



Research Article

Comparative Study of Ultrasound-Guided Versus Landmark-Guided Suprascapular Nerve Block in Adhesive Capsulitis of the Shoulder

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ABSTRACT

Background : Adhesive capsulitis, commonly referred to as "frozen shoulder," is a debilitating condition marked by pain and progressive stiffness in the shoulder joint, frequently associated with diabetes, thyroid disease, and trauma. Suprascapular nerve block (SSNB) offers a potential treatment to reduce pain and enhance joint mobility.

Aim : This study compares the effectiveness of ultrasound-guided SSNB and landmark-guided SSNB in improving shoulder pain and function in patients with adhesive capsulitis.

Method : Conducted at the Department of Orthopaedics at ESI-PGIMSR, New Delhi, from December 2020 to April 2022, this randomized controlled trial evaluated pain reduction and functional improvement using Visual Analogue Scale (VAS) and Shoulder Pain and Disability Index (SPADI) scores across 70 patients.

Result : The findings indicate that both approaches effectively reduce pain and improve function, with no statistically significant difference between the two methods at 12-week follow-up.

Conclusion : The study concludes that both ultrasound- and landmark-guided SSNB are effective, safe treatments for adhesive capsulitis, though ultrasound-guided SSNB offers the benefit of real-time visualization.

Keywords: Colorectal carcinoma, Adhesive capsulitis, ultrasound-guided SSNB.

INTRODUCTION

Adhesive capsulitis, or frozen shoulder, is a chronic inflammatory condition characterized by shoulder pain and restricted mobility due to fibrosis and contractures around the glenohumeral joint. Affecting approximately 2% of the general population, adhesive capsulitis peaks in individuals aged 40 to 60 years, with increased prevalence among women and patients with metabolic or autoimmune conditions, particularly diabetes mellitus and thyroid disorders^[1,2]. The condition progresses through three stages: the painful "freezing" stage, the "frozen" stage where stiffness predominates, and the "thawing" stage, where gradual improvement in movement occurs. Pathologically, the condition is defined by capsular thickening, chronic inflammation, and collagen fibrosis, often impacting the rotator interval, coracohumeral ligament, and anterior capsule^[3].

Traditionally, adhesive capsulitis has been managed through a combination of pharmacologic therapy, physical therapy, and intra-articular corticosteroid injections, which alleviate pain but may not fully restore range of motion (ROM) due to patient discomfort during stretching. The suprascapular nerve block (SSNB) is an emerging intervention to relieve pain and support physical therapy by numbing 70% of the sensory innervation in the shoulder joint, thereby facilitating improved ROM without the associated discomfort of physical therapy alone^[4,5].

First described by Wertheim and Rovenstien in 1941, the SSNB was initially a landmark-guided procedure^[6]. However, advancements in imaging have enabled ultrasound-guided techniques, which provide real-time visualization of the suprascapular nerve and surrounding structures. Ultrasound guidance increases the accuracy of the block, allowing precise infiltration around the nerve and enhancing the efficacy and safety of SSNB compared to the landmark-guided

approach^[7,8]. This study examines the comparative effectiveness of ultrasound- and landmark-guided SSNB in pain reduction and functional improvement among patients with adhesive capsulitis.

METHOD

Study Design and Participants

This prospective, randomized controlled study was conducted from December 2020 to April 2022 at ESI-PGIMS, New Delhi, following ethical clearance. Seventy patients diagnosed with adhesive capsulitis were recruited based on specific inclusion and exclusion criteria. Patients aged 40–70 years with a history of shoulder pain and restricted movement for at least 12 weeks, unresponsive to conservative treatment, were included. Exclusion criteria encompassed secondary causes of shoulder pain (e.g., fractures, acute trauma), hypersensitivity to bupivacaine or methylprednisolone, pregnancy, and systemic comorbidities like uncontrolled diabetes or thyroid disease.

Randomization and Groups

Patients were randomized into two groups using block randomization. Group A (n=35) received SSNB under ultrasound guidance, while Group B (n=35) underwent SSNB via a landmark-guided technique.

