Research Article

Functional Outcome of the Latarjet Procedure in Recurrent Anterior Shoulder Dislocation: A Prospective Observational Study from Central India

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Background: Recurrent anterior shoulder dislocation is a disabling condition predominantly affecting young, active adults. In patients with significant glenoid bone loss and engaging Hill-Sachs lesions, isolated soft-tissue repair carries high failure rates. The Latarjet procedure addresses instability through triple stabilization: bony augmentation, the conjoint-tendon sling, and capsular reinforcement. Evidence from India — particularly from non-athletic, late-presenting cohorts — remains limited.

Methods: This prospective observational study enrolled 30 patients undergoing the open Latarjet procedure for recurrent anterior shoulder dislocation at a tertiary centre in central India over 24 months. Preoperative characteristics including glenoid bone loss (mean 22.79 ± 4.24%), number of dislocations, and Hill-Sachs engagement were documented. Functional outcomes were assessed using the Rowe score and American Shoulder and Elbow Surgeons (ASES) score; pain was evaluated with the Visual Analog Scale (VAS). Radiological outcomes — graft position, graft union, and glenohumeral osteoarthritis (Samilson-Prieto classification) — baseline post-operative radiological baseline for long-term OA tracking.

Results: The mean age was 36.27 ± 11.17 years; 80% of patients had more than five prior dislocations. Mean Rowe score improved from 40.47 ± 8.66 to 89.23 ± 4.83 (mean improvement 48.77 points, p <0.001). Mean ASES score improved from 47.70 ± 8.17 to 91.77 ± 3.38 (improvement 44.07 points, p <0.001). Pain VAS decreased from 7.77 to 0.93 (p <0.001). All patients achieved good-to-excellent Rowe outcomes (excellent 53.3%, good 46.7%). Complete graft union was achieved in 76.7% and partial union in 23.3% at six months. Complications were infrequent (10%), and no recurrent dislocation or neurovascular injury was recorded. Complications like superficial wound infection, transient musculocutaneous neuropraxia, or screw prominence/backout were reported in 3 patients.

Conclusion: The Latarjet procedure yields excellent short-term functional outcomes and reliable stability in patients with recurrent anterior shoulder dislocation, including those with heavy preoperative instability burden and substantial glenoid bone loss. Outcomes were consistent across subgroups defined by sex, occupation, Hill-Sachs engagement status, and bone loss severity, affirming the procedure's robustness in an Indian tertiary-care setting.

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Keywords: Latarjet procedure, recurrent anterior shoulder dislocation, glenoid bone loss, Hill-Sachs lesion, Rowe score, ASES score, functional outcome, India

Introduction

The glenohumeral joint, the most mobile articulation in the human body, is also the most frequently dislocated major joint, accounting for approximately half of all joint dislocations [1]. Its inherent hypermobility, arising from the mismatch between the large spherical humeral head and the shallow glenoid fossa, necessitates dependence on a complex interplay of static and dynamic stabilizers [2]. Traumatic anterior dislocation is the dominant pattern, occurring at an estimated incidence of 21.9 per 100,000 persons per year and constituting approximately 95% of all shoulder dislocations [3].

The risk of recurrence after a first traumatic anterior dislocation approaches 90% in men under 30 years of age, with cumulative structural damage — labral detachment, glenoid rim erosion, and humeral head impaction defects — worsening with each episode [4,5]. In India, delayed presentation is a well-recognized challenge: many patients attend traditional bonesetters before reaching specialist care, and by the time surgical assessment is undertaken, glenoid bone loss commonly exceeds 20-25%

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with an engaging Hill-Sachs lesion, a scenario in which isolated soft-tissue repair yields failure rates approaching 67% [4,6].

The Bankart lesion — avulsion of the anteroinferior labrum — is the primary pathological substrate of traumatic anterior instability [7]. Hill-Sachs lesions, present in 65 to 93% of dislocations, interact with the glenoid rim during functional motion when they extend beyond the glenoid track, perpetuating instability even after soft-tissue healing [8]. The threshold for bone augmentation surgery is now well-established: glenoid deficiency exceeding 13.5 to 15% significantly increases instability risk, and losses beyond 20 to 25% constitute an absolute indication for bony reconstruction [6].

