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Original Research Article

CONSERVATIVE TREATMENT VS TENS NAILING IN BOTH BONE FOREARM FRACTURE IN PAEDIATRIC AGE GROUP: A COMPARATIVE STUDY

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ABSTRACT

Background: Both-bone forearm fractures are among the most common fractures in the paediatric age group and may affect forearm rotation, alignment, and upper limb function if not treated appropriately. Conservative treatment with closed reduction and casting has traditionally been used for stable fractures, while Titanium Elastic Nailing System (TENS) is increasingly preferred for unstable, displaced, or complete fractures due to better stabilization and early mobilization. The aim is to compare the functional and radiological outcomes of conservative treatment and TENS nailing in paediatric patients with both-bone forearm fractures.

Materials and Methods: This prospective cohort study was conducted in the Department of Orthopaedics, Regional Institute of Medical Sciences, Imphal, Manipur, from April 2023 to March 2025. A total of 80 paediatric patients with radiologically confirmed both-bone forearm fractures were included. Forty patients were treated with closed reduction and casting, and 40 patients underwent TENS nailing. Patients were assessed clinically and radiologically at regular follow-up intervals. Functional outcome was evaluated using Price criteria, while radiological outcome was assessed by union status, angular deformity, and limb length discrepancy. Data were analysed using appropriate statistical tests, with p-value less than 0.05 considered statistically significant.

Results: The baseline demographic characteristics were comparable between the two groups. The 6–10 years age group was most commonly affected in both groups, and male predominance was observed. Closed fractures were common in both groups, while complete fractures were more frequent in the TENS group. The mean time of union was significantly shorter in the TENS group compared to the casting group (6.5 ± 1.0 weeks versus 8.5 ± 1.2 weeks, p=0.03). No pain was reported by 75.0% of patients in the TENS group compared to 50.0% in the casting group. Excellent functional outcome was achieved in 75.0% of TENS patients and 50.0% of casting patients. Loss of reduction and angular or rotational deformity were more common in the casting group. Complete union was observed in 95.0% of TENS patients and 87.5% of casting patients.

Conclusion: Both treatment methods were effective, but TENS nailing provided faster union, better early functional outcome, improved pain relief, and fewer deformity-related complications. Casting remains suitable for stable fractures, whereas TENS is preferable for unstable, complete, or displaced fractures.

Keywords: Paediatric forearm fracture; Both-bone forearm fracture; Conservative treatment; TENS nailing; Functional outcome.

