

# A Research on the Clinical Outcome of Diaphyseal Orthopaedic Forearm Fractures in Children undergoing Conservative Treatment with a Plaster Cast

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## Abstract

**Objective:** Conservative treatment, including closed reduction and immobilization with an above-elbow plaster cast, is still the most prevalent method of treating forearm fractures in children. However, side effects of conservative treatment with a plaster cast include malunion, joint stiffness, and compartment syndrome. The therapeutic environment has changed thanks to the titanium elastic nailing system (TENS). The care of pediatric forearm fractures was the focus of the comparison of titanium elastic nailing versus conservative treatment using a plaster cast.

**Method:** This study was carried out at Department of Orthopaedic, Veer Surendra Sai Institute of Medical Sciences and Research, Burla, from June 2021 to July 2022. 50 patients with diaphyseal forearm fractures in the age range of 4 to 16 years were treated with internal fixation utilizing TENS, while another 50 patients were treated conservatively with a plaster cast. 12 months of prospective follow-up were conducted, and the results were examined.

**Results:** Among patients treated with TENS, 44 (87.4%) cases had outstanding functional outcomes, 3 (11%) had acceptable outcomes, and 2 (1.6%) had fair outcomes. 22 (77.4%) of patients who received conservative treatment with a POP cast had outstanding functional outcomes, 13 (17.4%) had acceptable outcomes, and 5 (5.2%) had fair outcomes.

**Conclusion:** In terms of a functional output with little difficulties, TENS provides numerous advantages over a more conventionally conservative treatment strategy.

**Keywords:** Children's fractures, plaster cast, titanium elastic nails, forearm, and diaphyseal.

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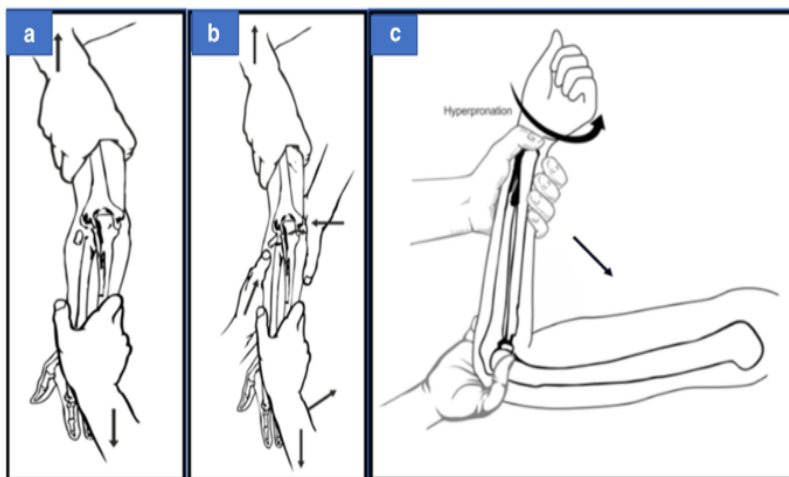
## Introduction

The orthopaedic community faces substantial obstacles as a result of paediatric fractures. According to epidemiologic research, 18% of kids will fracture by the time they are 9 years old, with kids between the ages of 5 and 14

having the highest fracture incidence [1]. Because to the high prevalence of fractures in children, it is crucial to treat them properly while also acknowledging the potential psychosocial effects a fracture may have,

including restricting physical activity and compromising a child's academic performance. Forearm fractures, which account for 40% of all paediatric fractures, are the third most frequent fracture in children [2]. Because to the special characteristic of the juvenile bones' ability for

growth, closed reduction and plaster cast application have historically been the gold standard in the care of these fractures [FIGURE 1]. Nevertheless, particularly in older children, there are greater odds of redisplacement leading to shortening, angulation, and rotation.



**Figure 1: Close reduction**

In an effort to enhance clinical outcomes, there is a growing tendency towards more surgical care of these fractures. TENS surgery is a minimally invasive approach that spares the physis, offers three points of fixation, and so frequently does not require a plaster of Paris (POP) splint or cast, enabling early mobilisation to achieve outstanding functional results [3-5].

## Methods

**Study Design:** 100 young patients with displaced diaphyseal forearm fractures were treated at Department of Orthopaedic, Veer Surendra Sai Institute of Medical Sciences and Research, Burla from June 2021 to July 2022 using a titanium elastic nail system and conservative care with a plaster cast.

**Methodology:** Sedation was administered to patients who were chosen for care using conservative techniques, and the fracture was reduced. Afterwards a POP cast above the elbow was used to immobilise the patient.

The patient was monitored for any urgent problems like ischemia or edoema. If the patient notices any bluish discoloration of the fingers or intense pain, they are urged to go directly to the hospital. Beginning were the passive and active finger movements. After 4 weeks, the POP cast was removed. Patients' functional and cosmetic outcomes were assessed at the conclusion of the second week, third week, fifth week, fourth month, and seventh month.