First described by Michel Latarjet in 1954, the Latarjet procedure transfers the coracoid process and its attached conjoint tendon to the anterior glenoid, stabilizing the joint through three complementary mechanisms: restoration of glenoid bone stock, dynamic sling action of the conjoint tendon in abduction-external rotation, and capsular reinforcement via the coracoacromial ligament stump [9,10]. Long-term series have reported recurrence rates below 2-3% even in the presence of severe bone loss [11].

While Western and East Asian literature documents excellent outcomes primarily in athletic cohorts, data from India — where patients typically present late, have sustained multiple dislocations, and make occupational (rather than athletic) demands on the shoulder — are sparse [4]. This prospective study was therefore undertaken to evaluate the functional and radiological outcomes of the open Latarjet procedure in patients with recurrent anterior shoulder dislocation at a tertiary care centre in central India, and to assess the influence of preoperative variables on postoperative recovery.

Material and methods

Study Design and Setting

This prospective descriptive observational study was conducted in the Department of Orthopaedics, R. D. Gardi Medical College and Hospital, Ujjain (Madhya Pradesh), a tertiary referral centre serving a catchment population of over five million in central India. The study was conducted over 24 months following approval by the Institutional Ethics Committee (IEC), and all participants provided written informed consent in their preferred language (English or Hindi). The study adhered to the Declaration of Helsinki.

Inclusion Criteria

- Patients aged ≥18 years
- Recurrent anterior shoulder dislocation (≥3 documented episodes)
- Positive apprehension test
- Failed previous Bankart repaire lesion
- Presence of Hill-Sachs(off tarck) lesion on MRI Glenoid bone loss modern threshold:>13 to 15%, critical threshold:>20 to 25% requiring Latarjet procedure ·
- ASA grade I or II

Exclusion criteria

- Age <18 years
- Posterior or multidirectional instability
- Previous shoulder stabilization surgery Atraumatic dislocation
- Associated rotator cuff tear requiring repair
- Acromioclavicular joint pathology
- ASA grade III or IV
- Patients unwilling for surgery

Sample Size

Using the formula $n = (Z^2 \times p \times q) / d^2$ with an anticipated success rate of 80%, 95% confidence level (Z=1.96), and an acceptable precision of 15%, the minimum required sample was 28 patients. To allow for a 10-15% dropout rate, 30 consecutive eligible patients were enrolled.

Inclusion and Exclusion Criteria

Patients aged ≥18 years with recurrent anterior shoulder dislocation (≥3 documented episodes), a positive apprehension test, an off-track Hill-Sachs lesion on MRI, and glenoid bone loss ≥13 to 15% (critical threshold >20 to 25%) on MRI/CT were included. Patients with posterior or multidirectional instability, previous shoulder stabilization surgery, atraumatic dislocation, associated rotator cuff tear, acromioclavicular pathology, or ASA grade III/IV were excluded.

Surgical Technique

All procedures were performed under general anaesthesia with an interscalene block in the beach-chair position. A standard deltopectoral approach was used. After harvesting the coracoid process (approximately 2.5–3 cm graft) with a 5 mm coracoacromial ligament stump, the graft was rotated 90° to optimise articular congruity. The subscapularis was split horizontally at the junction of the upper two-thirds and lower one-third. The glenoid neck was decorticated and the graft was fixed with two 3.5 mm

cortical lag screws, flush with the articular surface and perpendicular to the joint. The coracoacromial ligament stump was sutured to the capsule for static reinforcement. The subscapularis split was repaired anatomically.

Rehabilitation

Patients were immobilised in a neutral-rotation sling for two weeks, followed by progressive passive range of motion (external rotation limited to 0° for four weeks), active-assisted exercises, and progressive strengthening. Return to light manual activities was permitted at three months and full activities at six months, conditional on adequate strength and absence of apprehension.

Outcome Assessment

Functional outcomes were assessed preoperatively and at 6 weeks, 3, and 6 months postoperatively using the Rowe Shoulder Instability Score (maximum 100; excellent ≥90, good 75–89, fair 51–74, poor ≤50), the American Shoulder and Elbow Surgeons (ASES) score (maximum 100), and the Visual Analog Scale (VAS) for pain (0–10). Radiological outcomes at each visit included graft position (flush vs. medial), graft union (complete/partial/non-union), and glenohumeral osteoarthritis (Samilson-Prieto classification). Treatment success was defined as a Rowe score ≥80 with no recurrent dislocation and radiological evidence of graft union.