INTRODUCTION

Both-bone forearm fractures, involving the radius and ulna, are among the commonest fractures seen in the paediatric age group. These injuries usually occur following a fall on an outstretched hand, direct trauma, road traffic accident, or sports-related activity. Forearm fractures constitute a major proportion of childhood fractures and are seen more commonly in boys, especially during the active school-going age group. Because the forearm plays an important role in pronation and supination, accurate restoration of length, alignment, and rotation is essential for achieving good functional recovery.[1] Paediatric forearm fractures may involve the distal, middle, or proximal third of the radius and ulna and may present as greenstick, complete, displaced, or unstable fractures. The outcome of treatment depends on the age of the child, site of fracture, degree of angulation, rotational deformity, displacement, and remodelling potential. Younger children have greater remodelling capacity and can tolerate some degree of angulation, whereas older children have less remodelling potential and are more prone to functional limitation if malalignment persists. Therefore, treatment should aim to restore acceptable anatomical alignment while preserving forearm rotation and preventing deformity.[2] Conservative treatment by closed reduction and above-elbow cast immobilization has traditionally been the standard treatment for most paediatric both-bone forearm fractures. It is simple, safe, cost-effective, and avoids surgical risks. Stable fractures, minimally displaced fractures, and fractures in younger children usually show satisfactory union and functional recovery with casting. However, conservative treatment may be associated with redisplacement, loss of reduction, malunion, stiffness, and limitation of pronation-supination, particularly in unstable, complete, or proximal-third fractures.[3] Surgical treatment is indicated when acceptable reduction cannot be achieved or maintained by closed methods, and in cases of unstable fractures, open fractures, severe displacement, unacceptable angulation, rotational deformity, or failure of conservative management. Operative options include plate fixation, K-wire fixation, and intramedullary fixation. Although plating provides rigid anatomical reduction, it requires extensive soft tissue dissection and may be associated with larger scars, infection, periosteal stripping, and difficult implant removal. These limitations have increased the preference for minimally invasive fixation techniques in children.[4] Titanium Elastic Nailing System (TENS) has emerged as an effective method for managing unstable paediatric both-bone forearm fractures. It provides elastic three-point fixation, maintains fracture alignment, preserves fracture haematoma and periosteal blood supply, and allows early mobilization. TENS is particularly useful in displaced and unstable fractures, especially in older children where remodelling potential is reduced. Compared with plating, it is less invasive, cosmetically better, and allows easier implant removal after fracture union.[5] Despite the increasing use of TENS, conservative treatment continues to remain effective for selected stable paediatric forearm fractures. Both methods have their own advantages and limitations. Casting avoids surgical complications but carries the risk of loss of reduction, whereas TENS offers better stability and early functional recovery but may be associated with implant irritation, infection, and the need for a second procedure for implant removal. Therefore, comparison between conservative treatment and TENS nailing is important to determine their relative effectiveness in terms of fracture union, pain relief, functional outcome, radiological alignment, complications, and overall recovery in paediatric both-bone forearm fractures.[6]

MATERIALS AND METHODS

This prospective cohort study was conducted to compare the functional and radiological outcomes of conservative treatment with casting and Titanium Elastic Nailing System (TENS) nailing in paediatric patients with both-bone forearm fractures. The study was carried out in the Department of Orthopaedics, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur. Patients were recruited from both the orthopaedic outpatient department and the emergency department. The study was conducted over a period of two years, from April 2023 to March 2025.

The study included paediatric patients presenting with radiologically confirmed both-bone forearm fractures during the study period. Patients were included after applying the eligibility criteria and obtaining informed written consent from their legal guardians. The inclusion criteria consisted of paediatric patients aged more than 3 years and less than 14 years with radiologically confirmed both-bone forearm fractures who were willing to undergo treatment and participate in the study. Patients aged less than 3 years or more than 14 years, patients with bilateral forearm fractures, polytrauma cases, neurovascular injuries, additional fractures of the ipsilateral upper limb, previous displaced forearm fractures, or systemic and metabolic conditions affecting fracture healing were excluded from the study. Participants fulfilling the criteria were selected consecutively until the required sample size of 80 was achieved. Convenience sampling was used for recruitment.

Methodology: Relevant demographic and clinical details were recorded for all patients, including age, sex, side of injury, mode of injury, limb deformity, associated injuries, nature of injury, and time interval between injury and treatment. Fracture-related details such as type of fracture, duration of hospital stay, and any relevant medical history affecting fracture

management or healing were also documented. Data were collected using a structured proforma for demographic and clinical details and a semi-structured proforma for clinical history, mechanism of injury, and associated factors. Radiographs of the forearm in anteroposterior and lateral views were obtained to confirm the diagnosis and assess fracture characteristics. Functional and radiological outcomes were assessed using Daruwalla grading criteria, while pain and forearm rotation were evaluated using the Price criteria during follow-up.

Treatment Procedure: All patients underwent initial clinical and radiological assessment. Vascular and neurological status of the affected limb was assessed before treatment. Patients were allocated to either the conservative treatment group or the TENS nailing group based on clinical judgment and fracture characteristics. In the conservative group, fractures were reduced within three days of injury, and a synthetic circular above-elbow cast was applied with the forearm in a neutral position of pronation and supination. Final fracture alignment was confirmed using standard anteroposterior and lateral radiographs after cast application. If reduction failure was noted within 10 days, defined as unacceptable angulation or shortening on follow-up radiographs, cast wedging was performed in the outpatient clinic, followed by repeat radiological assessment. The cast was generally maintained for six weeks, and patients were reviewed regularly for fracture healing, range of motion, and maintenance of alignment.

