

Plate Fixation Versus Flexible Intramedullary Nails For Management Of Closed Femoral Shaft Fractures In The Paediatric Population: A Systematic Review And Meta-Analysis Of The Adverse Outcomes

Trauma / Paediatric Trauma / Surgical Treatment

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Background

Femoral shaft fractures convey a significant risk of morbidity in children and various methods of fixation have evolved with limited evidence supporting their adoption. This systematic review evaluates the quality of the evidence and clinical outcomes for paediatric (aged 5-12 years) closed femoral shaft fractures treated with plate fixation (PF) versus flexible intramedullary nails (FIN).

Objectives

To define the rate of adverse outcomes in this patient group. The primary outcome was union abnormality (malunion and nonunion). Secondary outcomes were infection (osteomyelitis and/or soft tissue infection), unplanned reoperation and leg-length difference.

Study Design & Methods

A PROSPERO-registered, PRISMA-compliant systematic review and meta-analysis was conducted. MEDLINE, Embase and Web of Science (WoS) databases were searched from inception to January 2021. Clinical studies reporting adverse outcomes following surgical treatment of paediatric closed femoral shaft fractures using PF and FIN were included. The ROBINS-I tool assessed the risk of bias.

Results

Nine retrospective studies reporting 563 closed femoral fractures in 561 children (383 males, 178 females; mean age 8.4 years (range 5.9-10.6)) were included. There were 236 PF and 327 FIN with no cases of osteomyelitis or nonunion. Meta-analysis suggested a reduced risk of unplanned reoperation (RR 0.50 [95%CI 0.23-1.09]) following PF. There was no difference in the following outcomes between the groups- malunion (RR 0.74 [95%CI 0.31-1.76]); soft tissue infection (RR 0.31 [95%CI 0.06-1.52]) and leg-length difference (RR 1.96 [95%CI 0.74-5.21]). All studies were at high risk of bias.

Conclusions

The quality of the evidence relating to surgical management of paediatric closed femoral shaft fractures is low, and findings are limited by significant methodological flaws in the literature. Therefore, an observational data analysis of 563 fractures with minimal heterogeneity in meta-analyses may be considered high quality. There is no statistically significant difference in adverse outcomes between the modalities and well-designed prospective studies employing standardised core outcomes are needed to inform robust treatment recommendations.