Statistical Analysis

Preoperative-to-postoperative score changes were compared with paired t-tests (normally distributed data) or the Wilcoxon signed-rank test. Subgroup comparisons used independent t-tests or Mann-Whitney U tests; categorical comparisons used chi-square or Fisher's exact tests. Pearson's or Spearman's correlation was used for correlation analyses. Multivariate linear regression was performed to identify independent predictors of the six-month Rowe score. A two-tailed *p-value* <0.05 was considered statistically significant, with Bonferroni correction applied for multiple comparisons.

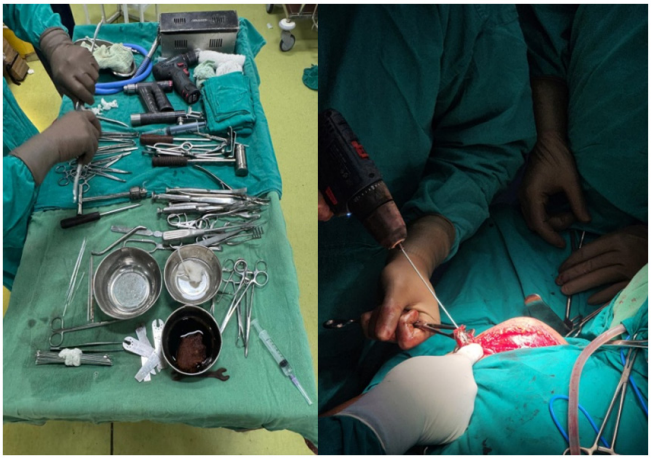

Figure 1: Intra-operative images

Table 1: Demographic and preoperative characteristics of the study population

Variable	*Value*
Age (years), mean ± SD	36.27 ± 11.17
Age group ≤30 years	9 (30.0%)
Age group 31–40 years	9 (30.0%)
Age group 41–50 years	8 (26.7%)
Age group >50 years	4 (13.3%)
Sex: Male	14 (46.7%)
Sex: Female	16 (53.3%)
Affected side: Right	12 (40.0%)
Affected side: Left	18 (60.0%)
Dominant arm: Right	30 (100.0%)
Occupation: Physically demanding	24 (80.0%)
Occupation: Sedentary	6 (20.0%)

Results

Demographic and Preoperative Characteristics

Thirty patients (30 shoulders) were enrolled. The mean age was 36.27 ± 11.17 years (range 19–55 years). The sex distribution was near-balanced (male 46.7%, female 53.3%). All patients were right-hand dominant; the left shoulder was affected in 60%. Physically demanding occupations were represented in 80% of patients (Table 1 and Figure 1).

Table 2: Clinical instability history and duration before surgery

Variable	*Value*
Number of dislocations, mean ± SD	8.83 ± 3.45
Dislocations ≤3	3 (10.0%)
Dislocations 4–5	3 (10.0%)
Dislocations >5	24 (80.0%)
Time since first dislocation (months), mean ± SD	42.77 ± 18.88
Delay ≤12 months	2 (6.7%)
Delay 13–24 months	5 (16.7%)
Delay 25–60 months	16 (53.3%)
Delay >60 months	7 (23.3%)

Table 3: Preoperative functional and pain scores

Outcome	*Mean ± SD*	*Median (Min–Max)*
Rowe score (preoperative)	40.47 ± 8.66	41.0 (25–54)
ASES score (preoperative)	47.70 ± 8.17	48.0 (34–60)
Pain VAS (preoperative)	7.77 ± 1.22	8.0 (6–9)

Instability History and Structural Pathology

The mean number of preoperative dislocations was 8.83 ± 3.45; 80% of patients had more than five episodes. The mean duration from first dislocation to surgery was 42.77 ± 18.88 months, with 76.7% presenting after more than two years. Mean glenoid bone loss was 22.79 ± 4.24%; 43.3% of patients had bone loss exceeding 25%. A Hill-Sachs lesion was present in all patients; 56.7% had an engaging lesion (Table 2).