In the TENS group, patients underwent preoperative evaluation and counselling. Radiographs in two planes were obtained, and antibiotics were administered on the day of surgery. Under appropriate anaesthesia, patients were positioned supine on a radiolucent arm table. Titanium elastic nails of suitable diameter were selected according to the medullary canal size. For the radius, the entry point was made either just proximal to the radial styloid or through Lister's tubercle. For the ulna, the entry point was made either at the posterior aspect of the olecranon or at the distal metaphysis. Nails were inserted manually with oscillating movements and advanced across the fracture site after reduction. Closed reduction was achieved in most cases, while a small incision was used where required to aid reduction. The protruding ends of the nails were trimmed appropriately. Postoperatively, most patients did not require external immobilization, although a plaster of Paris slab was applied for two weeks in selected cases with soft tissue injury. Distal neurovascular status was checked after surgery, and early range-of-motion exercises were encouraged as clinically appropriate.

Follow-Up and Outcome Assessment: Patients in both groups were followed up at 10 days, six weeks, three months, six months, and one year. Clinical evaluation included assessment of pain, tenderness, limb deformity, and functional recovery. Range of motion of the forearm was measured using a goniometer and compared with the unaffected limb. Functional outcome was graded according to Daruwalla criteria and the Price criteria, which assessed symptoms and loss of forearm rotation. Radiological assessment was performed using anteroposterior and lateral radiographs. Fracture union was determined by the presence of bridging callus and partial obliteration of the fracture line. Angular deformity was measured on conventional radiographs, and limb length discrepancy was assessed by measuring the distance between the lateral epicondyle of the humerus and the radial styloid process.

Ethical Clearance: Ethical clearance was obtained from the Research Ethics Board, RIMS Imphal, before commencement of the study. Informed written consent was obtained from the legal guardians of all participants prior to inclusion. Privacy and confidentiality of patient information were maintained throughout the study.

Statistical Analysis: Data were entered in Microsoft Excel and analysed using Statistical Package for Social Sciences software, version 25.0. Categorical variables were presented as numbers and percentages, while quantitative variables were expressed as mean ± standard deviation. Normality of data was assessed using the Shapiro-Wilk test. Quantitative variables were compared using the independent t-test, while qualitative variables were analysed using the Chi-square test. Fisher's exact test was applied when the expected value in any cell was less than 5.

RESULTS

In the present study, a total of 80 paediatric patients with both-bone forearm fractures were included, with 40 patients managed by casting and 40 patients managed by TENS nailing. The baseline demographic characteristics were comparable between the two groups. In the casting group, most patients belonged to the 6–10 years age group, accounting for 18 cases (45.0%), followed by 11–15 years with 13 cases (32.5%) and 0–5 years with 9 cases (22.5%). In the TENS group also, the 6–10 years age group formed the largest proportion with 18 cases (45.0%), followed by 11–15 years with 16 cases (40.0%) and 0–5 years with 6 cases (15.0%). The difference in age distribution was not statistically significant (p=0.61). Male predominance was observed in both groups, with 27 males (67.5%) in the casting group and 29 males (72.5%) in the TENS group. Females accounted for 13 cases (32.5%) and 11 cases (27.5%) respectively. The difference in sex distribution was not statistically significant (p=0.81). Right-sided injury was more common in the casting group, seen in 26 patients (65.0%), whereas in the TENS group, right-sided injury was seen in 21 patients (52.5%). Left-sided injury was noted in 14 patients (35.0%) in the casting group and 19 patients (47.5%) in the TENS group. This difference was also not statistically significant (p=0.36).

