

**ORIGINAL RESEARCH**

# Comparison of Frequency of Complications of Paediatric Femoral Shaft Fractures Treated with Hip Spicca Versus Flexible Nails

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**ABSTRACT**

**Introduction:** Femoral shaft fractures are among the most common long-bone fractures in children and can result from both high-energy trauma, such as motor vehicle accidents, and low-energy impacts, often related to falls or sports activities. **Objectives:** The main objective of the study is to find the comparison of frequency of complications of paediatric femoral shaft fractures treated with hip spicca versus flexible nails. **Methodology:** This retrospective study was done and the data were collected from 85 patients with femoral shaft fractures were included in the study. Children aged 3 to 12 years with isolated femoral shaft fractures without additional injuries that might interfere with recovery were included in the study. Patients with associated comorbidities, prior fractures, or multiple traumas were excluded from the study. These patients were divided into two groups based on the treatment method received: hip spicca casting or flexible intramedullary nailing. **Results:** Data were collected from 85 patients with the hip spicca group averaging 5.01 years and 18 kg, while the FIN group averages 7.81 years and 25 kg, reflecting a slightly older and heavier patient profile for those treated with flexible intramedullary nailing. The hip spicca group had a slightly higher incidence of open fractures (11.1%) compared to the FIN group (5%), and the average time to treatment was slightly longer for the hip spicca group at 2 days versus 1 day for FIN. The analysis of complication rates indicates that hip spicca casting had a higher rate of complications (40%) compared to flexible intramedullary nailing (25%). Out of the 45 patients treated with hip spicca casting, 18 experienced complications, whereas only 10 out of 40 patients in the FIN group reported complications. **Conclusion:** It is concluded that flexible intramedullary nailing (FIN) offers a safer and more effective treatment option for pediatric femoral shaft fractures in older children, reducing complication rates and allowing faster functional recovery compared to hip spicca casting.

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**INTRODUCTION**

Femoral shaft fractures are among the most common long-bone fractures in children and can result from both high-energy trauma, such as motor vehicle accidents, and low-energy impacts, often related to falls or sports activities. Treatment of these fractures involves; age of the child, weight of the child, type of fracture, and presence of other injuries. In young children, conventional forms of treatment have included hip spicca casting because of their simplicity and cost [1]. However, in growing patients and even more in school age we are facing an increasing

number of children and adolescents in this context flexible intramedullary nailing FIN has proved to be a feasible and often preferred option as it can as well provide the potential for early mobilization and improved functional outcome [2]. Hip spicca casting which is non-surgical technique involves applying hip and knee POP (Plaster of Paris) or fiberglass cast that covers the waist down to the lower limbs so as to maintain the fracture fragment in correct position and alignment [3]. This approach I must indicate has some advantages that makes it useful when healing bones in the younger children but there are some disadvantages

especially in the cases of older children or high energy trauma cases. The risks involved in hip spica casting are skin problems like sores and skin infections arising from long periods of inactivity, and joint stiffness [4]. In addition, casting may cause late angular deformities or shortening if the position of the fracture changes with time, especially in more proactive kids or unstable fracture situations. Furthermore, these casts limit the child's movement, which requires long periods of in-bed rest, the child's, as well as the family's quality of life is affected [5]. In contrast, FIN has been established a popular trend in the management of children's fractures in the paediatric orthopaedic population especially children aged between 5 and 12 years. In this case, thin and pliant titanium or stainless-steel nails are slid into the intramedullary canal of the femur to hold the fractured area together in place [6]. Because the nails are flexible, stability is offered while possessing some elasticity that is necessary so that early movement can be facilitated and the load can be distributed across the fracture site. In this regard, the load-sharing capacity of FIN is fundamentally aligned with biological fixation as it fosters callus formation to favour the secondary bone healing [7]. In addition, flexible nailing also has multiple benefits regarding the time a child has to lay down absolutely motionless, decreased time that might require a child to be hospitalized and return to normal life and schooling as soon as possible [8]. However, as we shall see, FIN is not devoid of challenges of various ramifications as far as working capital management is concerned. Some problems include infection at the site where the nail is attached which can cause osteomyelitis or bursitis and secondly the nail backing maybe uncomfortable if it extends beyond the bone. Sometimes they have to be removed surgically and this brings an extra procedure in addition to the risks associated with it. There are other rarely reported complications which include; failure of the hardware, slow bone healing, as well as fracture reinjection after nail removal [9]. Infections are also an issue, and if an entrant has an entry point that gets infected after the surgery. The above-mentioned potential disadvantages underscore the need for employing proper surgical procedure and monitoring of the affected area after the operation in a bid to boost the recovery process [10]. These two treatment processes must be compared because they are entirely different from each other depending on the patient's age, fracture type, and general health. In regard to the comparison of frequencies of complications between hip spica casting and flexible nailing some researchers have shown that FIN may have less malunion and shorter period of immobilization but they have probably more infection as the procedure is more invasive than the casting [11]. Moreover, the economic benefit of each method can be different, for example, FIN has the need of surgical intervention and additional follow up procedures costs might overcome the initial cheap

price of casting. In fact, the long-term benefits of FIN might positively influence the gross academic achievement and save societal utility costs considering school-aged children as candidates might benefit from earlier return to normal activity and lose a minimum of family-related time [12].