Procedure

Ultrasound-Guided SSNB (Group A): Patients were seated, with the ipsilateral arm across the chest. The ultrasound probe was placed parallel to the scapular spine, enabling visualization of the suprascapular nerve in the suprascapular fossa. After administering local anesthesia, a needle was inserted in the longitudinal axis of the ultrasound beam toward the nerve. A solution of 0.5% bupivacaine (10 ml) with 40 mg methylprednisolone was then injected around the nerve.

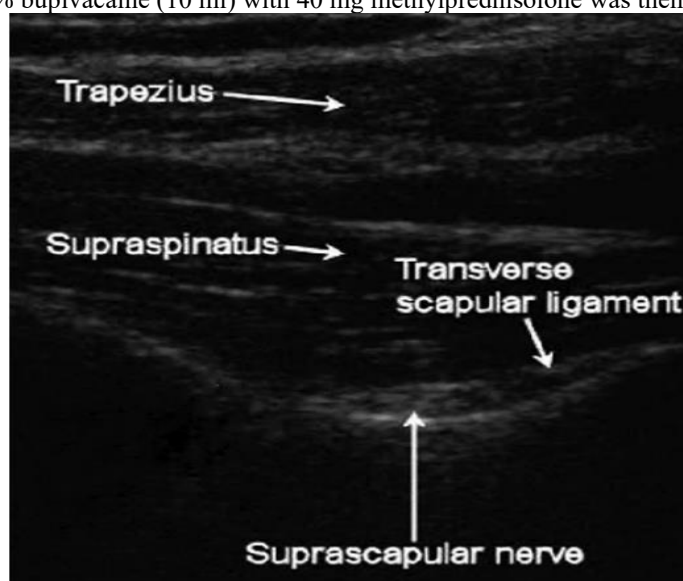


Figure 1 : Ultrasound visualization of suprascapular nerve

Landmark-Guided SSNB (Group B): In this approach, a line was drawn along the spine of the scapula and bisected by a vertical line from the scapular angle. After local anesthesia, the needle was inserted 2 cm cephalad to the midpoint of the scapular spine and directed parallel to the scapula blade. The same solution of bupivacaine and methylprednisolone was injected upon contact with the bone surface.



Figure 2 : Figure showing landmark guided technique

Outcome Measures

The primary outcomes were pain reduction and functional improvement, assessed using VAS and SPADI scores at baseline and follow-up intervals of 1 week, 4 weeks, and 12 weeks post-procedure.

Statistical Analysis

Continuous variables were analyzed using t-tests, with p-values <0.05 indicating significance. Descriptive statistics were used to report demographic data, and results were presented as mean $\pm$ standard deviation.

RESULTS

Demographic Data

The study included 70 patients (47.1% male, 52.9% female) with adhesive capsulitis. Most participants (55.7%) were between 51 and 59 years of age, with an overall mean age of 51.8 ± 6.3 years. Age distribution analysis indicated that 35.7% of patients were between 40–49 years, and 8.6% were in the 60–69 age group, reflecting the condition's peak incidence within middle-aged adults.

VAS Score Comparison

Both groups exhibited significant pain reduction over the 12-week follow-up period. Pre-injection mean VAS scores were 6.62 ± 1.11 (landmark-guided) and 6.60 ± 1.21 (ultrasound-guided). Following intervention, scores consistently decreased across both groups. At the 12-week mark, VAS scores averaged 2.80 ± 1.05 for the landmark-guided group and 2.74 ± 0.65 for the ultrasound-guided group. Despite slight variations, the difference between the two methods was not statistically significant ($p > 0.05$).

SPADI Score Comparison

Similarly, both groups showed improvement in SPADI scores from baseline to 12 weeks. Initial SPADI scores were 67.85 ± 11.61 for the landmark-guided group and 63.58 ± 13.87 for the ultrasound-guided group. At 12 weeks, mean scores decreased to 31.40 ± 7.05 (landmark-guided) and 28.12 ± 8.56 (ultrasound-guided). While ultrasound-guided SSNB showed a marginally greater reduction, the difference remained statistically insignificant ($p > 0.05$).