Regarding injury characteristics, closed fractures were more common than open fractures in both

groups. In the casting group, 33 patients (82.5%) had closed fractures and 7 patients (17.5%) had open fractures, while in the TENS group, 30 patients (75.0%) had closed fractures and 10 patients (25.0%) had open fractures. The difference in nature of injury between the groups was not statistically significant (p=0.58). The middle third of the forearm was the most common fracture level in both groups, involving 22 patients (55.0%) in the casting group and 29 patients (72.5%) in the TENS group. Distal-third fractures were equally distributed, with 7 patients (17.5%) in each group, while proximal-third fractures were seen in 11 patients (27.5%) in the casting group and 4 patients (10.0%) in the TENS group. The difference in fracture level was not statistically significant (p=0.12). Greenstick fractures were more frequent in the casting group, with 25 cases (62.5%), compared to 10 cases (25.0%) in the TENS group. Complete fractures were more frequent in the TENS group, with 30 cases (75.0%), compared to 15 cases (37.5%) in the casting group. The differences in fracture type were statistically significant, with p=0.01 for greenstick fractures and p=0.02 for complete fractures.

The most common mode of injury was fall from height, seen in 20 patients (50.0%) in the casting group and 15 patients (37.5%) in the TENS group, with no statistically significant difference (p=0.39). Road traffic accidents accounted for 12 cases (30.0%) in the casting group and 13 cases (32.5%) in the TENS group (p=0.84). Sports injuries were reported in 6 patients (15.0%) in the casting group and 9 patients (22.5%) in the TENS group (p=0.43), while other causes were reported in 2 patients (5.0%) and 3 patients (7.5%) respectively (p=0.65). Angular deformity was more commonly observed in the casting group, affecting 10 patients (25.0%), compared to 3 patients (7.5%) in the TENS group, and this difference was statistically significant (p=0.01). Rotational deformity was also higher in the casting group, seen in 8 patients (20.0%), compared to 2 patients (5.0%) in the TENS group (p=0.03). No significant deformity was observed in 22 patients (55.0%) in the casting group and 35 patients (87.5%) in the TENS group, showing a statistically significant difference (p=0.03). Associated injuries were relatively uncommon in both groups. Head injury was noted in 2 patients (5.0%) in the casting group and 1 patient (2.5%) in the TENS group (p=0.56). Soft tissue injury was present in 5 patients (12.5%) and 4 patients (10.0%) respectively (p=0.74), while other fractures were seen in 3 patients (7.5%) and 2 patients (5.0%) respectively (p=0.65). Most patients had no associated injuries, with 30 cases (75.0%) in the casting group and 33 cases (82.5%) in the TENS group (p=0.70).

Both treatment groups had an equal number of participants, with 40 patients (50.0%) treated by casting and 40 patients (50.0%) treated by TENS nailing. The time elapsed between injury and treatment showed no statistically significant difference between the groups. Treatment within 6 hours was received by 20 patients (50.0%) in the casting group and 15 patients (37.5%) in the TENS group (p=0.39). Treatment between 6–12 hours was received by 12 patients (30.0%) in the casting group and 18 patients (45.0%) in the TENS group (p=0.27), while treatment after more than 12 hours was received by 8 patients (20.0%) and 7 patients (17.5%) respectively (p=0.79). Duration of hospital stay differed significantly between the two groups. A hospital stay of 1–3 days was more common in the casting group, seen in 35 patients (87.5%), compared to 10 patients (25.0%) in the TENS group (p=0.01). A stay of 4–7 days was more frequent in the TENS group, seen in 25 patients (62.5%), compared to 5 patients (12.5%) in the casting group (p=0.02). Hospital stay of more than 7 days was observed only in the TENS group, involving 5 patients (12.5%), while none of the casting patients required such prolonged stay (p=0.02). The mean time of union was shorter in the TENS group, with 6.5 ± 1.0 weeks, compared to 8.5 ± 1.2 weeks in the casting group, and this difference was statistically significant (p=0.03). The mean time for implant removal in the TENS group was 9.0 ± 1.5 months.

