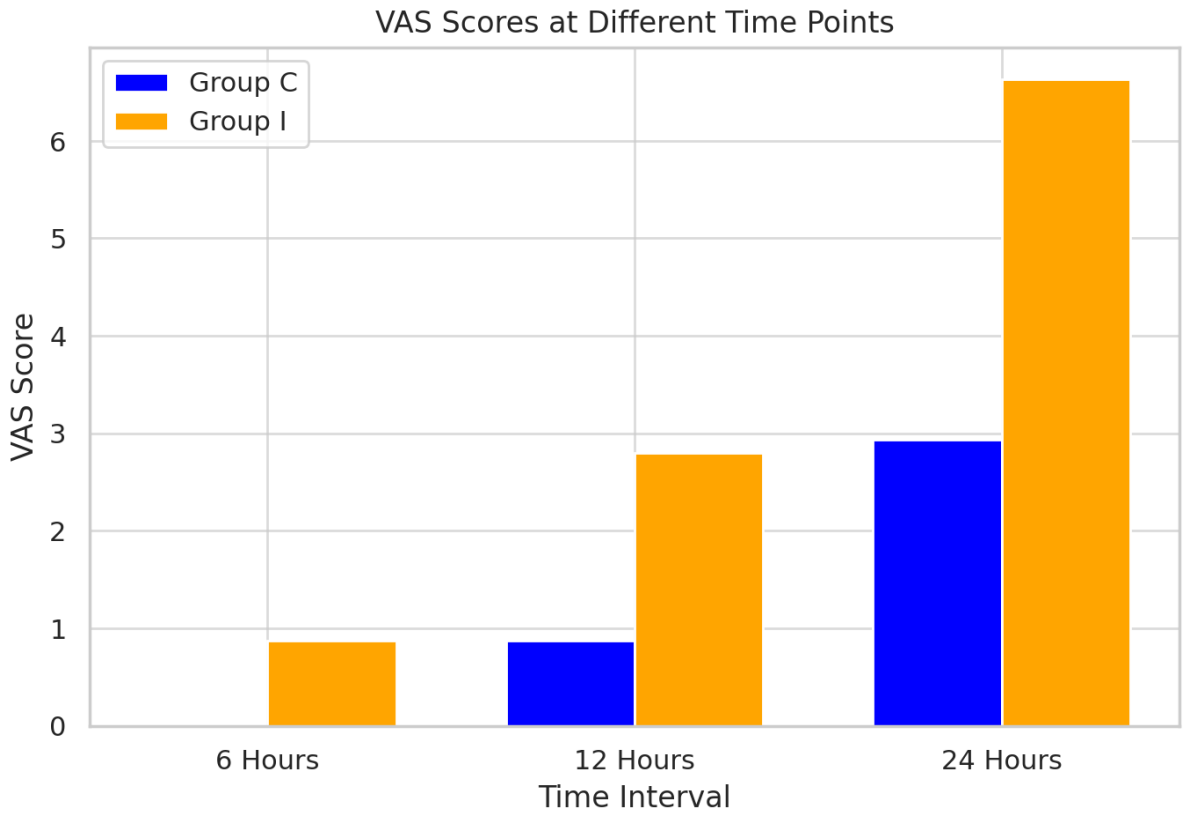
Time Interval	Group C	Group I	p-value
Duration of Analgesia (hours) (Time od 1st rescue analgesia)	23.23 ± 1.96	14.23 ± 1.33	0.00171
VAS at 6 hours	0.00 ± 0.00	0.87 ± 0.97	0.00112
VAS at 12 hours	0.87 ± 1.01	2.80 ± 0.61	0.00133
VAS at 24 hours	2.93 ± 0.94	6.63 ± 0.81	0.00196

Table 7: Duration of Analgesia and VAS Score



Graph 10: Comparison of duration of analgesia between Group C and Group I

Group I (14.23 ± 1.33 hours, p=0.00171)



- Graph 11: Comparison of the VAS pain scores at 6, 12, and 24 hours between Group C and Group I. Group I VAS score **6 hours : (0.87 ± 0.97, p = 0.00112), 12 hours (2.80 ± 0.61, p = 0.00133), 24 hours (6.63 ± 0.81, p = 0.00196).**

Duration of Analgesia

The duration of analgesia was significantly prolonged in Group C (23.23 ± 1.96 hours) compared to Group I (14.23 ± 1.33 hours, $p < 0.001$). This suggests that Clavipectoral Fascial Block combined with Superficial Cervical Plexus Block provides more sustained pain relief than the Interscalene Brachial Plexus Block combined with Superficial Cervical Plexus Block.

VAS Scores at 6, 12, and 24 Hours

- At **6 hours**, Group C had a VAS score of 0.00 ± 0.00, whereas Group I had a significantly higher VAS score (0.87 ± 0.97, $p < 0.001$). This indicates that patients in Group C **experienced prolonged analgesia and better pain relief**.

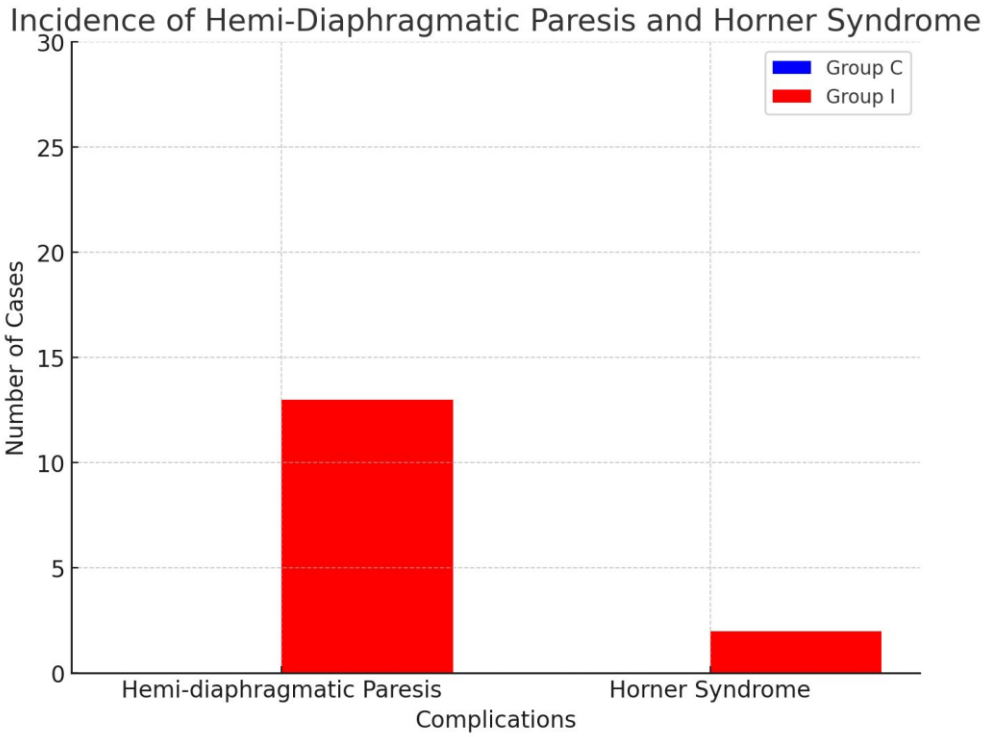
- At **12 hours**, Group C maintained lower pain levels (0.87 ± 1.01) compared to Group I (2.80 ± 0.61, $p < 0.001$).
- At **24 hours**, Group C continued to show significantly lower pain scores (2.93 ± 0.94) than Group I (6.63 ± 0.81, $p < 0.001$).