## OBJECTIVES

The main objective of the study is to find the comparison of frequency of complications of paediatric femoral shaft fractures treated with hip spica versus flexible nails.

## METHODOLOGY

This retrospective study was done and the data were collected from 85 patients with femoral shaft fractures were included in the study. Children aged 3 to 12 years with isolated femoral shaft fractures without additional injuries that might interfere with recovery were included in the study. Patients with associated comorbidities, prior fractures, or multiple traumas were excluded from the study. These patients were divided into two groups based on the treatment method received: hip spica casting or flexible intramedullary nailing. Group 1 consisted of patients treated with hip spica casting, while Group 2 included those who underwent flexible nailing. All patients were between the ages of 3 and 12 years, the age range in which both treatment options are commonly considered. The patients were further categorized by age, fracture type, and any underlying health conditions that could impact healing. This demographic data was documented to provide context for any variations in complications between the two groups. Data was collected from patient medical records, including demographic information, type of fracture, treatment details, duration of immobilization, and follow-up information. Both groups were observed for a minimum of six months post-treatment to allow for adequate monitoring of complications. Data on clinical signs and laboratory results, including infections at surgical entry sites for the FIN group were noted. All patients were followed up at regular intervals—1 month, 3 months, and 6 months post-treatment to monitor recovery and document any complications.

## STATISTICAL ANALYSIS

Data were analyzed using SPSS v22. Descriptive statistics were used to outline patient demographics, fracture characteristics, and complication types. Chi-square tests were applied to evaluate categorical variables, while a t-test was used for continuous variables, such as age and healing duration. A p-value of <0.05 was considered statistically significant.

## RESULTS

Data were collected from 85 patients with the hip spica group averaging 5.01 years and 18 kg, while the FIN group averages 7.81 years and 25 kg, reflecting a

slightly older and heavier patient profile for those treated with flexible intramedullary nailing. The hip spica group had a slightly higher incidence of open fractures (11.1%) compared to the FIN group (5%), and the average time to treatment was slightly longer for the hip spica group at 2 days versus 1 day for FIN.

**Table 1: Demographic Data of Patients**

| Demographic Factor               | Hip Spica Group (n=45) | FIN Group (n=40) |
|----------------------------------|------------------------|------------------|
| Average Age (years)              | 5.01±0.89              | 7.81±1.60        |
| Age Range (years)                | 3-8                    | 6-12             |
| Male Patients (%)                | 25 (55.6%)             | 22 (55%)         |
| Female Patients (%)              | 20 (44.4%)             | 18 (45%)         |
| Average Weight (kg)              | 18                     | 25               |
| Fracture Type (Closed)           | 40 (88.9%)             | 38 (95%)         |
| Fracture Type (Open)             | 5 (11.1%)              | 2 (5%)           |
| Average Time to Treatment (days) | 2                      | 1                |

The analysis of complication rates indicates that hip spica casting had a higher rate of complications (40%) compared to flexible intramedullary nailing (25%). Out of the 45 patients treated with hip spica casting, 18 experienced complications, whereas only 10 out of 40 patients in the FIN group reported complications.

**Table 2: Overall Complication Rate by Treatment Group**

| Treatment Group                           | Total Patients | Patients with Complications | Complication Rate (%) |
|---|----------------|-----------------------------|-----------------------|
| Hip Spica Casting (Group 1)               | 45             | 18                          | 40%                   |
| Flexible Intramedullary Nailing (Group 2) | 40             | 10                          | 25%                   |

Malunion and nonunion were observed in 13.3% of the hip spica group but only 2.5% of the FIN group, indicating better fracture alignment with FIN. Similarly, angular deformities and limb length discrepancies were more prevalent in the hip spica group (15.6% and 11.1%, respectively) than in the FIN group (7.5% and 5%). Infection rates were low in both groups, with a slight advantage for FIN (5% vs. 6.7%), and refractures were minimal across both groups but slightly higher in hip spica patients.

**Table 3: Specific Complications by Treatment Group**

| Complication            | Hip Spica Group (n=45) | FIN Group (n=40) |
|-------------------------|------------------------|------------------|
| Infection               | 3 (6.7%)               | 2 (5%)           |
| Malunion and Nonunion   | 6 (13.3%)              | 1 (2.5%)         |
| Limb Length Discrepancy | 5 (11.1%)              | 2 (5%)           |
| Angular Deformity       | 7 (15.6%)              | 3 (7.5%)         |
| Refracture              | 2 (4.4%)               | 1 (2.5%)         |

The average healing duration for the FIN group was 8 weeks, with 80% of patients resuming daily activities within 10 weeks. In contrast, the hip spica group had an average healing time of 12 weeks, with only 60% returning to daily activities within 14 weeks. This suggests that FIN may facilitate a quicker recovery and reintegration into regular activities for pediatric patients.

