Original Article

Functional Outcome of Intranasal Calcitonin in Patients with Adhesive Capsulitis of the Shoulders

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Abstract

Background: Adhesive capsulitis, also known as frozen shoulder, is a common condition that causes painful limitations on shoulder movement. Managing this condition can be tough, even with various treatment options. Calcitonin, a hormone derived from the thyroid, has shown promise in reducing pain and inflammation in chronic muscle and joint disorders. This study aimed to assess the effectiveness of intranasal calcitonin in relieving pain, improving shoulder mobility, and enhancing overall function in patients with adhesive capsulitis. **Material and Methods:** We conducted a hospital-based prospective comparative study in the Department of Orthopaedics at Assam Medical College in Dibrugarh from May 2023 to May 2024. Ninety patients aged 40 to 70 years with clinically diagnosed adhesive capsulitis participated in the study. They were split into two groups. The control group (n=45) received physiotherapy along with non-steroidal anti-inflammatory drugs (NSAIDs). The intervention group (n=45) received intranasal salmon calcitonin (200 µg/day for six weeks) in addition to the same treatment. We evaluated functional outcomes using the Constant–Murley Score (CMS) at baseline, 6 weeks, and 12 weeks. We analyzed the data with SPSS v20, considering results statistically significant at $p<0.05$. **Results:** The two groups had similar baseline characteristics (mean age: 53.05±6.61 vs 53.65±6.88 years; p=0.78). After treatment, the CMS improved significantly in both groups, but the calcitonin group experienced a greater mean improvement in pain score (10.69±1.86 vs 9.58±2.59; p=0.111), movement (33.0±2.10 vs 31.16±2.38; p=0.001), and total score (67.8±4.03 vs 62.65±4.28; $p<0.001$). No major side effects were reported. **Conclusion:** Intranasal calcitonin, along with physiotherapy and NSAIDs, offers better pain relief and quicker functional recovery than standard therapy alone for adhesive capsulitis. It can be considered a safe addition to treatment to improve outcomes in frozen shoulder.

Keywords: Adhesive capsulitis, Intranasal calcitonin, Frozen shoulder, Constant–Murley Score, Shoulder mobility.

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Introduction

Adhesive capsulitis, or frozen shoulder, is a disabling condition of the glenohumeral joint. It causes progressive pain and stiffness, leading to significant restriction of both active and passive range of motion (ROM). This condition typically affects adults between 40 and 70 years old, with a higher occurrence in women and people with diabetes. The incidence in the general population is about 2-5%, but it increases to 20% in diabetic patients.[1]

Codman first described the condition in 1934. He noted its slow onset, pain at the deltoid insertion, and limited elevation and external rotation, despite normal radiographic results.[2] Kessel later highlighted that it can occur spontaneously after minor trauma or sometimes without any clear reason.[3] Despite years of research, the cause of adhesive capsulitis is still unclear. Some suggested mechanisms include ongoing inflammation of the joint capsule and synovium, which can lead to fibrosis and tightening.[4]

Various treatments have been suggested, ranging from conservative options like NSAIDs, physiotherapy, intra-articular corticosteroid injections, and hydrodilatation to more invasive methods like manipulation under anesthesia (MUA) and arthroscopic capsular release.[5,6] Unfortunately, no single treatment has proven effective for everyone, and long recovery times often leave patients frustrated.

Calcitonin is a 32-amino acid peptide released by thyroid parafollicular cells. It has strong pain-relieving and anti-inflammatory effects. Intranasal administration of synthetic salmon calcitonin (SSCT) provides a non-invasive option with few systemic side effects. Research suggests that calcitonin modulates pain signaling by interacting with serotonin pathways and reducing peripheral nerve hyperactivity.[7,8]

Given these effects, calcitonin may help manage adhesive capsulitis by reducing pain and improving mobility. This study aimed to evaluate the functional outcomes of intranasal calcitonin therapy compared to standard treatment in patients

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with adhesive capsulitis.

Materials and Methods

Study Design and Setting: A hospital-based prospective comparative study was conducted in the Department of Orthopaedics at Assam Medical College and Hospital in Dibrugarh over a year, from May 2023 to May 2024.

