Management of Periarthritis of Shoulder Joint by Suprascapular Nerve Block

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Abstract

Introduction: Periarthritis of the shoulder is a condition characterized by painful and global restriction of active and passive glenohumeral range of motion in at least two directions, most notably shoulder abduction and external rotation. Therapeutic options for the management of periarthritis of shoulder are as follows: nonsteroidal anti-inflammatory drugs, intra-articular steroid injections, suprascapular nerve block (SSNB), platelet-rich plasma injection, manipulation under general anesthesia, or arthroscopic capsular release. SSNB is an old and effective method for the treatment of periarthritis of shoulder. Recently, ultrasonography (USG)-guided nerve blocks have been found to be safer and more efficacious compared to landmark guided nerve blocks. In this case series, SSNB has been done under USG guidance to check for its efficacy.

Aim: This study aims to assess the efficacy of SSNB in the treatment of periarthritis of the shoulder joint. Materials and Methods: Patients with periarthritis of shoulder received single injection of SSNB (n = 20) (40 mg methylprednisolone + 5 ml 2% lignocaine). All participants were also advised to perform a home-based 10 min exercise therapy after injection. The outcome was measured using Constant and Murley shoulder score. Participants were evaluated at 0, 3rd day, and 1 month. Unpaired t-test was used to determine significant differences. Results: SSNB treatment resulted in statistically significant improvements in CONSTANT score on both 3rd day and 1-month follow-up. No major adverse effects were seen in SSNB. Conclusion: This study demonstrates that single injection of SSNB improves both in pain and all range of motion of shoulder joint.

Keywords: Chronic shoulder pain, constant, Murley shoulder assessment score, periarthritis of shoulder, suprascapular nerve block

Introduction

Periarthritis of the shoulder is a condition characterized by painful and global restriction of active and passive glenohumeral range of motion in at least two directions most notably shoulder abduction and external rotation.[1] Periarthritis of the shoulder has an incidence of 3%–5% in the general population and up to 20% in those with diabetes.[2] It has prevalence rate of 2%–5%.[3] It is more common in females, peaks in 40–60 years of age group and 10 times more in diabetic patients.

Inflammation is an important event that leads to stiffness, pain, and capsular fibrosis.[4] Inflammatory cytokines such as (tumor necrosis factor)-alpha, interleukin (IL)-1 alpha, IL-1 beta, and IL-6 are known to appear both in the glenohumeral and subacromial bursa.[5] Fibroblast/myofibroblast with abundant type-3 collagen deposition is seen on the coracohumeral ligament and rotator interval capsule. The absence of multiplication is seen at the superficial synovial layers.

Therapeutic options for the management of periarthritis of shoulder are as follows: NSAIDs, intra-articular steroid injections, suprascapular nerve block (SSNB), platelet-rich plasma (PRP) injection, manipulation under general anesthesia, or arthroscopic capsular release.[6-10] PRP is an emerging treatment option, and its efficacy needs to be examined.

Several fundamental protein growth factors that are actively secreted by platelets initiate wound healing process. Blood activation causes the granules present in platelets to fuse to its cell membrane and release their growth factors (degranulation).

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The secretory proteins (e.g., platelet-derived growth factor and transforming growth factor-β) are then transformed into their bioactive state by the addition of histones and carbohydrate side chains. The active proteins then bind to the transmembrane receptors of target cells, which include mesenchymal stem cells, osteoblasts, fibroblasts, endothelial cells, and epidermal cells.

Suprascapular nerve, a mixed nerve, originates in upper trunk of brachial plexus, C5 and C6 roots, with prefix from C4 root in 50% population. Just proximal to the suprascapular notch, the SSN gives off the sensory branches, which travels with
it through the notch before proceeding laterally to innervate the acromioclavicular joint and its associated bursa and the coracoclavicular and coracohumeral ligaments.

The suprascapular nerve supplies sensory fibers to about 70% of the shoulder joint, including the superior and posterosuperior regions of the shoulder joint, capsule, and acromioclavicular joint. Nerve blockage increases patient’s pain tolerability.

SSNB was first described in 1941 by Wertheim and Rovenstein. Since then, SSNB has been applied in the management of acute and chronic pain.

Specific chronic shoulder pain syndromes in which SSNB has been used include rheumatoid arthritis, osteoarthritis of the glenohumeral joint, and various rotator cuff disorders including frozen shoulder.

The implementation of imaging guidance with ultrasound (US) most recently has attempted to improve the accuracy of blocking the SSN.

Gorthi et al. reported that the patients who underwent US-guided nerve block had more significant pain relief, and the effect was more longer than the patients who had nerve block by traditional blind technique.

**Materials and Methods**

A total of 20 patients attended the outpatient department, Department of Orthopaedics, AIIMS, Raipur, Chhattisgarh, India, with pain and restricted shoulder joint mobility in any plane of <25% especially abduction and external rotation for more than a month duration and a normal X-ray were diagnosed to be having periarthritis of shoulder clinically and were included in the study. Of 20 cases, 15 were female, i.e., M: F was 1:3. The mean age group was 48.6 years. About 40% patients of periarthritis shoulder presented with uncontrolled diabetes.