The **progressively increasing pain scores in Group I** suggest a shorter duration of effective analgesia, **whereas Group C maintained superior pain control over an extended period.**

SIDE EFFECTS AND COMPLICATIONS

Complication	Group C	Group I
Hemi diaphragmatic Paresis	0	13
Horner Syndrome	0	2

Table 8: Incidence of Hemi-diaphragmatic Paresis and Horner Syndrome



Graph 12: Incidence of Hemi-diaphragmatic Paresis and Horner Syndrome

There was **no incidence of hemi diaphragmatic paresis or Horner syndrome in Group C**. However, these complications were observed in Group I, consistent with the greater reduction in diaphragmatic excursion in that group. This suggests that the Interscalene Brachial Plexus Block is more likely to affect the phrenic nerve and sympathetic fibres, leading to these side effects.

STATISTICAL SIGNIFICANCE ANALYSIS

Parameter	Test Used	Statistic	p-value	Conclusion
Age	Mann-Whitney U test	386.0	0.347	No significant difference
Height (m)	t-test	-0.881	0.382	No significant difference
Weight (kg)	Mann-Whitney U test	723.0	**0.00005**	**Significant difference**
BMI	t-test	4.682	**0.00003**	**Significant difference**
Duration of Analgesia	Mann-Whitney U test	900.0	**0.000**	**Highly significant**
VAS Score (6 hrs)	Mann-Whitney U test	240.0	**0.00003**	**Significant difference**
VAS Score (12 hrs)	Mann-Whitney U test	58.5	**0.000**	**Highly significant**
VAS Score (24 hrs)	Mann-Whitney U test	0.0	**0.000**	**Highly significant**
Diaphragmatic Excursion (Baseline)	t-test	1.231	0.223	No significant difference
Diaphragmatic Excursion (30 min)	Mann-Whitney U test	899.5	**0.000**	**Highly significant**
Diaphragmatic Excursion % Decrease	Mann-Whitney U test	900.0	**0.000**	**Highly significant**

Table 9: Statistical Significance Analysis

DISCUSSION

"Pain, like pleasure, is passion of the soul, that is an emotion and not one of the senses" - PLATO and ARISTOLLE (ca 375 B.C)

Clavicle fractures are a prevalent type of shoulder injury among young males, constituting 2.6% - 4% of all fractures around the shoulder[1]. 69% -82 % of this occurs in the midshaft region because the junction of the outer third and middle third is the thinnest part of the clavicle bone, which is prone to fracture[4]. Moreover, this is the only area of clavicle bone that is not protected by muscles or ligamentous attachments. The clavicle has a more complex and variable nerve supply as compared to the other sites of the upper limb, making it difficult to choose an optimum regional anaesthetic technique for clavicle surgeries with optimum postoperative pain management[6]. Regional anaesthesia can be used, which meets the requirements for a satisfactory surgery, avoiding the complications of general anaesthesia and also good postoperative analgesia. The clavipectoral fascial plane block (CPB) is a newer regional anaesthetic technique introduced by Valdés-Vilches in 2017[5.]The clavipectoral fascial plane block has emerged as a safer and more effective alternative, particularly for patients with respiratory issues. Compared to interscalene brachial plexus blocks, which inhibit pain transmission at a more proximal level and are positioned near the neurovascular structures of the cervical spine, the clavipectoral fascial plane block offers a safety advantage[8]

The present study aimed to compare the efficacy of ultrasound-guided clavipectoral fascial plane block (CPB) with interscalene brachial plexus block (ISBPB) combined with superficial cervical plexus block (SCPB) for clavicle surgeries. The study evaluated multiple parameters, including the duration of analgesia, postoperative pain scores, respiratory function, block success rate, and overall clinical outcomes. The findings provide valuable insights into the advantages and limitations of CPB, demonstrating its potential as an effective regional anaesthesia

technique with superior analgesic benefits and fewer respiratory complications compared to ISBPB.

Effective postoperative pain management is crucial for achieving optimal recovery after clavicular surgeries to pain-free recovery phase , promotes a faster healing process and immediate mobility. An important consideration in regional anaesthesia for clavicular surgery is the extent of sensory coverage provided by the chosen block. In this study, block success rates in the sternoclavicular joint (SCJ), mid-clavicular (MC), and acromioclavicular joint (ACJ) regions were comparable between CPB and ISBPB combined with SCPB, with no statistically significant differences ($p > 0.05$). These results indicate that CPB can serve as an effective surgical anaesthetic technique. However, anatomical studies by Labandeyra et al. (2024) indicate that CPB predominantly anesthetizes the anterosuperior periosteum while offering limited diffusion to the posterior and inferior clavicular regions[4]. This suggests that while CPB provides excellent anterior pain relief, additional techniques may be required to achieve comprehensive coverage of the entire clavicle. Given this limitation, the combination of CPB with SCPB may be an optimal approach to ensure full sensory blockade of the clavicle while minimizing side effects. Further research is required to refine CPB's application by adjusting local anaesthetic volumes and injection techniques to achieve broader diffusion across the periosteal surface. Combining CPB with adjunctive nerve blocks targeting the posterior clavicle, such as the suprascapular or subclavian nerve block, may further enhance its efficacy in providing complete analgesia.

The current study reinforces the conclusions drawn by previous research on CPB. Kartik Sonawane et al. (2021) advocated for the use of CPB in clavicle surgeries due to its ability to provide motor-sparing and opioid-sparing anaesthesia, enhancing postoperative recovery. The present findings also support Valdés-Vilches' (2017) initial description of CPB as a safer and more effective alternative to ISBPB, especially

in patients who are at risk of respiratory complications[6]. The superior analgesic efficacy of CPB with SCPB without compromising respiratory function, highlights its potential for wider clinical application.

The findings of this study revealed CPB with SCPB provided a significantly longer duration of analgesia compared to ISBPB with SCPB . The mean duration of analgesia in Group C (CPB + SCPB) was 23.23 ± 1.96 hours, whereas in Group I (ISBPB + SCPB), it was significantly shorter at 14.23 ± 1.33 hours ($p < 0.001$). This prolonged analgesia resulted in superior pain control, as demonstrated by lower Visual Analog Scale (VAS) scores at 6, 12, and 24 hours postoperatively in the Group C ($p < 0.001$). These findings are consistent with the study by Xu et al. (2023), which demonstrated that SCPB combined with CPB provided longer-lasting analgesia and minimized the requirement for opioid administration compared to ISBPB[1]. Similarly, Zhuo et al. (2022) found that CPB combined with an intermediate cervical plexus block significantly improved postoperative pain relief while preserving upper limb motor function[2].