Pain and functional outcomes showed better results in the TENS group. No pain was reported by 30 patients (75.0%) in the TENS group compared to 20 patients (50.0%) in the casting group (p=0.05). Mild pain with activity was reported by 15 patients (37.5%) in the casting group and 8 patients (20.0%) in the TENS group (p=0.04). Moderate pain was present in 5 patients (12.5%) in the casting group and 2 patients (5.0%) in the TENS group (p=0.05). No patient in either group had severe pain. According to the Price criteria, excellent outcomes were achieved in 30 patients (75.0%) in the TENS group compared to 20 patients (50.0%) in the casting group, and this difference was statistically significant (p=0.04). Good outcomes were seen in 15 patients (37.5%) in the casting group and 7 patients (17.5%) in the TENS group (p=0.03), while fair outcomes were seen in 5 patients (12.5%) and 3 patients (7.5%) respectively (p=0.05). No poor outcome was reported in either group. Complications were more common in the casting group for loss of reduction and deformity. Loss of reduction occurred in 8 patients (20.0%) in the casting group compared to 2 patients (5.0%) in the TENS group (p=0.04). Superficial infection was seen in 2 patients (5.0%) in the casting group and 3 patients (7.5%) in the TENS group (p=0.06). Nail irritation was observed only in the TENS group, affecting 5 patients (12.5%). Angular or rotational deformity occurred in 5 patients (12.5%) in the casting group and 1 patient (2.5%) in the TENS group (p=0.03). No complications were reported in 25 patients (62.5%) in the casting group and 29 patients (72.5%) in the TENS group (p=0.07).

Radiological outcomes showed a higher rate of complete union in the TENS group, although the difference was not statistically significant. Complete union was observed in 35 patients (87.5%) in the casting group and 38 patients (95.0%) in the TENS

group (p=0.42), while partial union was seen in 5 patients (12.5%) and 2 patients (5.0%) respectively. Acceptable angular deformity of less than 10° was observed in 30 patients (75.0%) in the casting group and 37 patients (92.5%) in the TENS group (p=0.06). Unacceptable angular deformity of more than 10° was seen in 10 patients (25.0%) in the casting group and 3 patients (7.5%) in the TENS group. Limb length discrepancy of less than 1 cm was noted in 38 patients (95.0%) in the casting group and all 40 patients (100.0%) in the TENS group (p=0.47). Limb length discrepancy of more than 1 cm was observed in 2 patients (5.0%) in the casting group and none in the TENS group.

Follow-up assessment showed progressive improvement in both groups, with comparatively better early outcomes in the TENS group. At 10 days, excellent results were seen in 10 patients (25.0%) in the casting group and 15 patients (37.5%) in the TENS group, while good results were seen in 15 patients (37.5%) and 20 patients (50.0%) respectively. Fair results were observed in 10 patients (25.0%) in the casting group and 5 patients (12.5%) in the TENS group, while poor results were seen only in the casting group in 5 patients (12.5%). The difference at 10 days was statistically significant (p=0.03). At 6 weeks, excellent outcomes were noted in 20 patients (50.0%) in the casting group and 25 patients (62.5%) in the TENS group, while good outcomes were seen in 10 patients (25.0%) in each group. Fair outcomes were seen in 5 patients (12.5%) in each group, and poor outcomes were present in 5 patients (12.5%) in the casting group but none in the TENS group. The difference was not statistically significant (p=0.13). At 3 months, excellent outcomes were observed in 30 patients (75.0%) in the casting group and 35 patients (87.5%) in the TENS group. Good outcomes were present in 5 patients (12.5%) in each group, while fair outcomes were seen only in the casting group in 5 patients (12.5%). No poor outcomes were reported at this stage, and the difference was not statistically significant (p=1.0). At 6 months, excellent outcomes increased to 35 patients (87.5%) in the casting group and 38 patients (95.0%) in the TENS group, while good outcomes were seen in 5 patients (12.5%) and 2 patients (5.0%) respectively. No fair or poor outcomes were observed at 6 months, and the difference was not statistically significant (p=0.43). At 1 year, all patients in both groups achieved excellent outcomes, with 40 patients (100.0%) in each group showing complete functional recovery.