Our inclusion criteria were, patients who had pain and stiffness in one or both the shoulders for at least 4 weeks, restricted active and passive range of motion at the glenohumeral joint, age of ≥40 and ≤60 years, and who gave voluntary consent for participation were included in the study.

Patients with chronic shoulder pain due to other causes such as nerve damage or neurologic disorders, any skin problems including trauma and infection over the affected shoulder, history of fracture around the shoulder joint, patient following shoulder surgery, uncontrolled diabetes were excluded from the study.

Patient in sitting position with hand on opposite shoulder. Patient attached to a monitor, the US machine is placed anterior to the patient allowing an unobstructed view of the US screen by the operator [Figure 1]. The skin should be sterilized with antiseptic solution and a sterile dressing applied to the probe surface. A linear transducer (L38x, 6–13 MHz, broadband linear array; Sonosite M-turbo Inc., Bothell, WA, USA) is placed just cephalad and parallel to scapular spine. First identify the scapular spine as a hyperechoic linear structure that, unlike the pleura, does not move with normal respiration [Figure 2]. Moving the probe laterally and cephalad, the SSN is identified as a 2–3-mm hyperechoic structure 3–4 cm deep to the skin beneath the transverse scapular ligament in the scapular notch.

Two milliliters 2% lignocaine is injected for local anesthesia. A 50-mm short bevel needle is then advanced in-plane with US guidance in a medial to lateral approach toward the scapular notch. When the needle tip is adjacent to the nerve and underneath the transverse suprascapular ligament, 9 ml of 2% lignocaine and 1 ml (40 mg) of depot methyl prednisolone in 3 mL increments with intermittent aspiration used for SSNB. A successful injection is confirmed by cephalad displacement of the transverse scapular ligament.

**Constant and Murley shoulder assessment score**

Table I Constant and Murley shoulder assessment score were recorded (using standard orthopedics goniometer and spring balance) immediately before the procedure, on day 3, after 1 month.

**Figure 7: 1 Month: Flexion**

**Figure 8: 1 Month: External rotation**
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### Statistical analysis

The data were managed using Microsoft Excel and analyzed using t-test was used for comparing parameters. Results were considered significant at 5% level of significance, i.e., $P < 0.05$. Scores were recorded in Constant and Murley score. SSNB treatment resulted in significant improvement in the mean active range of shoulder abduction, flexion, external rotation, and internal rotation in 1-month follow-up. Patient showed improvement in range of motion in Figures 3-8.

### Discussion

In this case series, of 20 cases, 15 were female, i.e., M: F was 3:1 Table 2, demographic distribution. The mean age group was 48.6 years. Forty percent of patients of periarthritis shoulder presented with uncontrolled diabetes. In Constant and Murley score patients presented with mean pain score of 6.25, mean activity score = 4.1, mean arm position score = 3.9, strength of abduction = 8.4, and external rotation = 3.2 Table 3, Day-0 score. There was a significant decrease in pain, increase in activity level, arm position, strength of abduction, flexion, abduction, external rotation, and internal rotation which were measured by orthopedic goniometer and spring balance after SSNB on both the follow-ups.

No adverse effects were observed. In uncontrolled diabetic patients, we controlled blood sugar level by antidiabetics and then SSNB was done.

Adam et al. have reported average improvement in abduction of 86.92°, and external rotation of 32°. They have further reported significant improvement in pain and achieved almost normal day to day activity after SSNB in adhesive capsulitis.[10]

According to Shanahan et al., there was a significant improvement in the group receiving SSNB than the control group.