The clinical significance of these findings is profound, as extended postoperative analgesia directly contributes to reduced opioid consumption, minimizing associated side effects such as nausea, vomiting, respiratory depression, and prolonged hospital stays. This makes CPB with SCPB a valuable component of multimodal analgesia protocols, promoting enhanced recovery after surgery (ERAS) pathways for clavicular procedures. Additionally, better pain control enhances patient satisfaction, improves early rehabilitation, and reduces the risk of chronic post-surgical pain.

One of the most notable concerns with ISBPB is the high incidence of phrenic nerve involvement, leading to hemi diaphragmatic paresis, which can severely impact respiratory function. In this study, patients who received ISBPB exhibited a significant reduction in diaphragmatic excursion (50.21% ± 10.60%), while those who received CPB experienced only a minimal decrease (95.57% ± 4.25%), with the difference

being highly significant ($p < 0.001$). These findings align with the study by Zhuo et al. (2022), where a 0% incidence of hemi diaphragmatic paralysis was observed in the CPB group, in stark contrast to the 50% incidence recorded in the ISBPB group ($p < 0.001$)[2]. Additionally, Kukreja et al. (2020) highlighted that CPB offers effective analgesia while reducing the risk of respiratory complications associated with ISBPB[3]. From a clinical perspective, this advantage makes CPB with SCPB particularly suitable for patients with pre-existing pulmonary conditions such as chronic obstructive pulmonary disease (COPD) or restrictive lung disease, where avoiding phrenic nerve paralysis is critical. Additionally, CPB's with SCPB ability to preserve respiratory mechanics can facilitate early mobilization, improve pulmonary hygiene, and prevent postoperative pulmonary complications such as atelectasis or pneumonia. This has significant implications for surgical candidates in high-risk populations, including elderly patients and those undergoing clavicle surgery as part of trauma

This study builds on existing literature by providing quantitative evidence of CPB's with SCPB benefits compared to ISBPB with SCPB, particularly in terms of analgesic duration and preservation of diaphragmatic function. The correlation with previous research strengthens the argument for CPB with SCPB as a viable alternative, warranting further exploration in larger clinical trials.

The results of this study strongly suggest that CPB combined with SCPB is a highly effective alternative to ISBPB with SCPB for clavicle surgeries, particularly for patients who require prolonged pain relief without significant respiratory compromise. The improved analgesic profile and preservation of diaphragmatic function position CPB with SCPB as a preferred technique for patients with underlying respiratory diseases or those undergoing outpatient surgical procedures, where rapid recovery is essential.

However, CPB with SCPB does not provide complete sensory blockade of the entire clavicle, indicating the need for further refinements in technique. Future research

should explore modifications such as increasing the volume of local anaesthetic, optimizing injection techniques, or combining CPB with other regional blocks to improve its overall efficacy. Larger multicentre randomized controlled trials will be necessary to establish CPB with SCPB as a standard regional anaesthesia technique for clavicle surgeries, ensuring its safety and effectiveness across diverse patient populations. Additionally, evaluating patient satisfaction, opioid consumption, and functional outcomes in long-term follow-ups would provide further insight into CPB's role in enhanced recovery pathways.

The clavipectoral fascial plane block (CPB) with superficial cervical plexus block SCPB is an emerging regional anaesthesia technique with promising applications in upper limb and clavicular surgeries. Despite its potential benefits—such as reduced opioid consumption, improved postoperative analgesia, and fewer complications compared to conventional brachial plexus blocks—there remains a significant gap in comprehensive clinical evidence. My research will be pivotal in establishing CPB with SCPB as the new standard of care—ensuring patients no longer have to choose between effective pain relief and safety. I believe **CPB combined with SCPB is the Future of Patient-Centric Analgesia.**

CONCLUSION

The results indicate that the Clavipectoral Fascial Block combined with Superficial Cervical Plexus Block (Group C) had superior analgesic efficacy, with a significantly longer duration of pain relief and lower VAS scores at all time points compared to the Interscalene Brachial Plexus Block combined with Superficial Cervical Plexus Block (Group I). Additionally, Clavipectoral Fascial Block was associated with no incidence of hemidiaphragmatic paresis or Horner syndrome**,** making it a safer alternative for patients at risk of respiratory complications.

The results align with previous literature, reinforcing the advantages of CPB in preserving respiratory function while effectively managing postoperative pain. Despite its limitations in posterior clavicular sensory coverage, CPB remains a valuable addition to the range of regional anaesthesia techniques available for clavicle surgeries. Further research is warranted to optimize its application and to ensure comprehensive anaesthetic coverage for clavicular procedures. With its advantages in analgesia, respiratory preservation, and overall patient recovery, CPB has the potential to become an integral component of modern regional anaesthesia strategies for clavicle surgery.

So our suggestions are:

For prolonged analgesia, a Clavipectoral Fascial Block is preferable. **For patients at risk of respiratory complications**, the Clavipectoral Fascial Block is a safer alternative to the Interscalene Brachial Plexus Block. **As the motor function is preserved**, the Clavipectoral Fascial Block facilitates early mobilisation with effective analgesia. **Monitoring for hemi diaphragmatic paresis and Horner syndrome** is crucial when using the Interscalene Brachial Plexus Block to mitigate potential risks. **For complete analgesia but with motor blockade**, the Interscalene + Superficial Cervical Plexus Block is effective

LIMITATIONS OF THE STUDY

This study has several limitations.

1. Clavicle fractures are categorized into proximal, middle, and distal types based on location and further classified as nondisplaced, displaced, or comminuted. However, this study did not account for variations in fracture sites and types.
2. Since clavicle fractures are more prevalent among young and middle-aged adults, most participants had good physical function. As a result, the findings may not be fully applicable to elderly or critically ill patients, warranting further investigation.
3. The study revealed that most patients preferred not to remain awake during surgery. Even in the absence of pain, they reported feelings of anxiety and fear. Therefore, we recommend incorporating sedatives along with this during the clinical practice to enhance patient comfort.

SUMMARY

COMPARATIVE STUDY ON THE EFFICACY OF ULTRASOUND-GUIDED CLAVIPECTORAL FASCIAL PLANE BLOCK VS INTERSCALENE BRACHIAL PLEXUS BLOCK COMBINED WITH SUPERFICIAL CERVICAL PLEXUS BLOCK IN CLAVICLE SURGERIES- A RANDOMIZED CLINICAL TRIAL

This study was conducted in the Orthopaedic Operation Theatre Complex, B.L.D.E.U.'s Shri. B.M. Patil Medical College, Hospital and Research Centre, Vijayapura

This study aims to compare the Efficacy Of ultrasound-guided clavipectoral Fascial Plane Block And Interscalene Brachial Plexus block combined with Superficial Cervical Plexus Block Posted For Clavicle Surgery

The primary objectives were to assess the success rate of the block, Ultrasonographic assessment of hemi diaphragmatic paresis by using sigh test and modified Bromage scale to assess the upper limb function. The secondary objectives were Assessment of pain by using the VAS score, Time for first rescue analgesia and side effects, including local anaesthetic systemic toxicity and Horner syndrome.