The patient was positioned on the operating table in the supine position with the afflicted arm resting on a radiolucent arm table for surgical treatment via TENS.

The right diameter titanium elastic nails were chosen. The nail sizes were roughly two-thirds the width of each bone's medullary isthmus. After that, an entry point was made in the bones using an awl. The radius was entered through Lister's tubercle or a site close to the radial styloid [2]. The posterior side of the olecranon or a lateral approach

through the proximal metaphysis are two possible locations for the antegrade entrance site into the ulna [2].

The distal metaphysis served as the ulna's retrograde entry site. The vast majority of the time, closed reduction was used. In a few instances when closed reduction was not possible, internal fixation with a titanium elastic nail was performed after making a small incision over the fracture site.

#### Inclusion criteria:

1. Displaced diaphyseal forearm fracture in children ages 4 to 14
2. Children between the ages of 4 and 14 with a complex forearm fracture (Grade 1 and Grade 2)

#### Exclusion criteria:

1. Children who are older than 14 years old.
2. Younger than 4-year-old children.
3. Kids with physical injuries.
4. Cases where there is a radial head fracture and an ulnar fracture.
5. Children between the ages of 4 and 14 with a complex forearm fracture (Grade 3)
6. Disruption of the distal radioulnar joint and both forearm bones fractured.

**Ethical Consideration:** The study was approved by the ethical committee of Veer

Surendra Sai Institute of Medical Sciences and Research, Burla after written consent was obtained from the subjects.

#### Results

In this study, 44 cases (87.4%) had excellent functional outcomes, 3 cases (11%) had passable results, and 2 cases (1.6%) had fair results. Among the patients who had conservative care and a POP cast, 22 (77.4%) had excellent functional results, 13 (17.4%) had passable results, and 5 (5.2%) had fair results. Mann-Whitney U Score was determined to be 560 when comparing TENS with cautious care, and p-value was less than 0.04. Three (11%) of the TENS patients had superficial infections that were treated with local antibiotics and recovered, and one (4%) incidence of neuropraxia involving the superficial radial nerve was found; this case cleared after a few weeks without causing any long-term complications. Three (11%) incidences of malunion occur in patients receiving conservative care with a POP cast, and one (4%) cases have poor cosmesis. In 2 (7.4%) of the patients, forearm rotational movements are severely restricted. 7 (20%) cases have an elbow's range of motion that is less than usual [Table 1]

**Table 1: Functional outcome**

Function Outcome	TENS		Conservative Group	
	No. of patients	Percentage	No. of patients	Percentage
Excellent	45	87.5%	22	77.4
Good	4	11%	13	17.4
Fair	2	1.6%	5	5.2
Poor	0	0	0	0
Mann-Whitney U Score And p-value	Mann-Whitney U Score= 560 P-value <0.04			

#### Discussion

One of the most typical childhood fractures is a broken forearm on both sides. Closed

reduction and casting, open reduction and plating, and open or close reduction with

internal fixation by titanium elastic nails, K-wire, and ender's nails are the most often utilised procedures for treating both bone forearms. The goal of the treatment is to prevent problems while achieving functionally and aesthetically pleasing results. The superiority of one method over another has not yet been demonstrated in the literature of today. In this study, we assessed both conservative and TENS treatment for bone forearm fractures and gave clinical advice for the best course of treatment, concentrating particularly on the pediatric age group.

According to pricing *et al's* criteria [6], 87.4% of TENS patients had outstanding functional outcomes, 11% had good results, and 1.6% had fair results.

All subjects eventually had a full range of motion and no functional deformity or complaints. According to pricing *et al's* criteria, [6] 57.4% of patients who received POP Cast had outstanding results, 34% had good results, and 5.2% had fair results. Children's diaphyseal forearm fractures treated by Calder and Barry with elastic stable intramedullary nailing had excellent results [7].

Good functional results were achieved by Malek IA, Webster R, Garg NK, Bruce CE, and Bass A, and any problems were minor and brief [8]. A full range of elbow and wrist movements were observed in all cases in the study by Houshain S. and Bajaj SK, which involved single bone fixation of both forearm bones with radiological union at a median of 6.7 weeks and at follow-up [9]. Excellent outcomes and full range of motion were achieved in 92% of the 85 patients with forearm fractures treated with elastic intramedullary nails by Lascombes *et al.* [10].

The majority of patients with diaphyseal forearm fractures who had TENS treatment showed outstanding functional results,

according to Vishwanath C and Satheesh GS [11].

### Conclusion

When compared to more conventional conservative care, this TENS approach for treating pediatric forearm fractures has several advantages in terms of functional results with few problems and cosmesis. It also benefits from maintaining fracture reduction, promoting fracture union, and avoiding cast-related problems.

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