Table 1: Baseline Demographic Characteristics of Study Participants

Variable	Category	Casting (n=40)	TENS (n=40)	P-value
Age group	0–5 years	9 (22.5%)	6 (15.0%)	0.61
	6–10 years	18 (45.0%)	18 (45.0%)	
	11–15 years	13 (32.5%)	16 (40.0%)	
Sex	Female	13 (32.5%)	11 (27.5%)	0.81
	Male	27 (67.5%)	29 (72.5%)	
Side of injury	Left	14 (35.0%)	19 (47.5%)	0.36
	Right	26 (65.0%)	21 (52.5%)	

Table 2: Injury Characteristics of Study Participants

Variable	Category	Casting (n=40)	TENS (n=40)	P-value
Nature of injury	Closed	33 (82.5%)	30 (75.0%)	0.58
	Open	7 (17.5%)	10 (25.0%)	
Fracture level	Distal third	7 (17.5%)	7 (17.5%)	0.12
	Middle third	22 (55.0%)	29 (72.5%)	
	Proximal third	11 (27.5%)	4 (10.0%)	
Type of fracture	Greenstick fracture	25 (62.5%)	10 (25.0%)	0.01
	Complete fracture	15 (37.5%)	30 (75.0%)	0.02

Table 3: Mode of Injury, Deformity and Associated Injuries

Variable	Category	Casting (n=40)	TENS (n=40)	P-value
Mode of injury	Fall from height	20 (50.0%)	15 (37.5%)	0.39
	Road traffic accident	12 (30.0%)	13 (32.5%)	0.84
	Sports injury	6 (15.0%)	9 (22.5%)	0.43
	Others	2 (5.0%)	3 (7.5%)	0.65
Deformity	Angular deformity	10 (25.0%)	3 (7.5%)	0.01
	Rotational deformity	8 (20.0%)	2 (5.0%)	0.03
	No significant deformity	22 (55.0%)	35 (87.5%)	0.03
Associated injury	Head injury	2 (5.0%)	1 (2.5%)	0.56
	Soft tissue injury	5 (12.5%)	4 (10.0%)	0.74
	Other fractures	3 (7.5%)	2 (5.0%)	0.65
	No associated injuries	30 (75.0%)	33 (82.5%)	0.70

Table 4: Treatment Details and Hospital Stay

Variable	Category	Casting	TENS	P-value
Treatment procedure	Number of participants	40 (50.0%)	40 (50.0%)	1.0
Time elapsed between injury and treatment	<6 hours	20 (50.0%)	15 (37.5%)	0.39
	6–12 hours	12 (30.0%)	18 (45.0%)	0.27

	>12 hours	8 (20.0%)	7 (17.5%)	0.79
Duration of hospital stay	1–3 days	35 (87.5%)	10 (25.0%)	0.01
	4–7 days	5 (12.5%)	25 (62.5%)	0.02
	>7 days	0 (0.0%)	5 (12.5%)	0.02
Average time of union	Mean ± SD	8.5 ± 1.2	6.5 ± 1.0	0.03
Implant removal	Mean ± SD	—	9.0 ± 1.5	—

Table 5: Functional Outcome, Pain and Complications

Variable	Category	Casting (n=40)	TENS (n=40)	P-value
Pain scale outcome	No pain	20 (50.0%)	30 (75.0%)	0.05
	Mild pain with activity	15 (37.5%)	8 (20.0%)	0.04
	Moderate pain	5 (12.5%)	2 (5.0%)	0.05
	Severe pain	0 (0.0%)	0 (0.0%)	—
Price criteria	Excellent	20 (50.0%)	30 (75.0%)	0.04
	Good	15 (37.5%)	7 (17.5%)	0.03
	Fair	5 (12.5%)	3 (7.5%)	0.05
	Poor	0 (0.0%)	0 (0.0%)	—
Complications	Loss of reduction	8 (20.0%)	2 (5.0%)	0.04
	Superficial infection	2 (5.0%)	3 (7.5%)	0.06
	Nail irritation	0 (0.0%)	5 (12.5%)	—
	Angular/rotational deformity	5 (12.5%)	1 (2.5%)	0.03
	No complications	25 (62.5%)	29 (72.5%)	0.07