A Total of 60 patients with unilateral clavicle fractures of ASA I & II, age between 18 to 55 who underwent elective internal fixation of clavicle fractures were included in this study. Randomisation was done by a computer-generated randomized table

Group C: Superficial Cervical Plexus Block and Clavipectoral Fascial Plane Block (S.C.P.B. and C.P.B.)
Group I: Superficial Cervical Plexus Block and Interscalene Brachial Plexus Block (S.C.P.B. and I.S.B.P.)

Group C (SCPB AND CPB): S.C.P.B. with 7ml of 0.5%Ropivacaine
C.P.B. with 20ml of 0.5% Ropivacaine

Group I (SCPB AND ISBP): S.C.P.B. with 7ml of 0.5%Ropivacaine
I.S.B.P. with 20ml of 0.5% Ropivacaine

The observations were analysed statistically, and the results are as follows:

- The two groups were comparable in terms of baseline demographic characteristics.
- The duration of analgesia was significantly prolonged in Group C compared to Group I
- VAS Scores (6, 12, and 24 hrs) are significantly lower in Group C, meaning better pain relief.
- Diaphragmatic Excursion at 30 min and its % decrease are significantly different, suggesting a different impact of the intervention on respiratory mechanics.
- Both blocks provided excellent sensory blockade, with no major differences in their effectiveness across clavicular regions
- The group I shows an increase in MBS score, suggesting a significant motor block after 30 minutes

The Clavipectoral Fascial Block combined with Superficial Cervical Plexus Block (Group C) had superior analgesic efficacy, with a significantly longer duration of pain relief as compared to the Interscalene Brachial Plexus Block combined with Superficial Cervical Plexus Block (Group I). Additionally, Clavipectoral Fascial Block combined with Superficial Cervical Plexus Block was associated with no incidence of hemi diaphragmatic paresis or Horner syndrome**.**

The major limitation of this study is that it does not consider the fracture pattern and anatomical location of clavicle fracture. Most of the patients in this study group are younger candidates with good health, so these findings may not be fully applicable to elderly or critically ill patients, warranting further investigation.

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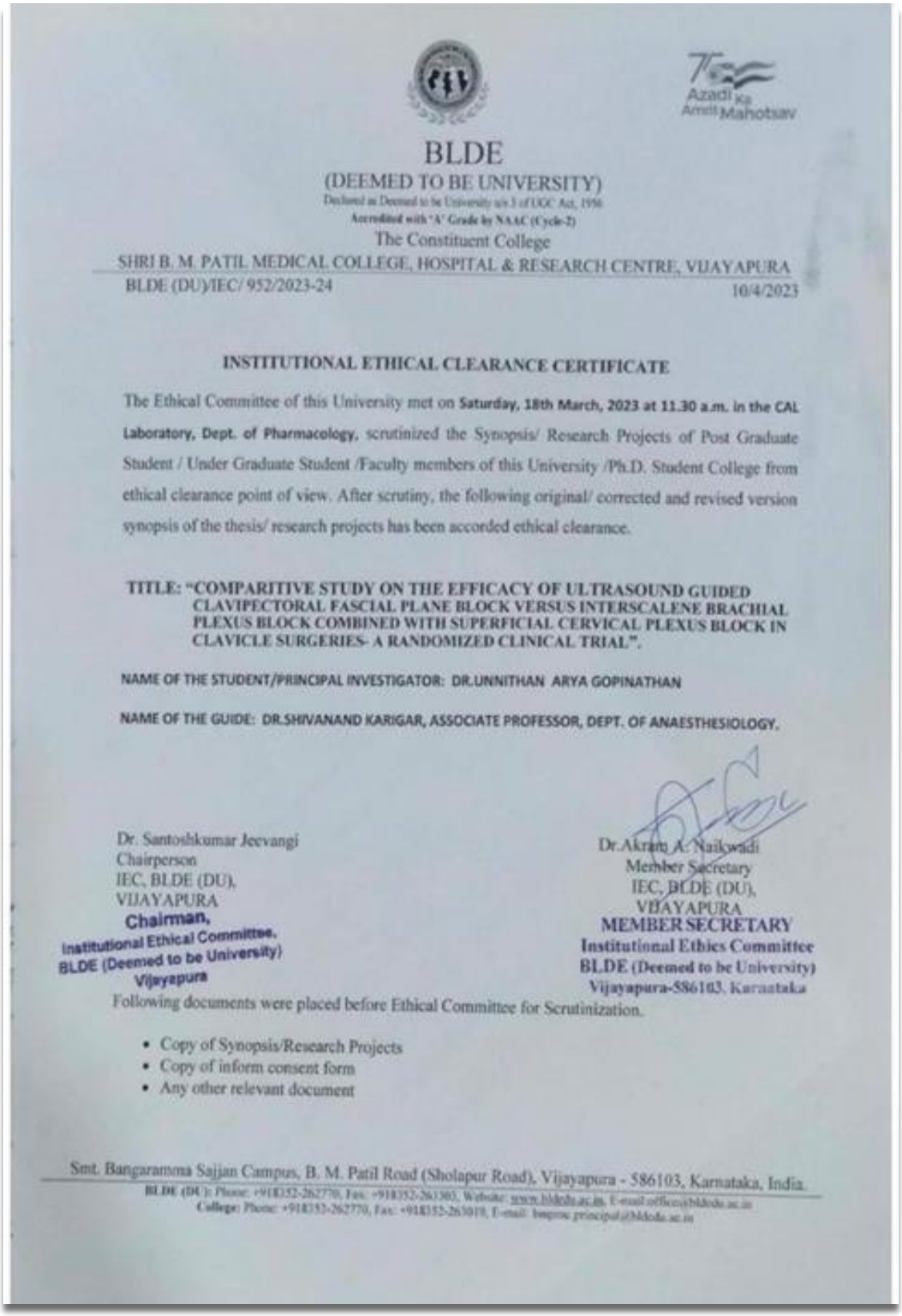
ANNEXURE I

ETHICAL COMMITTEE APPROVAL LETTER



BLDE
(DEEMED TO BE UNIVERSITY)
Declared as Deemed to be University u/s 3 of UGC Act, 1956
Accredited with 'A' Grade by NAAC (Cycle-2)
The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

BLDE (DU)/IEC/ 952/2023-24 10/4/2023

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on **Saturday, 18th March, 2023 at 11.30 a.m. in the CAL Laboratory, Dept. of Pharmacology,** scrutinized the Synopsis/ Research Projects of Post Graduate Student / Under Graduate Student /Faculty members of this University /Ph.D. Student College from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "COMPARITIVE STUDY ON THE EFFICACY OF ULTRASOUND GUIDED CLAVIPECTORAL FASCIAL PLANE BLOCK VERSUS INTERSCALENE BRACHIAL PLEXUS BLOCK COMBINED WITH SUPERFICIAL CERVICAL PLEXUS BLOCK IN CLAVICLE SURGERIES- A RANDOMIZED CLINICAL TRIAL".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: DR.UNNITHAN ARYA GOPINATHAN

NAME OF THE GUIDE: DR.SHIVANAND KARIGAR, ASSOCIATE PROFESSOR, DEPT. OF ANAESTHESIOLOGY.