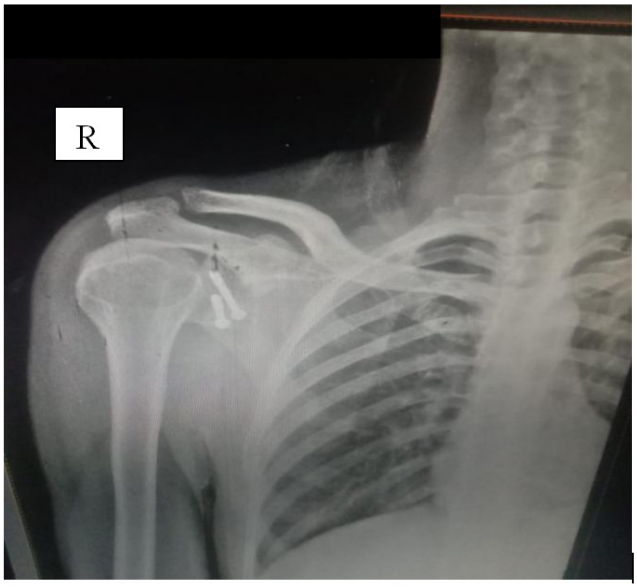

Figure 2: Post-operative x-ray

Table 5: Postoperative range of motion profile at 6 months

ROM parameter	*Value*
Forward elevation (degrees)	160.60 ± 6.15
External rotation (degrees)	53.37 ± 6.00
Internal rotation T7	4 (13.3%)
Internal rotation T8	8 (26.7%)
Internal rotation T9	7 (23.3%)
Internal rotation T10	11 (36.7%)

Preoperative Functional Scores

Preoperative scores confirmed severe functional impairment. The mean Rowe score was 40.47 ± 8.66 (median 41; range 25-54), the mean ASES score was 47.70 ± 8.17, and the mean pain VAS was 7.77 ± 1.22, reflecting significant pain and disability at baseline (Table 3 and Figure 2).

Six-Month Postoperative Outcomes and Inferential Comparison

At the six-month follow-up, the mean Rowe score had improved to 89.23 ± 4.83 (mean change +48.77; paired t-test t=26.47, p <0.001). The mean ASES score improved to 91.77 ± 3.38 (mean change +44.07; Wilcoxon W=0.00, p <0.001). Pain VAS decreased to 0.93 ± 0.87 (mean change −6.83, p <0.001). Every patient achieved a Rowe score within the good-to-excellent category (excellent 53.3%; good 46.7%); 73.3% achieved an ASES score ≥90 (Table 4 and Figure 3).

Table 4: Six-month postoperative clinical and radiological outcomes

Outcome	*Value*
Rowe score at 6 months	89.23 ± 4.83
ASES score at 6 months	91.77 ± 3.38
Pain VAS at 6 months	0.93 ± 0.87
Forward elevation at 6 months (degrees)	160.60 ± 6.15
External rotation at 6 months (degrees)	53.37 ± 6.00
Internal rotation level T7	4 (13.3%)
Internal rotation level T8	8 (26.7%)
Internal rotation level T9	7 (23.3%)
Internal rotation level T10	11 (36.7%)
Graft position: Flush	18 (60.0%)
Graft position: Medial	12 (40.0%)
Graft union: Complete	23 (76.7%)
Graft union: Partial	7 (23.3%)

Table 6: Sex-wise comparison of 6-month outcomes

Outcome	*Male (n=14)*	*Female (n=16)*	*p-value*
Rowe	89.43 ± 4.80	89.06 ± 5.01	0.840
ASES	91.00 ± 3.66	92.44 ± 3.08	0.259
Pain_VAS_0_to_10	0.86 ± 0.95	1.00 ± 0.82	0.665
ROM_FE_Deg	160.29 ± 5.37	160.88 ± 6.93	0.795
ROM_ER_Deg	51.21 ± 5.70	55.25 ± 5.77	0.065

Table 7: Association of graft position with union, osteoarthritis, and complications

Outcome measure	*Flush (n=18)*	*Medial (n=12)*	*p-value*
Complete graft union	14 (77.8%)	9 (75.0%)	1.000
Partial graft union	4 (22.2%)	3 (25.0%)	1.000
OA Grade I	9 (50.0%)	3 (25.0%)	0.260
OA none	9 (50.0%)	9 (75.0%)	0.260
Any complication	2 (11.1%)	1 (8.3%)	1.000

Table 8: Correlation of baseline variables with 6-month functional outcomes

Predictor	*Outcome*	*Correlation coefficient (r)*	*p-value*
Age	Rowe score at 6 months	0.010	0.960
Number of dislocations	Rowe score at 6 months	0.042	0.827
Time since first dislocation	Rowe score at 6 months	0.095	0.616
Glenoid bone loss	Rowe score at 6 months	0.024	0.899
Age	ASES score at 6 months	-0.207	0.274
Number of dislocations	ASES score at 6 months	-0.163	0.390
Time since first dislocation	ASES score at 6 months	-0.063	0.741
Glenoid bone loss	ASES score at 6 months	0.124	0.512

Figure 3: Follow up images:- After 6 months

Postoperative Range of Motion

Mean forward elevation at six months was 160.60° ± 6.15° and mean external rotation was 53.37° ± 6.00°. Internal rotation levels ranged from T7 to T10; T10 was most frequent (36.7%). These results indicate functionally adequate shoulder mobility was preserved after surgery (Table 5).