Table 6: Radiological and Follow-Up Outcomes

Variable	Category	Casting (n=40)	TENS (n=40)	P-value
Union	Complete union	35 (87.5%)	38 (95.0%)	0.42
	Partial union	5 (12.5%)	2 (5.0%)	
Angular deformity	<10° acceptable	30 (75.0%)	37 (92.5%)	0.06
	>10° unacceptable	10 (25.0%)	3 (7.5%)	
Limb length discrepancy	<1 cm	38 (95.0%)	40 (100.0%)	0.47
	>1 cm	2 (5.0%)	0 (0.0%)	
10 days follow-up	Excellent	10 (25.0%)	15 (37.5%)	0.03
	Good	15 (37.5%)	20 (50.0%)	
	Fair	10 (25.0%)	5 (12.5%)	
	Poor	5 (12.5%)	0 (0.0%)	
6 weeks follow-up	Excellent	20 (50.0%)	25 (62.5%)	0.13
	Good	10 (25.0%)	10 (25.0%)	
	Fair	5 (12.5%)	5 (12.5%)	
	Poor	5 (12.5%)	0 (0.0%)	
3 months follow-up	Excellent	30 (75.0%)	35 (87.5%)	1.0
	Good	5 (12.5%)	5 (12.5%)	
	Fair	5 (12.5%)	0 (0.0%)	
	Poor	0 (0.0%)	0 (0.0%)	
6 months follow-up	Excellent	35 (87.5%)	38 (95.0%)	0.43
	Good	5 (12.5%)	2 (5.0%)	
	Fair	0 (0.0%)	0 (0.0%)	
	Poor	0 (0.0%)	0 (0.0%)	
1 year follow-up	Excellent	40 (100.0%)	40 (100.0%)	—
	Good	0 (0.0%)	0 (0.0%)	
	Fair	0 (0.0%)	0 (0.0%)	
	Poor	0 (0.0%)	0 (0.0%)	

DISCUSSION

In the present study, the commonest age group was 6–10 years in both groups, with 18 patients (45.0%) each in the casting and TENS groups. Male predominance was also observed, with 27 males (67.5%) in the casting group and 29 males (72.5%) in the TENS group. These findings are comparable to Hedström et al. (2010), who reported a male-to-female incidence ratio of 1.5 and noted that fracture incidence increased with age during childhood and adolescence. The similarity suggests that paediatric forearm fractures are more frequent among active school-aged boys due to greater outdoor activity and trauma exposure.[7] Injury mechanism in the present study showed that fall from height was the commonest cause, accounting for 20 cases (50.0%) in the casting group and 15 cases (37.5%) in the TENS group, followed by road traffic accidents. This pattern is similar to Hikichi et al. (2022), who studied 1379 paediatric limb fractures and reported that falls or turnover were responsible for 969 cases (70%), while school-aged children between 6 and 10 years formed the largest group with 553 cases (40%).[8] Closed fractures were more common in both groups in the present study, with 33 cases (82.5%) in the casting group and 30 cases (75.0%) in the TENS group. The middle third was the commonest fracture level, involving 22 patients (55.0%) in the casting group and 29 patients (72.5%) in the TENS group. Caruso et al. (2021) stated that conservative management with cast immobilization remains safe and successful for many paediatric forearm fractures,