Dr. Santoshkumar Jeevangi
Chairperson
IEC, BLDE (DU),
VIJAYAPURA
Chairman,
Institutional Ethical Committee,
BLDE (Deemed to be University)
Vijayapura

Dr.Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA
MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Vijayapura-586103, Karnataka

Following documents were placed before Ethical Committee for Scrutinization.

- Copy of Synopsis/Research Projects
- Copy of inform consent form
- Any other relevant document

Smt. Bangaramma Sajjan Campus, B. M. Patil Road (Sholapur Road), Vijayapura - 586103, Karnataka, India.
BLDE (DU): Phone: +918352-262770, Fax: +918352-263303, Website: www.bldedu.ac.in, E-mail:office@bldedu.ac.in
College: Phone: +918352-262770, Fax: +918352-263019, E-mail: bmpmc.principal@bldedu.ac.in

ANNEXURE II
PLAGIARISM CERTIFICATE SCREENSHOT

Arya Unnithan

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ANNEXURE III

PATIENT INFORMED CONSENT FORM

B.L.D.E (DU) S.H.R.I. B.M.PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPURA - 586103, KARNATAKA

TITLE OF THE PROJECT: COMPARATIVE STUDY ON THE EFFICACY OF ULTRASOUND GUIDED CLAVIPECTORAL FASCIAL PLANE BLOCK VS INTERSCALENE BRACHIAL PLEXUS BLOCK COMBINED WITH SUPERFICIAL CERVICAL PLEXUS BLOCK IN CLAVICLE SURGERIES- A RANDOMIZED CLINICAL TRIAL

PRINCIPAL INVESTIGATOR: Dr. UNNITHAN ARYA GOPINATHAN
Department of Anaesthesiology
BLDE (Deemed to be University)
Shri B M Patil Medical College hospital &
Research Center,Vijayapura
E-mail: dr.aryaunnithan@gmail.com

PG GUIDE : DR. SHIVANAND KARIGAR, M.D ANAESTHESIOLOGY
Associate Professor
Department of Anaesthesiology
BLDE (Deemed to be University)
Shri B M Patil Medical College hospital &
Research Center,Vijayapura

PURPOSE OF RESEARCH:

I have been informed that this study compares the efficacy and safety of Superficial cervical plexus block combined with clavipectoral fascial plane block or interscalene brachial plexus block in clavicular surgeries under ultrasound guidance.

I have been explained the reason for doing this study and for me/my ward to get selected as a subject for this study. I have also been given the free choice of either being included or not in the study.

PROCEDURE:

I understand that I will be participating in the study to compare Superficial cervical plexus block combined with clavipectoral fascial plane block or interscalene brachial plexus block in clavicular surgeries under ultrasound guidance

RISKS AND DISCOMFORTS:

I understand that my ward may experience some discomfort during the
the procedure, and I know necessary measures will be taken to reduce them.

BENEFITS:

I understand that my ward participating in this study will help find the efficacy and safety of the block by comparing Superficial cervical plexus block combined with clavipectoral fascial plane block or interscalene brachial plexus block in clavicular surgeries under ultrasound guidance.

CONFIDENTIALITY:

I understand that medical information produced by this study will become a part of this hospital's records and will be subjected to the confidentiality and privacy regulation of this hospital. Suppose the data are used for publication in the medical literature or teaching purposes. No names will be used in that case, and other identities, such as photographs and audio and video tapes, will be used only with my special written permission. I understand that I may see the picture and videotapes and hear audiotapes before giving consent.

REQUEST FOR MORE INFORMATION:

I may ask more questions about the study at any time. Dr. UNNITHAN ARYA GOPINATHAN will be available to answer my questions or concerns. I will be informed of any significant new findings discovered during this study, which might influence my continued participation. If, during this study or later, I wish to discuss my involvement in or concerns regarding this study with a person not directly involved, I am aware that the hospital's social worker is available to talk with me and that a copy of this consent form will be given to me for a keep for careful reading.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:

I understand that my participation is voluntary. I may refuse to participate or withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital.
I also understand that Dr. UNNITHAN ARYA GOPINATHAN will terminate my participation in this study at any time after she has explained the reason for doing so and has helped arrange for my continued care by my physician or therapist if this is appropriate.

INJURY STATEMENT:

I understand that in the unlikely event of injury to me/my ward resulting directly from my participation in this study, such damage will be reported promptly. Medical treatment would be available to me, but no further compensation will be provided.
I understand that I am not waiving my legal rights by my agreement to participate in this study.

I have explained to_____ the purpose of this research, the procedure required and the possible risk and benefits, to the best of my ability in the patient's own language.

Dr. UNNITHAN ARYA GOPINATHAN
DATE (investigator)

PATIENT/PARENT SIGNATURE Witnes

STUDY SUBJECT CONSENT STATEMENT:

I confirm that Dr. UNNITHAN ARYA GOPINATHAN has explained to me the purpose of this research, the study procedure I will undergo, and the possible discomforts and benefits I may experience in my own language.
I have been explained all the above in detail in my language, and I understand the same.
Therefore, I agree to consent to participate as a subject in this research project.

_____ _____
(Participant) (Date)

_____ _____
(Witness to above signature) (Date)

B.L.D.E (DEEMED TO BE UNIVERSITY)

