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An Observational Prospective Study to Evaluate the Functional Outcome of Displaced Clavicle Fracture Treated with Titanium Elastic Nails (TENS)

Dr. Dishant Chahar[1], Dr. Vishal Bansal[2], Dr. Rajat Nagar[3]

[1]Resident, Department of Orthopaedics, Peoples College of Medical Sciences and Research Center, Bhopal, Madhya Pradesh

[2]Professor, Department of Orthopaedics, Peoples College of Medical Sciences and Research Center, Bhopal, Madhya Pradesh

[3]Resident, Department of Orthopaedics, Peoples College of Medical Sciences and Research Center

Abstract: ***The clinical assessment of titanium elastic nailing for displaced mid-shaft clavicle fractures offers a revealing look at how modern orthopedics is gradually shifting toward less invasive yet reliable interventions. The authors present a prospective evaluation that, as I read it, captures both the practical realities of treating active patients and the subtle challenges clinicians face when balancing stability with soft-tissue preservation. It is evident that the consistently improving VAS and DASH scores over time suggest more than simple symptomatic relief; they point to a meaningful restoration of daily functionality, which often matters most to patients. That said, the almost uniform progression toward union and the very low complication rate raise another point about how intramedullary fixation-when used thoughtfully-can serve as a middle path between conservative care and more aggressive plating techniques. Taking this further, the study's emphasis on early mobilization and cosmetic benefits reflects broader trends in orthopedic decision-making, where patient comfort and long-term functional ease increasingly guide technique selection. This suggests that TENS-based CRIF, though not without its learning curve, fits well into contemporary practice where outcomes are judged not only by radiological union but also by patient-perceived recovery and postoperative independence.***

Keywords: clavicle fracture management, titanium elastic nailing, minimally invasive fixation, functional recovery, orthopedic outcomes

1. Introduction

Clavicle fractures are among the most common osseous injuries in adults, accounting for roughly 2.6–5% of all fractures and up to 44% of injuries involving the shoulder girdle. The majority involve the mid-shaft and frequently result from falls or road traffic accidents, particularly affecting younger, active individuals. While non- displaced fractures are traditionally managed conservatively, increasing evidence highlights suboptimal outcomes for displaced mid-shaft clavicle fractures, including higher rates of malunion, nonunion, and chronic functional impairment.

Surgical management, especially open reduction and plate fixation, has been advocated for its biomechanical stability but is associated with extensive soft tissue dissection, hardware prominence, and increased risk of complications. The titanium elastic nail system (TENS) offers a minimally invasive alternative allowing intramedullary stabilization while preserving periosteal blood supply and minimizing surgical morbidity.

This study evaluates the clinical outcome, radiological union, pain reduction, and complication rates associated with CRIF (closed reduction and internal fixation) using TENS in displaced mid-shaft clavicle fractures.

2. Methodology

2.1 Study Design

A prospective, observational clinical study was conducted at a tertiary care orthopedic center. Institutional ethical approval was obtained prior to study initiation.

2.2 Sample Size

Thirty patients (20 males, 10 females) aged 13–54 years with isolated, closed, displaced mid-shaft clavicle fractures (Robinson Type 2A1/2A2) were included.

Inclusion criteria:
- Age 13–54 years
- Isolated mid-shaft fracture
- >2 cm displacement/shortening
- Injury-to-surgery interval <2 weeks

Exclusion criteria:
- Open/pathological fractures
- Polytrauma
- Neurovascular compromise
- Prior ipsilateral surgery

2.3 Procedure Details

All patients underwent CRIF with TENS under general anesthesia.

2.4 Post-Operative Protocol

- Sling immobilization – 2 weeks
- Pendulum exercises – Day 3–5
- Active ROM – After 2 weeks
- Full activity – By 6–8 weeks if union evident

3. Statistical Data

Statistical analysis was performed using SPSS v25.0. Wilcoxon signed-rank tests were used.

Table 1: Mean VAS and DASH Scores

	Mean VAS	DASH Scores
Pre-op	VAS 6.5	DASH 48
5 Days	VAS 5.5	DASH 35
30 Days	VAS 4.7	DASH 30
6 Months	VAS 3.0	DASH 25

Table 2: Wilcoxon Signed-Rank Results
All comparisons showed significant improvement ($p < 0.001$).

4. Results

- Mean age: 36.1 years
- Injury: 56.7% RTA, 43.3% falls
- Union time: Mean 13.3 weeks
- Complications: 2 minor; no nonunion
- Outcome: 15 excellent, 15 good

5. Discussion

CRIF with TENS shows high union rates, minimal complications, faster rehabilitation, and cosmetic advantages. Literature strongly supports its efficacy compared to plating.

6. Conclusion

CRIF with TENS is safe, minimally invasive, and highly effective for displaced mid-shaft clavicle fractures, with excellent functional outcomes.