Table 1: Table showing mean, standard deviation, t-score and p-value of VAS and SPADI pre-injection and 1 week, 4 weeks and 12 weeks post injection.

Variable	Landmark Guided		Ultrasound-Guided		t	p-value
	Mean	SD	Mean	SD		
VAS Pre injection	6.6286	1.11	6.60	1.21752	-.102	.919
VAS after 1 week	3.4571	.98	3.11	.79	-1.606	.113
VAS after 4 weeks	3.4000	.97	3.08	.85	-1.434	.156
VAS after 12 weeks	2.8000	1.052	2.74	.65	-.273	.786
SPADI Pre-injection	67.8543	11.63	63.58	13.87	-1.395	.168
SPADI after 1 week	35.6143	9.41	31.68	9.33	-1.755	.084
SPADI after 4 weeks	32.8600	8.27	31.90	8.79	-.468	.642
SPADI after 12 weeks	31.4000	7.06	28.12	8.565	-1.744	.086

DISCUSSION

The results of this study suggest that both ultrasound-guided and landmark-guided suprascapular nerve block (SSNB) are effective and safe treatment modalities for managing adhesive capsulitis, or frozen shoulder. Both techniques significantly reduced shoulder pain and disability, as evidenced by improvements in VAS and SPADI scores. These findings align with prior research, indicating the potential of SSNB to facilitate better range of motion (ROM) and patient compliance with rehabilitation exercises by reducing discomfort during therapy^[9,10].

While the ultrasound-guided approach offers enhanced visualization, allowing clinicians to confirm needle placement and target infiltration, the landmark-guided technique remains a viable alternative, as evidenced by the lack of significant difference in outcomes between the two methods. This finding supports the broader applicability of SSNB, especially in resource-limited settings where ultrasound guidance may not be readily available^[11,12].

Previous studies, such as those conducted by Gorthi et al. and Shanahan et al., have noted benefits in pain relief and functional improvement with ultrasound-guided SSNB compared to traditional landmark-guided methods^[13,14]. However, these studies often emphasize increased precision and safety associated with real-time imaging. In contrast, our study demonstrated that, under controlled conditions, both techniques yielded similar clinical results, suggesting that landmark-guided SSNB is a safe and effective option, provided that it is performed by trained practitioners.

Clinical Implications

This study underscores the clinical utility of SSNB as a non-surgical intervention that allows patients to regain shoulder function and alleviate pain. By mitigating pain during movement, SSNB can improve adherence to physical therapy

regimens, thereby promoting faster recovery. Ultrasound-guided SSNB may be preferable in cases requiring high precision or in anatomically complex cases, while landmark-guided SSNB serves as an effective alternative in standard cases^[15,16].

Study Limitations and Future Directions

Although the study demonstrated clear improvements in pain and functional outcomes, limitations include the relatively short follow-up period (12 weeks) and a modest sample size, which may limit the generalizability of the results. Future studies could include longer follow-up intervals to assess sustained efficacy and potential late-onset complications. Additionally, larger sample sizes could offer more robust insights into demographic factors, such as age and gender, and their influence on treatment response.

Further research comparing SSNB with other treatment modalities, including intra-articular corticosteroid injections, could help clarify SSNB's relative efficacy in adhesive capsulitis management. Investigations into optimal dosing and frequency of SSNB could also enhance its effectiveness and patient satisfaction^[17,18].

CONCLUSION

This study affirms the effectiveness and safety of both ultrasound-guided and landmark-guided SSNB in treating adhesive capsulitis. Both methods resulted in significant pain reduction and functional improvement, with no substantial difference between the two approaches at 12-week follow-up. The ultrasound-guided approach provides the added benefit of real-time visualization, potentially enhancing safety and precision, yet the landmark-guided method offers an accessible and equally effective alternative.

In clinical practice, SSNB should be considered a valuable treatment option for patients with adhesive capsulitis, especially those resistant to conservative treatments. Given its minimal side effects and capacity to facilitate physical therapy, SSNB can play an essential role in comprehensive shoulder care. Future research could expand on these findings to further optimize the approach and long-term outcomes of SSNB in frozen shoulder management.

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