ಶ್ರೀ ಬಿ.ಎಂ.ಪಟ್ಟೀಲ್ ಮೆಡಿಕಲ್ ಕಾಲೇಜು, ಆಸ್ಪತ್ರೆ ಮತ್ತು ಸಂಶೋಧನಾ ಕೇಂದ್ರ, ವಿಜಯಪುರ-586103

ಪ್ರಬಂಧ/ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ಮಾಹಿತಿ ಪಡೆದ ಸಮ್ಮತಿ

ನಾನು, ಕೆಳಗಿನವರು_____ ಸಹಿಯಿಟ್ಟವರು, ಮಗ/ಮಗಳು/ಪತ್ನಿಯ _____ ವಯಸ್ಸು _____ವರ್ಷಗಳು, ಸಾಮಾನ್ಯವಾಗಿ ನಿವಾಸಿಸುವ ಸ್ಥಳದ ಹೆಸರು_____, ಇಲ್ಲಿ ಹೇಳಿದ್ದೇನೆ/ಘೋಷಿಸುತ್ತೇನೆ ಡಾಕ್ಟರ್ ಹೆಸರು_____ ಅವರು ಆಸ್ಪತ್ರೆ ಹೆಸರು_____ ಅವರು ನನ್ನನ್ನು ಪೂರ್ಣವಾಗಿ ಪರೀಕ್ಷಿಸಿದರು ದಿನಾಂಕದಲ್ಲಿ_____ ಸ್ಥಳ ಹೆಸರು_____ ಮತ್ತು ನನಗೆ ನನ್ನ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಲಾಗಿದೆ ನಾನು ಒಂದು ರೋಗ (ಸ್ಥಿತಿ) ಅನುಭವಿಸುತ್ತಿದ್ದೇನೆ. ಮುಂದುವರಿದು ಡಾಕ್ಟರ್ ನನಗೆ ತಿಳಿಸಿದ್ದಾರೆ ಅವರು ಒಂದು ಪದ್ಧತಿ/ಸಂಶೋಧನೆ ನಡೆಸುತ್ತಿದ್ದಾರೆ ಶೀರ್ಷಿಕೆಯುಳ್ಳ_____ ಡಾಕ್ಟರ್_____ ಮಾರ್ಗದರ್ಶನದಲ್ಲಿ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯನ್ನು ಕೇಳಿದ್ದಾರೆ ಅಧ್ಯಯನದಲ್ಲಿ.
ಡಾಕ್ಟರ್ ನನಗೆ ಇದನ್ನು ಕೂಡಾ ತಿಳಿಸಿದ್ದಾರೆ ಈ ಕ್ರಮದ ನಡೆವಲ್ಲಿ ಪ್ರತಿಕೂಲ ಫಲಿತಾಂಶಗಳನ್ನು ಎದುರಿಸಬಹುದು. ಮೇಲೆ ಹೇಳಿದ ಪ್ರಕಟಣೆಗಳಲ್ಲಿ, ಅಧಿಕಾಂಶವು ಚಿಕಿತ್ಸಿಸಬಹುದಾದರೂ ಅದನ್ನು ನಿರೀಕ್ಷಿಸಲಾಗುತ್ತಿಲ್ಲ ಆದ್ದರಿಂದ ನನ್ನ ಸ್ಥಿತಿಯ ಹಿರಿದಾಗುವ ಅವಕಾಶವಿದೆ ಮತ್ತು ಅಪರೂಪದ ಸಂದರ್ಭಗಳಲ್ಲಿ ಅದು ಮರಣಕಾರಕವಾಗಿ ಪರಿಣಮಿಸಬಹುದು ಹೊಂದಿದ ರೋಗನಿರ್ಧಾರ ಮತ್ತು ಯಥಾಶಕ್ತಿ ಚಿಕಿತ್ಸೆ ಮಾಡಲು ಹೊಂದಿದರೂ. ಮುಂದುವರಿದು ಡಾಕ್ಟರ್ ನನಗೆ ತಿಳಿಸಿದ್ದಾರೆ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆ ಈ ಅಧ್ಯಯನದ ಫಲಿತಾಂಶಗಳ ಮೌಲ್ಯಮಾಪನದಲ್ಲಿ ಸಹಾಯಕವಾಗುತತ್ತದೆ ಇತರ

ಸಮಾನ ಪ್ರಕರಣಗಳ ಚಿಕಿತ್ಸೆಗೆ ಉಪಯುಕ್ತ ಉಲ್ಲೇಖವಾಗಿದೆ, ಮತ್ತು ನಾನು ಅನುಭವಿಸುವ ರೋಗದಿಂದ ವಿಮುಕ್ತಿ ಅಥವಾ ಗುಣಮುಖಗೊಳ್ಳುವಲ್ಲಿ ನನಗೆ ಪ್ರಯೋಜನವಾಗಬಹುದು.
ಡಾಕ್ಟರ್ ನನಗೆ ಇದನ್ನು ಕೂಡಾ ತಿಳಿಸಿದ್ದಾರೆ ನನ್ನಿಂದ ನೀಡಿದ ಮಾಹಿತಿ, ಮಾಡಿದ ಪರಿಶೀಲನೆಗಳು / ಫೋಟೋಗ್ರಾಫ್‌ಗಳು / ವೀಡಿಯೋ ಗ್ರಾಫ್‌ಗಳು ನನ್ನ ಮೇಲೆ ತೆಗೆದುಕೊಳ್ಳಲಾಗುವ ಅನ್ವೇಷಕರು ರಹಸ್ಯವಾಗಿ ಇಡುವರು ಮತ್ತು ನಾನು ಅಥವಾ ನನಗೆ ಕಾನೂನು ದೃಷ್ಟಿಯಲ್ಲಿ ಸಂಬಂಧಿತrannu ಹೊರತುಪಡಿಸಿ ಇತರ ವ್ಯಕ್ತಿಯಿಂದ ಮೌಲ್ಯಮಾಪನ ಮಾಡಲಾಗುವುದಿಲ್ಲ. ಡಾಕ್ಟರ್ ನನಗೆ ತಿಳಿಸಿದ್ದಾರೆ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆ ಶುದ್ಧವಾಗಿ ಸ್ವೇಚ್ಛಾಯಿತ, ನನ್ನಿಂದ ನೀಡಿದ ಮಾಹಿತಿಯ ಆಧಾರದ ಮೇಲೆ, ಚಿಕಿತ್ಸೆ / ಅಧ್ಯಯನದ ಸಂಬಂಧದಲ್ಲಿ ರೋಗನಿರ್ಧಾರ, ಚಿಕಿತ್ಸೆಯ ವಿಧಾನ, ಚಿಕಿತ್ಸೆಯ ಫಲಿತಾಂಶ ಅಥವ ಆ ಭವಿಷ್ಯದ ಪ್ರವೃತ್ತಿಗಳು ಬಗ್ಗೆ ಯಾವುದೇ ಸ್ಪಷ್ಟತೆ ಕೇಳಬಹುದು. ಅದೇ ಸಮಯದಲ್ಲಿ ನನಗೆ ತಿಳಿಸಲಾಗಿದೆ ನಾನು ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಈ ಅಧ್ಯಯನದಲ್ಲಿ ನನ್ನ ಪಾಲ್ಗೊಳ್ಳುವಿಕೆಯನ್ನು ನಿಲ್ಲಿಸಬಹುದು ನಾನು ಬಯಸಿದರೆ ಅಥವಾ ಅನ್ವೇಷಕರು ಅಧ್ಯಯನದಿಂದ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ನನ್ನನ್ನು ನಿಲ್ಲಿಸಬಹುದು.
ಪ್ರಬಂಧ ಅಥವಾ ಸಂಶೋಧನೆಯ ಸ್ವಭಾವ, ಮಾಡಿದ ರೋಗನಿರ್ಧಾರ ಮತ್ತು ಚಿಕಿತ್ಸೆಯ ವಿಧಾನವನ್ನು ಅರ್ಥಮಾಡಿಕೊಂಡು, ನಾನು ಕೆಳಗಿನ ಶ್ರೀ / ಶ್ರೀಮತಿ_____ ನನ್ನ ಪೂರ್ಣವಾದ ಪ್ರಜ್ಞೆಯ ಸ್ಥಿತಿಯಲ್ಲಿ ಹೇಳಿದ ಸಂಶೋಧನೆ / ಪ್ರಬಂಧದಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳಲು ಒಪ್ಪುತ್ತೇನೆ.