Sample Size and Population: The sample size was calculated using a 5% prevalence of adhesive capsulitis, with 95% confidence and 80% power, yielding 90 patients. Eligible patients were aged 40 to 70 years and had shoulder pain and stiffness lasting at least one month, along with a restriction of at least 50% in external rotation.

Inclusion Criteria

- Age 40 to 70 years.
- Shoulder pain and stiffness lasting at least one month.
- At least 50% reduction in external rotation.
- Informed written consent.

Exclusion Criteria

- Shoulder pain caused by cervical spine or brachial plexus issues.
- History of shoulder fracture, infection, or cancer.
- Previous shoulder surgery or involvement of both shoulders.
- Metabolic bone or parathyroid disorders.
- Individuals who did not consent.

Grouping and Intervention

Patients were quasi-randomly assigned to two groups:

- Group A (Control): Physiotherapy and NSAIDs.
- Group B (Intervention): Intranasal calcitonin (200 µg/day for six weeks), physiotherapy, and NSAIDs.

Physiotherapy Protocol: All patients participated in supervised shoulder mobilization exercises, including pendulum, pulley, and wall-climbing exercises, starting on day one of enrolment. These exercises were performed twice daily for 15 minutes each time. We encouraged compliance during follow-ups.

Outcome Measures: Functional assessment used the Constant–Murley Score (CMS) at baseline, six weeks, and twelve weeks. The score has four domains:

- Pain (15 points)
- Activities of daily living (20 points)
- Range of motion (40 points)
- Strength (25 points)

Total CMS ranges from 0 to 100 points (a higher score equals better function).

Data Collection and Follow-up: We recorded all demographic and clinical data using a standardized form. Follow-ups were scheduled at 6 and 12 weeks for repeat CMS evaluations and to monitor any adverse effects.

Statistical Analysis: We analyzed the data using SPSS version 20 (IBM, Chicago, IL). Continuous variables were expressed as mean ± standard deviation and compared using Student's t-test. We used the Chi-square or Fisher's exact test for categorical variables. A p-value of less than 0.05 was considered statistically significant.

Results

Demographic Profile

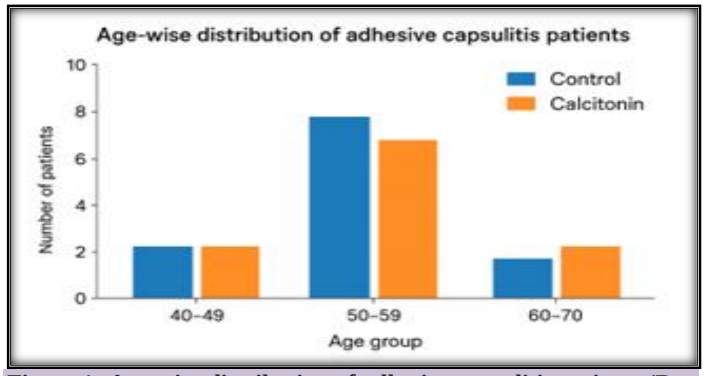

Figure 1: Age-wise distribution of adhesive capsulitis patients (Bar chart placeholder).

No significant age difference was observed between groups (p>0.05).

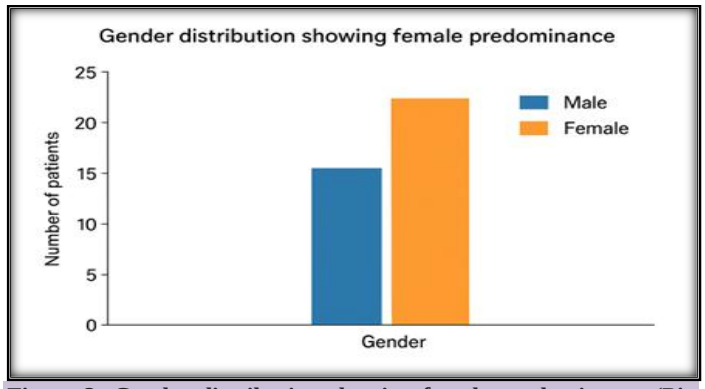

Figure 2: Gender distribution showing female predominance (Pie chart placeholder).

Laterality and Dominance: Left-sided involvement was more frequent in both groups (64.4% vs 75.6%; p=0.49). The non-dominant shoulder was involved in 68.8% and 75.5% of cases, respectively (p=0.72).