| Table 1: Constant and Murley shoulder score | Table 2: Demographic distribution |
|--------------------------------------------|----------------------------------|
| **Pain** | **Age** | **Gender** | **Uric acid** | **FBS/PPBS** |
| None: 15 | 52 | Female | 4.4 | 91/123 |
| Mild: 10 | 47 | Female | 4.2 | 107/156 |
| Moderate: 5 | 48 | Female | 4 | 83/105 |
| Severe: 0 | 56 | Male | 6 | 194/289 |
| **Activity** | 43 | Male | 7 | 98/156 |
| Ability to work: 0-4 | 50 | Female | 3 | 105/167 |
| Ability to recreational activity: 0-4 | 42 | Female | 5 | 116/202 |
| Ability to sleep: 0-4 | 42 | Male | 5 | 140/218 |
| **Arm position** | 58 | Female | 4 | 89/117 |
| Up to waist: 2 | 48 | Female | 5 | 192/258 |
| Up to xiphoid: 4 | 54 | Male | 4 | 101/158 |
| Up to neck: 6 | 43 | Female | 4 | 86/108 |
| Up to top of head: 8 | 43 | Female | 4 | 95/99 |
| Above head: 10 | 52 | Female | 4 | 82/108 |
| Strength of abduction (pounds)=25points | 51 | Female | 5 | 82/128 |
| (1/lb*) (1lb=0.454 kg) | 46 | Female | 5 | 96/114 |
| **Forward flexion** | 56 | Male | 6 | 90/130 |
| >150: 10 | 51 | Female | 5 | 107/163 |
| 121-150: 8 | 40 | Female | 5 | 89/105 |
| 91-120: 6 | 49 | Female | 4 | 69/107 |
| 61-90: 4 | 43 | Female | 4 | 105/167 |
| 31-60: 2 | 31-60: 2 | 5 | 140/218 |
| 0-30: 0 | 31-60: 2 | 5 | 140/218 |
| **Abduction** | 0-30: 0 | 31-60: 2 | 4 | 96/114 |
| >150: 10 | 0-30: 0 | 45 | Female | 4 | 105/167 |
| 121-150: 8 | 43 | Female | 4 | 95/99 |
| 91-120: 6 | 43 | Female | 4 | 86/108 |
| 61-90: 4 | 43 | Female | 4 | 82/108 |
| 31-60: 2 | 43 | Female | 4 | 95/99 |
| 0-30: 0 | 43 | Female | 4 | 86/108 |
| **External rotation** | 43 | Female | 4 | 95/99 |
| Head behind head-elbow forward: 2 | 43 | Female | 4 | 86/108 |
| Head behind head-elbow back: 2 | 43 | Female | 4 | 95/99 |
| Head on top of head-elbow forward: 2 | 43 | Female | 4 | 86/108 |
| Head on top of head-elbow back: 2 | 43 | Female | 4 | 95/99 |
| Full elevation: 2 | 43 | Female | 4 | 86/108 |
| **Internal rotation** | 43 | Female | 4 | 95/99 |
| Inter scapular region: 10 | 43 | Female | 4 | 86/108 |
| Inferior tip of the scapula: 8 | 43 | Female | 4 | 86/108 |
| 12th rib: 6 | 43 | Female | 4 | 86/108 |
| Lumbosacral junction: 4 | 43 | Female | 4 | 86/108 |
| Buttock: 2 | 43 | Female | 4 | 86/108 |
| Later al thigh: 0 | 43 | Female | 4 | 86/108 |

**FBS**: Fasting blood sugar, **PPBS**: Postprandial blood sugar

**Results**

A total of 20 individuals with complaints of shoulder pain associated with restriction of motion were assessed for eligibility. US-guided SSNB was given to all the patients.
Venkat et al. reported that the patients who underwent US-guided nerve block had more significant pain relief, and the effect was more longer than the patients who had nerve block by traditional blind technique.\(^{[18]}\)

In our study, pain improvement was 73%, activity improvement 70.2%, arm position by 77.14%, abduction by 66.6%, external rotation by 68.57%, and range of motion improved by average of 70% Table 4, Day-3 score Table 5, 1 month score Figure 9, improvement in constant score.

The above assessment yielded results that were comparable to the study by Adam et al.

**Conclusion**

This case series shows the effectiveness of ultrasonography-guided SSNB in the management of periarthritis of shoulder which is done by simple technique, without major adverse effects. There was limitation of this study, like small no of patients enrolled in our series and relatively short-term follow-up.
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### Table 5: 1 month score

| Pain  | Activity | Arm position | Strength of abduction | Flexion | Abduction | External rotation | Total |
|-------|----------|--------------|-----------------------|---------|-----------|-------------------|-------|
| 15    | 9        | 10           | 20                    | 8       | 10        | 8                 | 80    |
| 10    | 9        | 8            | 20                    | 8       | 8         | 6                 | 69    |
| 15    | 16       | 8            | 22                    | 6       | 10        | 10                | 87    |
| 10    | 5        | 8            | 16                    | 6       | 4         | 6                 | 55    |
| 5     | 10       | 8            | 20                    | 6       | 6         | 8                 | 63    |
| 10    | 8        | 6            | 10                    | 6       | 8         | 6                 | 54    |
| 10    | 9        | 10           | 16                    | 6       | 8         | 8                 | 67    |
| 10    | 10       | 8            | 16                    | 6       | 6         | 4                 | 60    |
| 15    | 8        | 8            | 15                    | 8       | 8         | 8                 | 70    |
| 10    | 9        | 8            | 12                    | 6       | 6         | 8                 | 59    |
| 15    | 7        | 8            | 22                    | 10      | 8         | 10                | 70    |
| 15    | 10       | 8            | 18                    | 6       | 6         | 8                 | 71    |
| 10    | 6        | 8            | 10                    | 4       | 2         | 6                 | 46    |
| 10    | 7        | 8            | 20                    | 4       | 6         | 6                 | 61    |
| 10    | 10       | 8            | 16                    | 6       | 8         | 8                 | 66    |
| 10    | 8        | 8            | 16                    | 6       | 6         | 6                 | 60    |
| 15    | 11       | 8            | 15                    | 8       | 8         | 8                 | 73    |
| 10    | 5        | 4            | 10                    | 6       | 6         | 4                 | 45    |
| 5     | 7        | 6            | 20                    | 6       | 6         | 4                 | 54    |
| 10    | 7        | 8            | 12                    | 6       | 4         | 6                 | 53    |

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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### Conflicts of interest

There are no conflicts of interest.

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