

Short Review of Pins & Nails in Orthopaedic Surgeries



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Abbreviations: TEN: Titanium Elastic Nails; RTAs: Road Traffic Accidents; IMN: Intramedullary Nailing; PFN: Proximal Femoral Nailing

Introduction

The incidence of human fractures requiring surgical fixation with pins and nails in India is extremely high and rising, driven by a growing, younger population susceptible to high-energy trauma and an aging population prone to osteoporotic fractures. Road traffic accidents (RTAs) are the primary cause, accounting for nearly 50% of these injuries [1]. Fractures can be described as i) low energy caused by twisting or falling from standing height. or ii) high energy caused by high levels of force, such as a car accident or a major fall [2]. Large urban hospitals even up-to Taluka level facilities in India frequently treat 1-50 new fracture cases daily, with about 20% of them requiring immediate operative intervention, such as internal fixation with nails or pins. Femur fractures are the most significant burden (30% of studies), followed by humerus (11%) and tibia (10%).

Estimates suggest that hip (proximal femur) fractures in India exceeded 400,000 in 2025 and this number is projected to reach 800,000 by 2050. Lower limb fractures are generally more prevalent. In inpatient settings, four-fifths (82%) of hospitalized fracture patients are treated surgically. TENS (Titanium Elastic Nailing System) is the gold standard for paediatric long bone fractures (ages 5-15), with 2.5mm nails commonly used, particularly in fractures resulting from RTAs and falls. Proximal Femoral Nailing (PFN) is the preferred method for the high volume of intertrochanteric fractures, which make up 66% of elderly hip cases [1].

Hip fractures are a major cause of morbidity and mortality in the elderly. The current literature on the injury patterns of hip fractures in India is lacking. The mechanism of injury for most patients with Femur fracture is a fall from a standing height (70%) followed by road traffic accident (25%). Slipping on a wet floor

(25 %) and change in posture (16.1%) were the most reported reasons for falling. Pedestrian injuries were the most common form of RTA (50%). Increasing age and female sex are associated with fall. Tibia fractures are the most common lower extremity fractures in children, accounting for 10 to 15 % of all paediatric fractures. A physical examination and X-rays are used to diagnose all fractures. Treatment for fractures ranges from casting to surgery, depending on the type and severity of the injury.

The current literature on the injury patterns of hip fractures in India is lacking. The overuse of pins and nails in Indian fracture surgeries is driven by the demand for minimally invasive, cost-effective, and rapid stabilization of long bone fractures. Rise in Minimally Invasive Techniques like Intramedullary nailing (IMN) is popular because it preserves soft tissue, minimizes blood loss, and allows earlier mobilization compared to traditional methods. However, the skills of the surgeon are technically demanding, requiring expertise to prevent technical failures. While effective for diaphyseal fractures, this trend risks issues like malunion, infection, and improper nail sizing, especially if not tailored to patient anatomy. This review is based on two recent cases in females aged 10 years and 70 years. Both are done in secondary care hospitals at district level private facilities. In both cases internal fixation with wire and Pin was opted.

Interlocking Nail

An interlocking nail is a type of orthopedic implant used for the surgical treatment of long bone fractures, such as the femur, tibia, and humerus. It stabilizes the bone internally, allowing for proper alignment and faster healing. Made of Stainless Steel or Titanium - preferred as they are lighter and more biocompatible. They provide strong internal support, allow early mobilization

and weight-bearing, minimally invasive, reduced infection risk and maintains proper bone alignment.

Intramedullary (IM) Nails

IM is primarily used for fractures of long bones such as the femur (thigh), tibia (shin), and humerus (upper arm). These hollow or solid metal rods are inserted into the medullary canal to share the mechanical load of the bone, promoting healing. Specialized nails that use locking screws at the top and bottom to prevent rotation and telescoping of the bone, increasing stability. Solid or cannulated titanium/stainless steel rods- Titanium Elastic Nails (TEN) are used for international centre for Limb Lengthening.

Types of Intramedullary Nails

i) Static Interlocking Nail are fixed locking screws at both ends prevent rotation and shortening ii) Dynamic Interlocking Nail allow controlled movement at the fracture site, promoting healing through micromotion iii) Universal Nail used for both static and dynamic fixation, depending on the placement of screws.

ii) **Orthopaedic Wires & Pins:** Wires in orthopaedic surgery are thin, flexible metallic devices used to hold bone fragments together or to assist in the alignment during fracture fixation. The most common type is the Kirschner wire (K-wire), which are thin wires used to pin small bone fragments, common in hand, foot, or paediatric fractures. They are also used to guide the insertion of large Cerclage Wires: Used to encircle and compress bone fragments, often in conjunction with other fixation devices

[2]. Tension Band Wiring Converts tensile forces into compressive forces across a fracture, typically used in patellar or olecranon fractures. Schanz Screws: Often used in external fixation frames to provide stable, rigid fixation [3,4].

Orthopaedic wire in Tibia of 10-Year-Old Girl

Surgical Application and Techniques of Insertion

Surgeons create an entry point, often reaming the canal (enlarging the medullary cavity) before inserting the nail over a guide wire. Interlocking bolts or screws are placed proximally and distally to lock the nail in place. While some hardware is permanent, pins and wires are frequently removed after the bone heals, sometimes in an office setting, while IM nails are removed in an operating room.

Orthopaedic Pins

Pins are rigid, pointed metal rods used for internal fixation, either alone or in combination with other devices like plates or wires.

There are 3 types:

- a. **Steinmann Pins:** Thicker than K-wires, used for larger bones
- b. **Rush Pins:** Flexible and used for intramedullary fixation, especially in paediatric fractures and
- c. **Denham Pins:** Threaded pins used in skeletal traction. The materials of pins are also either Stainless steel or Titanium



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