Mode of Onset and Duration: Most patients (84.4%) reported spontaneous onset, while 15.6% followed minor trauma. Mean disease duration was 2.95±1.10 months in controls and 2.75±1.21 months in the calcitonin group (p=0.59).

Comorbidities: Diabetes mellitus was present in 8% and 11.1% of patients, and hypertension in 11.0% and 15.6% respectively (p>0.05).

Table 1: Age Distribution of Study Participants

Age Group (years)	NSAIDs + Physio (n=45)	NSAIDs + Physio + Calcitonin (n=45)	p-value
40–49	13 (28.88%)	13 (28.88%)	0.909
50–59	25 (55.55%)	23 (51.11%)	
60–70	7 (15.55%)	9 (20.00%)	
Mean ± SD	53.05 ± 6.61	53.65 ± 6.88	0.78

Table 2: Gender Distribution

Gender	Control n (%)	Calcitonin n (%)	p-value
Male	14 (31.1%)	11 (24.4%)	0.723
Female	31 (68.9%)	34 (75.6%)	
Total	45 (100%)	45 (100%)	

Constant–Murley Score at Baseline

Table 3: Baseline Constant–Murley Components

Parameter	Control (Mean ± SD)	Calcitonin (Mean ± SD)	p-value
Pain	5.36 ± 2.15	5.24 ± 1.40	0.772
ADL	2.5 ± 1.49	3.24 ± 1.69	0.742
Movement	21.18 ± 4.40	21.31 ± 4.11	0.882
Strength	7.80 ± 3.00	7.89 ± 3.28	0.893
Total CMS	37.70 ± 7.69	37.68 ± 7.27	0.639

At baseline, both groups showed comparable poor functional scores (<56).

Improvement at 6 Weeks

Table 4: CMS Comparison at 6 Weeks

Parameter	Control (Mean ± SD)	Calcitonin (Mean ± SD)	p-value
Pain	9.58 ± 2.59	10.69 ± 1.86	0.111
ADL	5.76 ± 1.69	6.87 ± 1.44	0.011
Movement	31.16 ± 2.38	33.0 ± 2.10	0.001
Strength	16.20 ± 1.64	17.20 ± 1.44	0.047
Total CMS	62.65 ± 4.28	67.80 ± 4.03	<0.001

Improvement at 12 Weeks

Table 5: CMS Comparison at 12 Weeks

Parameter	Control (Mean ± SD)	Calcitonin (Mean ± SD)	p-value
Pain	12.36 ± 1.96	13.56 ± 1.45	0.014
ADL	8.91 ± 1.31	10.40 ± 1.28	0.002
Movement	36.07 ± 2.02	38.40 ± 1.68	0.000
Strength	19.31 ± 1.64	21.36 ± 1.30	0.001
Total CMS	76.65 ± 3.46	83.72 ± 3.16	<0.001

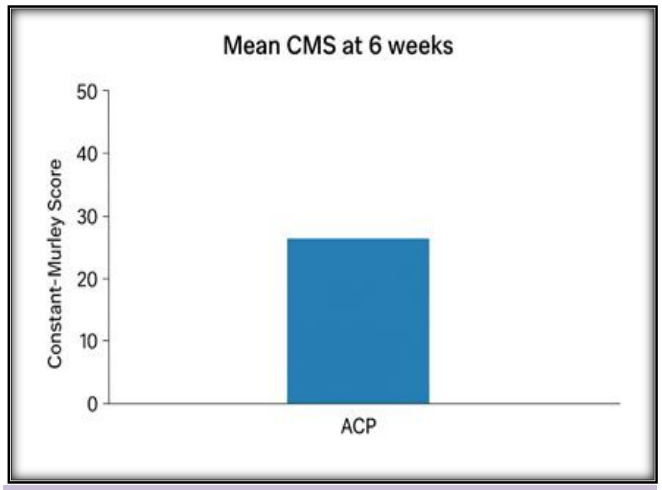

Figure 3: Mean CMS at 6 weeks (Bar chart placeholder).

