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التوثيق الالكتروني والميكروفيلم

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Intramedullary Distraction Devices for Lower Limb Lengthening

A Systematic Review and Meta-analysis for Partial Fulfillment of Master Degree in Orthopedic Surgery

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List of Abbreviations

Abb.	Full term
CT	Computed tomography
DO	Distraction osteogenesis
ERC	External Remote Controller
FDA	Food and Drug Authority
FIN	Flexible intramedullary nail
IMN	Intramedullary nail
ISKD	Intramedullary Skeletal Kinetic Distractor
LATN	Lengthening and then nailing
MLDFA	Mechanical lateral distal femoral angle
LLD	Limb length discrepancy
LON	Lengthening over a nail
MPTA	Medial proximal tibial angle
MRI	Magnetic resonance imaging
NCBI	National Center for Biotechnology Information
NLM	National Library of Medicine
PACS	Picture archiving and communications system
RCT	Randomized controlled trial
SD	Standard deviation
χ^2	Chi-square

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INTRODUCTION

Limb lengthening procedures have been of great interest to orthopedic surgeons since the early 20th century, when Italian surgeon Alessandro Codivilla published a paper detailing the use of Codivilla's nail to accomplish lower limb lengthening [(1)]. Over the course of the next century, a greater understanding of the physiology of the bone has led to major advances in the techniques and devices used for limb lengthening [(2)].

There is currently a wide selection of limb lengthening techniques and appliances for orthopedic surgeons to utilize in their practice. These include monolateral external fixation, external ring fixation (e.g., Ilizarov device), lengthening over nail, and intramedullary lengthening nails [(3)].

The intramedullary bone lengthening systems include mechanical systems (the Albizzia® and intramedullary skeletal kinetic distractor, ISKD® nails) and more recently motorized systems with the Fitbone® (Wittenstein, Igersheim, Germany) and Precice® (Ellipse Technologies, Irvine, CA, USA) nails. [(4)]

These devices can be employed to correct both congenital and acquired problems, including femoral deficiencies, tibial aplasia, achondroplasia, osteogenesis imperfecta, Ollier's disease, post-traumatic growth arrest, avascular necrosis, congenital femoral deficiency, and fibular hemimelia, among many others. [(5)]

Intramedullary nails may offer a solution to some of the problems associated with external fixation devices, including soft tissue scarring, muscle tethering, and inflammation and infection caused by the wires and pins [6]. In addition, internal devices may be more convenient due to their concealed nature and may provide patients with benefits to their pain and discomfort. [7]

Use of mechanical intramedullary implants has reduced the rate of septic complications and fractures of the lengthening callus. However, control of the lengthening and the patients' comfort remain problematic [8]. Intramedullary distraction devices have several reported complications, including over-lengthening (run-away of the nail), and many devices may need manipulation under general anesthesia.

Articles are lacking evidence to support the use of a certain nail design over the other. We conducted this systematic review to compare between PRECICE nail, Fit bone Nail, Albizzia Nail and ISKD regarding their safety and efficacy.

Aim of the Work

The aim of this study is to compare clinical and radiographic outcomes and complications between different intramedullary lengthening devices in lower limbs.