ರೋಗಿಯ ಸಹಿ
ಡಾಕ್ಟರನ ಸಹಿ

ಸಾಕ್ಷಿಗಳು
1)
2)

ANNEXURE IV

PROFORMA

PROFORMA

STUDY: COMPARITIVE STUDY ON THE EFFICACY OF ULTRASOUND-GUIDED CLAVIPECTORAL FASCIAL PLANE BLOCK VS INTERSCALENE BRACHIAL PLEXUS BLOCK COMBINED WITH SUPERFICIAL CERVICAL PLEXUS BLOCK IN CLAVICLE SURGERIES - A RANDOMIZED CLINICAL TRIAL

Patient Details

Name Age Sex Height
Weight
Ward Group allotted by randomization: C AND I

Diagnosis
Surgical Procedure

Past History

Mallampatti Grade:

Vital parameters:
Pulse Blood Pressure Respiratory Rate Temperature

Systemic Examination
CVS
RS
CNS
PA

Investigations

Haemoglobin: T.L.C.: Platelet count:
Urine routine: H.I.V.: HbsAg:
A.S.A. grade

Parameters:

TABLE 1- PATIENT CHARACTERISTICS

PARAMETERS	GROUP C	GROUP I
Sex (Male/Female)		
Age (years)		
Weight(kg)		
ASA I / II		

TABLE 2 – SUCCESS OF BLOCK AND MODIFIED BROMAGE SCALE

PARAMETERS	GROUP C	GROUP I
Sternoclavicular joint block		
Mid-clavicle Block		
Acromioclavicular joint block		
MBS		

TABLE 3- DURATION OF ANALGESIA, VISUAL ANALOG SCALE SCORE

	GROUP C	GROUP I
Duration of analgesia		
VAS Score after surgery		
6 hrs		
12 hrs		
24 hrs		

TABLE 4- HEMIDIAPHRAGMATIC EXCURSION USING SIGH TEST

	GROUP C	GROUP I

Incidence of hemi diaphragmatic paresis, n (%)		
DIAPHRAGMATIC EXCURSIONS		
M-mode sigh: baseline, cm		
M-mode sigh: 30 min, cm		
Decrease in the diaphragmatic excursion, (%)		

TABLE 5 - SIDE EFFECTS

	GROUP C	GROUP I
Local Anaesthetic Systemic Toxicity		
Horner Syndrome		

ANNEXURE V

BIO-DATA

BIODATA OF GUIDE

Name: DR. SHIVANAND L KARIGAR
Present Designation: Professor
Department: Department of ANESTHESIOLOGY
Date of birth: 20/07/1982
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Publications: 30 (Research Publications and case reports)
Research Projects: 1 Completed and 4 Ongoing Research Project

BIODATA OF INVESTIGATOR:

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ANNEXURE VI

MASTERCHART

SL NO	UHID NUMBER	PATIENT NAME	AGE	SEX	GROUP C/I	HEIGHT (M)	WEIGHT(KG)	BMI	ASA I / II	SUCESS OF BLOCK SCJ	MID CLAVICLE	ACJ	MBS	DURATION OF ANALGESIA	VAS SCORE AFTER SURGERY 6 HRS	12 HRS	24 HRS	HEMIDIAPHRAMATIC PARESIS YES/NO	DIAPHRAGMATIC EXCURSIONS BASE LINE (cm)	30 MIN (CM)	% DECREASE	SIDE EFFECTS LAST	HORNER SYNDROM
1	56776	Muhammad Ashfak	46	M	I	1.69	62	21.7079	I	3	3	3	1	12	0	3	6	Y	5.6	3.2	57.14285714	N	N
2	55653	Sanju Nayak	21	M	I	1.66	66	23.9512	II	2	3	3	1	14	2	3	6	N	6	2.1	35	N	N
3	49662	Sanjiv	20	M	I	1.75	72	23.5102	I	3	3	2	1	13	0	2	7	Y	6.1	2.6	42.62295082	N	N
4	63086	Dinesh	29	M	I	1.69	66	23.1084	II	2	3	3	1	14	2	2	6	Y	5.9	2.8	47.45762712	N	N
5	60617	Chandrashekar	35	M	I	1.69	69	24.1588	I	3	3	3	1	15	0	3	6	Y	5.5	3.4	61.81818182	N	N
6	228	Rachana	38	F	I	1.73	70	23.3887	II	3	3	3	1	13	2	3	7	N	6.5	3.3	50.76923077	N	N
7	79959	Girimalleshwarappa	22	M	I	1.7	68	23.5294	I	3	2	2	1	15	2	2	8	N	6.3	3.1	49.20634921	N	N
8	84476	Muhammad Rafiq	38	F	I	1.72	66	22.3094	II	2	3	3	1	14	0	2	7	N	5.8	2.9	50	N	N
9	102767	Akash	40	M	I	1.66	67	24.3141	II	3	3	2	1	14	2	2	6	Y	6.2	2.4	38.70967742	N	Y
10	81676	Savita	33	F	I	1.65	64	23.5078	II	3	3	3	1	15	0	3	8	Y	5.4	2.1	38.88888889	N	N
11	179686	Lakshmi	48	F	I	1.65	88	32.3232	II	2	3	3	1	17	1	4	7	N	6.4	2.7	42.1875	N	N
12	239630	Akash Gowda	35	M	I	1.69	69	24.1588	I	3	2	3	1	15	0	3	6	Y	5.5	3.4	61.81818182	N	N
13	264878	Laxman	46	M	I	1.69	69	24.1588	I	3	3	3	1	15	0	3	6	Y	5.5	3.4	61.81818182	N	N
14	257672	Nadiya Ameen sab	43	F	I	1.7	70	24.2215	II	3	3	3	1	13	2	3	7	N	6.5	3.3	50.76923077	N	N
15	335023	Sunil	21	M	I	1.72	66	22.3094	II	2	3	3	1	14	2	3	6	N	6	2.4	40	N	N
16	228116	Devi Vitthal	28	F	I	1.7	66	22.8374	II	2	3	3	1	14	0	2	7	N	5.8	2.7	46.55172414	N	N
17	348906	Shankarayya	33	M	I	1.62	66	25.1486	II	2	3	3	1	14	2	3	6	N	6	2.1	35	N	N
18	363451	Prashant	35	M	I	1.63	69	25.9701	I	3	3	3	1	15	0	3	6	Y	5.5	3.4	61.81818182	N	N
19	387878	Sunita Sahebgowda	40	F	I	1.75	66	21.551	II	2	3	3	1	14	0	2	7	N	5.8	2.9	50	N	N
20	60617	Mani	35	M	I	1.78	69	21.7776	I	3	3	3	1	15	0	3	6	Y	5.5	3.4	61.81818182	N	N
21	12751	Suresh	56	M	I	1.73	95	31.7418	II	3	2	3	1	10	0	4	8	N	6.5	4.9	75.38461538	N	Y
22	265668	Rekha Mahantesh	21	F	I	1.69	68	23.8087	I	3	3	2	1	15	2	2	8	N	6.3	3.1	49.20634921	N	N
23	44857	Sharan	21	M	I	1.68	66	23.3844	II	2	3	3	1	14	2	3	6	N	6	2.1	35	N	N
24	34160	Namrata Suhas	48	F	I	1.7	66	22.8374	II	2	3	3	1	14	0	2	7	N	5.8	2.9	50	N	N
25	211676	Sangamesh	35	M	I	1.65	88	32.3232	II	2	3	3	1	17	1	4	7	N	6.4	2.7	42.1875	N	N
26	82386	Prashanth	35	M	I	1.63	69	25.9701	I	3	3	3	1	15	0	3	6	Y	5.5	3.4	61.81818182	N	N
27	177323	Kallappa	38	M	I	1.63	69	25.9701	I	3	3	3	1	15	0	3	6	Y	5.5	3.4	61.81818182	N	N
28	238329	Ashwini Dilip	41	F	I	1.7	70	24.2215	II	3	3	3	1	13	2	3	7	N	6.5	3.3	50.76923077	N	N
29	196475	Gurulingappa	35	M	I	1.61	69	26.6193	I	3	3	3	1	15	0	3	6	Y	5.5	3.4	61.81818182	N	N
30	196447	Dundappa	21	M	I	1.62	66	25.1486	II	2	3	3	1	14	2	3	6	N	6	2.1	35	N	N
31	161910	Ningamma	20	M	C	1.66	67	24.3141	I	3	3	3	4	22	0	0	4	N	5.9	5.2	88.13559322	N	N
32	218819	Yashoda Siddaram	29	F	C	1.63	70	26.3465	II	3	3	3	4	20	0	0	2	N	5.8	5.4	93.10344828	N	N
33	249528	Sadashiv	30	M	C	1.59	65	25.711	I	3	3	3	4	25	0	0	4	N	6.4	5.9	92.1875	N	N
34	270725	Bhirappa	33	M	C	1.7	78	26.9896	II	2	3	3	4	23	0	2	2	N	6.8	6.4	94.11764706	N	N
35	280687	Shreeram	24	M	C	1.68	72	25.5102	I	3	3	3	4	25	0	2	2	N	6.2	5.9	95.16129032	N	N
36	289252	Sunita Rajesh	43	F	C	1.69	72	25.2092	II	3	3	3	4	26	0	0	4	N	6.1	5.9	96.72131148	N	N
37	5013	Ramanna	28	M	C	1.71	79	27.0169	I	3	3	3	4	22	0	2	4	N	5.2	4.9	94.23076923	N	N
38	256541	Supriya	40	F	C	1.56	65	26.7094	I	3	3	3	4	20	0	2	2	N	5.4	5.1	94.44444444	N	N
39	28634	Madagona	29	M	C	1.61	68	26.2336	I	3	3	3	4	22	0	0	3	N	5.8	5.2	89.65517241	N	N
40	213793	Mubarak Afiya	50	F	C	1.69	77	26.9598	II	2	3	2	4	23	0	0	2	N	6.2	6	96.77419355	N	N
41	220919	Bandagiub	55	M	C	1.71	80	27.3588	II	3	3	3	4	24	0	2	4	N	5.8	5.1	87.93103448	N	N
42	52029	Aruna	51	F	C	1.73	85	28.4005	I	3	3	3	4	22	0	0	2	N	5.5	5.2	94.54545455	N	N
43	3426	Shantaram	29	M	C	1.63	74	27.852	I	2	3	3	4	22	0	0	4	N	5.6	5.1	91.07142857	N	N
44	2426	Jayashree	33	F	C	1.62	75	28.578	I	3	3	3	4	23	0	0	2	N	5.8	5.7	98.27586207	N	N
45	8411	Vinod	31	M	C	1.67	78	27.968	I	2	3	3	4	21	0	2	3	N	5.9	5.2	88.13559322	N	N
46	86352	Sanjay	26	M	C	1.64	78	29.0006	I	3	3	2	4	24	0	2	4	N	5.9	6.2	105.0847458	N	N
47	2378	Sunil	31	M	C	1.56	69	28.3531	I	3	3	3	4	25	0	0	2	N	6.8	6.7	98.52941176	N	N
48	11011	Sunanda	22	F	C	1.69	73	25.5593	I	2	3	3	4	25	0	2	2	N	6.6	6.8	103.030303	N	N
49	10539	Lekha Chidanand	20	F	C	1.71	83	28.3848	I	3	3	3	4	26	0	0	4	N	6.3	5.9	93.65079365	N	N
50	12165	Waseem	19	M	C	1.69	80	28.0102	I	3	3	3	4	22	0	0	4	N	6.4	6.6	103.125	N	N
51	18251	Shashank	53	M	C	1.65	79	29.0174	II	3	3	3	4	24	0	0	2	N	5.9	5.8	98.30508475	N	N
52	426989	Sowmya Shankar	44	F	C	1.66	79	28.6689	II	3	3	3	4	22	0	2	3	N	6.1	6	98.36065574	N	N
53	81676	Savita	48	F	C	1.69	81	28.3604	II	2	3	3	4	20	0	0	4	N	6.3	6.1	96.82539683	N	N
54	127490	Vijaykumar	39	M	C	1.64	79	29.3724	II	3	3	3	4	23	0	2	2	N	6.2	6	96.77419355	N	N
55	19164	Shabhu	36	M	C	1.75	85	27.7551	II	3	3	3	4	24	0	2	4	N	6.6	6.3	95.45454545	N	N
56	15022	Saina	25	F	C	1.68	78	27.6361	I	2	3	3	4	24	0	0	2	N	6.5	6.1	93.84615385	N	N
57	12337	Laxmi Santosh	22	F	C	1.69	75	26.2596	I	3	3	3	4	20	0	0	3	N	5.9	5.9	100	N	N
58	426989	Shankar	20	M	C	1.71	79	27.0169	I	3	3	3	4	26	0	2	4	N	5.7	5.5	96.49122807	N	N
59	12865	Ravi	32	M	C	1.76	83	26.7949	I	3	3	3	4	26	0	2	2	N	5.7	5.4	94.73684211	N	N
60	127490	Vijaykumar	23	M	C	1.78	90	28.4055	I	3	3	3	4	26	0	0	2	N	6.2	6.1	98.38709677	N	N