Subgroup Analyses

Sex-wise comparison showed no statistically significant difference in Rowe score (p =0.840), ASES score (p =0.259), pain VAS (p =0.665), forward elevation (p =0.795), or external rotation (p =0.065) between male and female patients. Occupation-wise analysis showed similar Rowe (p =0.640) and range-of-motion outcomes, though physically demanding workers reported a significantly lower postoperative pain VAS than sedentary workers (0.79 vs. 1.50; p =0.029) (Table 6).

Patients with engaging Hill-Sachs lesions did not differ significantly from those without engagement in any functional parameter (Rowe p =0.503; ASES p =0.261). Outcomes were also equivalent across glenoid bone loss strata (15.1–20% vs. 20.1–25% vs. >25%; Rowe p =0.612; ASES p =0.079), indicating consistent benefit regardless of the degree of structural deficiency within the Latarjet indication range.

Radiological Outcomes and Complications

Complete graft union was confirmed radiographically via 3D-CT in 76.7% of patients and partial union in 23.3% at six months; no non-union was observed. Graft position was flush in 60% and medially placed in 40% of hips. Graft position did not significantly influence union rate (flush 77.8% complete union vs. medial 75.0%; p=1.000), incidence of grade I osteoarthritis (p =0.260), or complication rate (p =1.000). Grade I osteoarthritic changes (Samilson-Prieto) were detected in 40% of patients; none had grade II or III changes (Table 7).

Complications occurred in 3 of 30 patients (10%): two cases of superficial wound infection (6.7%) managed with antibiotics without progression to deep infection, and one case of restricted range of motion (3.3%). No recurrent dislocation, neurovascular injury, hardware failure, or graft non-union was recorded during the follow-up period.

Correlation of Baseline Variables with Postoperative Scores

No significant correlation was found between age, number of preoperative dislocations, time since first dislocation, or percentage glenoid bone loss and the six-month Rowe or ASES scores (all p >0.05). These findings indicate that within the studied range of preoperative severity, early postoperative functional recovery was not linearly predicted by baseline instability burden (Table 8).

Discussion

This prospective study evaluated 30 patients undergoing the open Latarjet procedure for recurrent anterior

shoulder dislocation at a tertiary centre in central India and found clinically and statistically significant improvements in all primary outcome measures at six months, with every patient achieving at least a good Rowe outcome. These results are placed in context against the published literature below.

The demographic profile — mean age 36.27 years, 80% with physically demanding occupations, and 80% with more than five preoperative dislocation episodes — reflects the characteristic pattern of late-presenting, non-athletic instability seen at Indian tertiary centres. This population differs substantially from the athletic cohorts that dominate Western Latarjet literature. Joshi *et al*. [12] demonstrated that excellent outcomes are achievable after open Latarjet in non-athletic middle-aged patients, and Nkosi *et al*. [13] similarly reported satisfactory function in community-based cohorts, lending external validity to the current findings.

The mean improvement in Rowe score of 48.77 points and ASES score of 44.07 points (both $p<0.001$) are consistent with major prospective and comparative series. Yapp *et al*. [14] reported high patient satisfaction and low recurrence rates in over 200 Latarjet procedures, while Joshi *et al*. [12] found mean Rowe and ASES scores exceeding 97 and 94, respectively in a comparable non-athlete population. In the current series, 53.3% of patients achieved an excellent Rowe outcome and a further 46.7% a good outcome, with no fair or poor results. An *et al*. [15] in a systematic review of eight studies confirmed that Latarjet confers significantly lower recurrence rates and superior functional outcomes compared with Bankart repair, a finding further reinforced by the large meta-analysis of Zadeh *et al*. [16].