**Table 4: Healing Duration and Functional Outcome**

| Treatment Group                           | Average Healing Duration | Percentage of Patients Returning to Daily Activities |
|---|--------------------------|--|
| Hip Spica Casting (Group 1)               | 12 weeks                 | 60% within 14 weeks                                  |
| Flexible Intramedullary Nailing (Group 2) | 8 weeks                  | 80% within 10 weeks                                  |

By the 6-month mark, follow-up slightly decreased, with 88.9% in the hip spica group and 90% in the FIN group. Complication detection was more frequent in the early follow-up stages; at 1 month, 22.2% of hip spica patients and 12.5% of FIN patients presented complications. By 3 months, complications dropped to 11.1% for hip spica and 7.5% for FIN, with a further decrease at 6 months (6.7% in hip spica and 5% in FIN).

**Table 5: Follow-Up Duration and Complication Monitoring**

| Follow-Up Interval                               | Hip Spica Group (n=45) | FIN Group (n=40)   |
|--|------------------------|--------------------|
| 1 Month  | 45 patients (100%)     | 40 patients (100%) |
| 3 Months   | 42 patients (93.3%)    | 38 patients (95%)  |
| 6 Months   | 40 patients (88.9%)    | 36 patients (90%)  |
| Patients with Complications Detected at 1 Month  | 10 (22.2%)             | 5 (12.5%)          |
| Patients with Complications Detected at 3 Months | 5 (11.1%)              | 3 (7.5%)           |
| Patients with Complications Detected at 6 Months | 3 (6.7%)               | 2 (5%)             |

## DISCUSSION

This study, comparing the complication rates and outcomes associated with each method, provides valuable insights into the relative effectiveness and potential risks of both treatments. The findings reveal that while both methods have their advantages, flexible intramedullary nailing appears to offer lower overall complication rates and faster functional recovery, particularly in school-aged children [13]. The study demonstrated a higher complication rate in the hip spica group (40%) compared to the FIN group (25%). Hip spica casting showed a higher incidence of malunion, limb length discrepancy, and angular deformities, likely due to the challenge of maintaining precise fracture alignment in non-operative management. As younger children tend to heal more effectively with non-invasive approaches, hip spica casting remains a preferred choice in this age group. However, the results indicate that older children, who experience higher physical demands and activity levels, may benefit more from FIN, which provides better fracture stability and alignment [14].

Infections were observed in both groups, though slightly more common in the hip spica group. In FIN cases, infections were typically related to entry sites of the nails, which underscores the need for meticulous surgical technique and post-operative care. Notably, while hip spica casting avoids the invasiveness of surgery, the extended immobilization required can result in skin issues and pressure sores, especially in active children [15]. Patients treated with FIN had shorter average healing times and faster returns to daily activities, aligning with previous studies suggesting that internal fixation allows for improved mobility and rehabilitation. The FIN group's average healing duration of 8 weeks and a 10-week return to activities were significantly shorter than the hip spica group's 12-week average healing time and 14-week return to function [16]. These faster recovery rates are particularly beneficial in children, where prompt resumption of physical activity and school attendance is critical for overall development and mental well-being. The quicker healing duration and reduced immobilization with FIN are also associated with a decrease in complications related to prolonged inactivity, such as joint stiffness and muscle atrophy. This benefit is especially relevant in older children and adolescents, whose need for mobility and social interaction is more pronounced [17].

The findings of this study suggest that treatment choice should be guided by age, fracture type, and the desired balance between recovery speed and risk of complications. Hip spica casting remains a viable option for younger children with isolated, closed fractures due to its non-invasive nature and lower upfront cost [18]. However, for older children or those with more complex fractures, FIN appears to offer a more effective solution by reducing the risk of malunion and enabling faster functional recovery [19].

This study is limited by its retrospective design and relatively small sample size. Larger, multi-center trials with longer follow-up periods would help provide more definitive conclusions. Additionally, while this study focused on general complication rates, future research could delve into the long-term outcomes of each treatment, including potential impacts on bone growth, functional mobility, and psychosocial development in children treated with each method.

## CONCLUSION

It is concluded that flexible intramedullary nailing (FIN) offers a safer and more effective treatment option for pediatric femoral shaft fractures in older children, reducing complication rates and allowing faster functional recovery compared to hip spica casting. However, hip spica casting remains beneficial in younger children with simple fractures, providing a cost-effective, non-invasive alternative. Treatment choice should be individualized, balancing patient age, fracture complexity, and recovery goals.

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