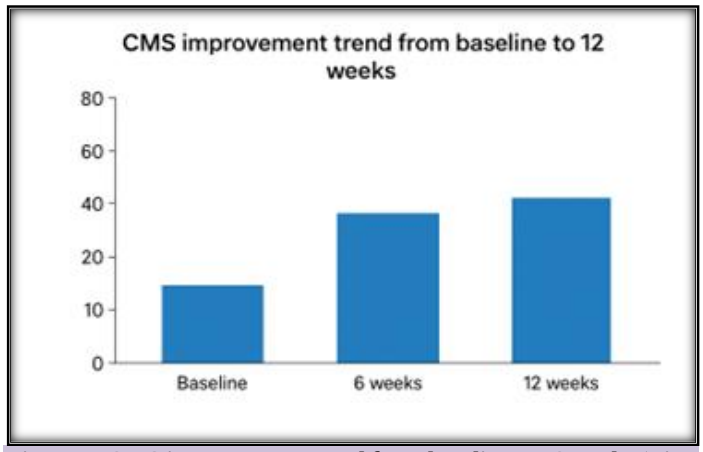

Figure 4: CMS improvement trend from baseline to 12 weeks (Line chart placeholder).

Significant improvements were seen in both groups; however, the calcitonin group demonstrated greater gains in ADL, movement, and strength ($p<0.05$).

At 12 weeks, the calcitonin group achieved a mean total CMS of 83.72 compared to 76.65 in controls, indicating faster and superior recovery.

Adverse Events

No major side effects were noted. Mild nasal irritation occurred in 4.4% of calcitonin users but resolved spontaneously.

Discussion

The current study shows that intranasal calcitonin, when added to physiotherapy and NSAIDs, provides much better pain relief and functional recovery than standard treatment alone. Improvement was observed as early as 6 weeks, confirming calcitonin's rapid pain-relieving effect.

The demographic profile of this study matches earlier reports, with an average age of 53 years and a majority of female participants.[9,10] Left shoulder and non-dominant side involvement were more common, consistent with previous

epidemiological findings.[11]

Calcitonin's positive effects may come from both central and peripheral mechanisms. Centrally, it affects serotonergic pathways and increases endorphin release. Peripherally, it lowers the production of inflammatory mediators and reduces nerve hyperactivity.[12,13] These actions support its effectiveness in treating both musculoskeletal and nerve pain conditions, such as complex regional pain syndrome.[14]

Rouhani et al. (2016) showed that intranasal calcitonin significantly improved pain and range of motion in adhesive capsulitis.[15] Similar results were found in this study, highlighting its potential as a treatment. The total Clinical Measurement Scale gain of 46 points in the calcitonin group compared to 39 points in the control group illustrates its added effectiveness.

Traditional treatment with physiotherapy and NSAIDs is still the standard approach, but recovery is slow and often incomplete.[16] Corticosteroid injections may provide quicker relief but come with risks of tendon rupture, skin thinning, and temporary increased blood sugar, which is especially worrying for people with diabetes.[17] In contrast, calcitonin offers a safer pharmacological option without these side effects.

The results align with Azria (2002), who discussed calcitonin's pain-relieving mechanisms, and Reginster et al. (1987), who confirmed its safety in intranasal form.[18-20] The absence of major side effects in this study further supports its tolerability.

Table 6: Comparison with Literature

Study	Year	Sample	Treatment	Outcome
Rouhani et al.	2016	60	Calcitonin vs control	Significant improvement in ROM and pain
Sahin et al.	2011	80	Calcitonin in CRPS	Beneficial in acute phase
Present Study	2024	90	Intranasal calcitonin + NSAIDs + Physio	Superior CMS improvement and pain reduction

Our results corroborate global evidence supporting calcitonin's efficacy in painful musculoskeletal conditions.

Clinical Implications

- Intranasal calcitonin is a non-invasive, safe option that improves recovery when added to standard therapy.
- It may be especially beneficial for patients who cannot tolerate corticosteroids or who have other metabolic conditions.
- Regular physiotherapy is still important for the best outcome.

Limitations

- This is a single-center study with a relatively small sample size.
- There is short-term follow-up (12 weeks), so long-term effectiveness is not yet known.
- The lack of blinding may lead to observer bias.

Future multicentric randomized controlled trials are recommended to confirm these findings.

Conclusion

Intranasal calcitonin is an effective and safe additional treatment for adhesive capsulitis. Its use results in greater pain reduction, quicker recovery of range of motion, and better shoulder function than standard physiotherapy or NSAID therapy alone. Adding calcitonin to regular management plans could significantly reduce recovery time and increase patient satisfaction.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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