A particular strength of the current dataset is the absence of significant differences in functional outcomes across preoperative subgroups — sex, Hill-Sachs engagement status, glenoid bone loss category, occupation type, and number of prior dislocations. These results are consistent with Hardy *et al*. [17], who found that Latarjet outcomes were unaffected by the number of prior dislocations, and with Yang *et al*. [18], who demonstrated satisfactory results despite concomitant bipolar bone loss. For patients with borderline bone loss (15–20%), the present data support Jeon *et al*. [19], who showed superior stability with Latarjet versus arthroscopic Bankart repair in this contested zone. van Spanning *et al*. [20] corroborated this, observing zero redislocations after Latarjet versus several after Bankart repair in subcritical bone loss, even when patient-reported scores were comparable.

Postoperative range of motion was preserved to a functionally adequate level, with mean forward elevation of 160.60° and external rotation of 53.37°. A modest reduction in external rotation is an expected trade-off following subscapularis splitting and capsular repair, and is generally well tolerated. De Carli *et al*. [21] found that Latarjet preserved external rotation comparably to other open stabilisation methods, while Aurich *et al*. [22] demonstrated that the subscapularis management technique influences early functional recovery, with longitudinal splitting favouring faster return to sporting activities.

The graft union rate of 76.7% complete and 23.3% partial at six months is consistent with the timeframe of coracoid incorporation; continued remodelling is expected with longer follow-up. Zhu *et al*. [23] documented comparable graft healing profiles in both arthroscopic and open Latarjet series, and Shao *et al*. [24] confirmed positive radiographic outcomes with arthroscopic suture-button fixation. Grade I osteoarthritic changes in 40% of patients at six months are likely attributable to pre-existing degenerative change from repeated dislocation episodes rather than surgery-induced arthropathy; long-term monitoring is required to determine the progression of these findings.

The overall complication rate of 10% (two superficial infections, one restricted motion) is within the range documented in large series. Zadeh *et al*. [16] acknowledged that Latarjet may carry a marginally higher early complication burden than Bankart repair, but noted substantially lower recurrence rates in favour of coracoid transfer. No serious complications — including recurrent dislocation, neurovascular injury, hardware failure, or non-union — were encountered, affirming the safety profile of the procedure when executed by trained surgeons with consistent technique.

This study has several limitations. The sample size of 30 patients limits statistical power for subgroup analyses, and some trends may not have reached significance due to inadequate power. The follow-up of six months, while sufficient for assessing early functional recovery and graft union, precludes conclusions regarding long-term implant durability, wear, progression of osteoarthritis, or late recurrence. The single-centre design and absence of a control group limit external validity and causal inference. Future multicentre studies with longer follow-up, CT-based evaluation of graft integration, and comparative arms would further strengthen the evidence base.

Conclusion

The open Latarjet procedure is a reliable, reproducible, and highly effective treatment for recurrent anterior shoulder dislocation in Indian patients, including those presenting late with multiple prior episodes, substantial glenoid bone loss, and engaging Hill-Sachs lesions. Short-term functional outcomes were excellent across all preoperative subgroups, with every patient achieving at least a good Rowe outcome and negligible recurrence. These findings affirm Latarjet's status as the procedure of choice when structural bone deficiency precludes predictable soft-tissue repair, and underscore the importance of early surgical referral to minimise cumulative instability burden,demonstrating efficacy in an older, non-athletic population with chronic instability. Larger multicentre studies with extended follow-up are warranted to evaluate long-term graft behaviour, arthritic progression, and durability of function.

Funding

No external funding was received for this study.

Conflict of Interest

The authors declare no conflict of interest.

Ethical Approval

Clearance was obtained from the Institutional Ethics Committee (IEC), R. D. Gardi Medical College, Ujjain. All patients provided written informed consent prior to enrolment.

Ethical Clearance

The study was approved by the Institutional Ethics Committee (IEC), R. D. Gardi Medical College, Ujjain. Written informed consent was obtained from all participants in accordance with the Declaration of Helsinki.

Author's Contribution

Dr. Ashish Agrawal: Concept, design, clinical study supervision, manuscript preparation and review; Guarantor of the study. Dr. Vivek Singh: Data acquisition, clinical studies, manuscript preparation and editing. Dr. Akshay Kumar Mehra: Literature search, data analysis, statistical analysis, manuscript editing. Dr. Sandeep Bhinde: statistical analysis, manuscript editing. Dr. Naman Gupta: Literature search, data acquisition, manuscript preparation.

Clinical Trial Registration

Not applicable (prospective observational study, not an interventional trial).

Author Approval Statement

The manuscript has been read and approved by all authors. The requirements for authorship as stated in the CIJMR Author Instructions have been met, and each author believes that the manuscript represents honest work.

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