while surgical fixation is indicated when acceptable reduction cannot be achieved or maintained. This supports the present finding that casting was used more often for stable fracture patterns, while TENS was preferred for more unstable injuries.[9] In the present study, greenstick fractures were significantly more common in the casting group, with 25 cases (62.5%), whereas complete fractures were more common in the TENS group, with 30 cases (75.0%). This difference was statistically significant. Vopat et al. (2014) also emphasized that treatment choice in paediatric diaphyseal forearm fractures depends on age, fracture stability, displacement, and ability to maintain reduction, with unstable or complete fractures more likely to require operative stabilization.[10] The present study showed that angular deformity was significantly higher in the casting group, affecting 10 patients (25.0%), compared with 3 patients (7.5%) in the TENS group. Rotational deformity was also higher in the casting group, with 8 cases (20.0%) compared with 2 cases (5.0%) in the TENS group. Similarly, Rokaya et al. (2017) reported radiological union at 7.75 ± 1.5 weeks after elastic stable intramedullary nailing, with excellent results in 29 patients (80.6%) and an overall complication rate of 22.2%, showing that elastic nailing provides good alignment and functional recovery in paediatric diaphyseal forearm fractures.[11] Duration of hospital stay was shorter in the casting group in the present study, as 35 patients (87.5%) stayed for only 1–3 days, compared with 10 patients (25.0%) in the TENS group. However, fracture union was faster in the TENS group, with mean union time of 6.5 ± 1.0 weeks compared with 8.5 ± 1.2 weeks in the casting group. Yalçinkaya et al. (2010) reported that intramedullary nailing in unstable paediatric diaphyseal forearm fractures maintained alignment and supported rapid healing, which is consistent with the faster union observed in the TENS group in this study.[12] Pain outcome was better in the TENS group in the present study, with 30 patients (75.0%) reporting no pain compared with 20 patients (50.0%) in the casting group. Mild pain with activity was lower in the TENS group, affecting 8 patients (20.0%), compared with 15 patients (37.5%) in the casting group. Kapila et al. (2016) reported favourable clinical outcomes after TENS fixation in paediatric forearm fractures, supporting the present observation that better fracture stability with intramedullary fixation may reduce pain during recovery.[13] Functional outcome according to Price criteria was superior in the TENS group, where excellent results were seen in 30 patients (75.0%) compared with 20 patients (50.0%) in the casting group. No poor outcome was observed in either group. Jain et al. (2023) reported excellent to good results in more than 98% of children treated with TENS and found excellent results in 59 patients (90.8%), good results in 5 patients (7.7%), and fair result in 1 patient (1.5%), which supports the favourable functional outcome observed in the TENS group.[14] Complications in the present study were more frequent in the casting group for loss of reduction and deformity. Loss of reduction occurred in 8 patients (20.0%) in the casting group compared with 2 patients (5.0%) in the TENS group, while angular or rotational deformity occurred in 5 patients (12.5%) and 1 patient (2.5%) respectively. Pogorelić et al. (2020) reported that elastic stable intramedullary nailing is a safe and effective method for paediatric forearm fractures, although complications such as irritation and infection may occur. This is comparable to the present study, where nail irritation was observed in 5 TENS patients (12.5%), but loss of reduction was lower than in the casting group.[15] Radiological and follow-up outcomes improved progressively in both groups. Complete union was achieved in 35 patients (87.5%) in the casting group and 38 patients (95.0%) in the TENS group. At one year, all patients in both groups achieved excellent outcomes, with 40 patients (100.0%) in each group. Tella et al. (2024) reported excellent outcomes in 19 patients (73.1%) and satisfactory outcomes in 7 patients (26.9%) following titanium elastic nail fixation, with no poor results and only minor complications such as skin irritation. This supports the present finding that both treatment methods can achieve good final outcomes, although TENS provides faster early recovery and better early alignment.[16]

CONCLUSION

Both conservative casting and TENS nailing were effective treatment methods for paediatric both-bone forearm fractures. TENS nailing showed better early functional recovery, faster fracture union, improved pain relief, and fewer deformity-related complications compared to casting. However, casting remained a suitable option for stable and less displaced fractures, with shorter hospital stay and avoidance of surgical risks. Overall, TENS nailing appears to be a better treatment option for unstable, complete, or displaced fractures in the paediatric age group.

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