

Original Research Article

Minimally Reamed Intramedullary Nailing in the Treatment of Diaphyseal Fractures of the Lower Limb

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Abstract: Intramedullary nailing has increasingly become the standard surgical technique for treating diaphyseal fractures of long bones. Experimental and clinical studies have shown that reaming stimulates bone healing and promotes earlier fracture consolidation without significantly increasing the risk of local or systemic complications. However, its negative impact on endosteal blood flow is well-documented. Minimally reamed nailing offers a promising alternative, preserving the osteogenic benefits of reaming while minimizing its harmful effects on endosteal circulation. This study presents a series of 140 cases of patients with diaphyseal fractures of the lower limbs, all treated with minimally reamed intramedullary nailing.

Keywords: Shaft fracture, long bones, intramedullary nailing, minimally reamed.

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INTRODUCTION

The use of intramedullary nails in the management of diaphyseal fractures of the femur and tibia has experienced significant growth over the past thirty years, with indications now encompassing increasingly complex fracture patterns.

Reaming have mechanical and biological effects on the fracture healing [1-3]. However, several clinical and experimental studies on embolization during intramedullary nailing have demonstrated significant alterations in alveolar-arterial gradients [4, 5].

The use of unreamed small-diameter nails in the treatment of tibial fractures with severe soft tissue damage was introduced to reduce certain complications. However, it has been reported to increase other issues, such as early fatigue failures of locking nails and screws [6, 7].

Minimal reaming may offer a way to retain the osteogenetic benefits of reamed nailing while avoiding its negative effects.

Our work reports a series of 140 cases of femur and tibia fractures treated by intramedullary nailing with minimal reaming in the orthopaedic and traumatology

department at the Avicenne Military Hospital in Marrakech over a 4-year period from January 2016 to December 2019. This study aims to contextualize our findings within the broader global literature and derive practical implications relevant to our specific circumstances.

MATERIALS AND METHODS

All our patients were aged 18 or over, with femoral or tibial shaft fracture treated with minimally reamed intramedullary nailing.

RESULTS

The average age of our patients was 35 years, with extremes ranging from 19 to 70 years. The gender distribution showed a clear male predominance, with 106 men or 75.7% against 34 women or 24.3%. Road traffic accidents were the cause of the majority of injuries with 98 cases or 70%. 114 fractures were closed, or 81.4% and 26 fractures were open, or 18.6%. All open fractures were classified as stage I of the Cauchoix and Duparc classification. None of our patients had any vascular-nervous lesions associated with their fracture.

Spinal anesthesia was used in 126 patients or 90% while general anesthesia was used in 14 patients, or 10%. Minimal reaming was performed in all patients. For

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tibial fractures, a single reamer with a diameter of 9 mm was used, while for femoral fractures, two reamers with diameters of 9 mm and 10 mm were employed. The nails used were 9 mm in diameter for the tibia and 10 mm for the femur. The locking was static in the majority of cases, 75%, and dynamic in 25% of cases.

There were two cases of superficial wound infection. Compartment syndrome occurred in one patient. Four patients developed fat embolism syndrome, all of them had femur fracture. Not one case of deep vein thrombosis occurred. There were no nail fracture and no distal screw failure. The average time to union was 12 weeks. Delayed union was observed in six cases. Non-union occurred in four cases and required reoperations leading to union. All patients maintained normal motion of the hip. We recorded three deficits of knee flexion, which was limited to 100 degrees. While deficit of ankle dorsiflexion was observed in two patients. Four patients complained of persistent pain around the knee joint. The average time to return to work was 12 weeks, while the average time to return to sports activities was 24 weeks.

DISCUSSION

Intramedullary nailing remains the treatment of choice for diaphyseal fractures of long bones. Reaming offers clear mechanical and biological advantages [8, 9]. However, it also has drawbacks; advocates of unreamed intramedullary nailing argue that reaming disrupts the endosteal circulation of the bone, which may increase rates of non-union and infection [7, 10].

A method to avoid the detrimental effects of reaming on endosteal circulation while preserving its osteogenic properties is minimally reamed intramedullary nailing. A prospective comparative study conducted by Gaebler [11] on reamed versus minimally reamed intramedullary nailing in the treatment of closed fractures of the tibial shaft, involving 100 patients, showed no significant differences between the two methods. The main parameters studied were the rates of infection and compartment syndrome, the time to union, and the time to return to professional and sports activities.

The results of our study show no difference between standard reamed intramedullary nailing and minimally reamed intramedullary nailing, aligning with Gaebler's study [11]. However, the timesavings observed with our method make minimally reamed intramedullary nailing a justifiable and defensible alternative for the treatment of diaphyseal fractures of the lower limbs.

CONCLUSION

Minimally reamed intramedullary nailing is a reliable and effective method for treating femoral and

tibial diaphyseal fractures. It provides comparable consolidation and functional recovery times to standard reamed nailing, without increasing postoperative complications. Additionally, it reduces operative time, making it a practical and promising alternative for managing these fractures.

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