

## Research Article

# Preliminary Results in Minimally Invasive Osteosynthesis for Tibia Fracture

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## Abstract:

The muscle skeletal system commonly suffers traumatic injuries, the tibia due to its anatomical characteristics is more susceptible to fractures. It is intended to present a series of preliminary results on minimally invasive osteosynthesis for the treatment of these lesions. Theoretical and empirical methods are used to perform the analysis of updated knowledge about them. Most of the patients treated with minimally invasive surgery for their tibia fractures are male (85.52%) and their age is generally between 40 and 60 years (48.15%). The most affected anatomical region was the distal third of the tibia. The surgical time for osteosynthesis decreased to 43 minutes, with few complications.

It is concluded that MIPO is an option for the treatment of tibial fractures taking into account its indications, it can be reproducible without the need for special instrumentation and as it is a biological osteosynthesis that preserves vascularization and the fracture hematoma has fewer risks of complications.

**Keywords:** minimally invasive surgery, tibia fractures, MIPO.

## Introduction

Tibia fractures have an incidence of 16.9 / 100,000 per year, and between 4 and 23% are open injuries, depending on the pattern of the fracture and the involvement of the soft tissues, they can be treated conservatively or conservatively. However, there is no consensus for determining the optimal surgical technique. (1)

Since the introduction of dynamic compression blades (DCP) for osteosynthesis, the popularity of the invasive treatment of these fractures has increased. This, in the latest research, has created study dynamics regarding concepts such as biological osteosynthesis, minimally invasive osteosynthesis, relative stability or absolute stability. The concept of biological osteosynthesis refers to the preservation of vascularity of the bone during the surgical intervention, to ensure the vitality of the individual fragments and achieve the healing of the fracture, with a minimum of damage to the soft tissues and a relative stability that favors the materials. (2)

Conventional osteosynthesis techniques applied for multi-fragmentary fractures can lead to a variety of complications, including delayed union, infection, implant failure, and nonunion.

This happens because to achieve anatomical reduction, extensive surgical exposure is necessary and sometimes the fragments of the fracture are stripped of the soft tissues, which provide vascularity. (3,4) The first attempts in the use of biological osteosynthesis appeared in the 80s of the last century, the development of indirect reduction techniques, the use of new osteosynthesis materials caused a basic change for the treatment of the fractures

Every fracture evolves towards consolidation with pain, inflammation and reflex immobility, which leads to what is known as fracture disease, which if not receiving adequate

treatment leads to muscle atrophy and generates adhesions that, taken to an extreme, cannot be reversed, determined sequelae that limit functionality. (5) An adequate quality of life is guaranteed by free and painless movement, this is the philosophy that motivates us to select a fracture fixation technique that allows us to achieve total mobilization and promote rapid revascularization of bone and soft tissue.

Minimally invasive osteosynthesis is a method in which the percutaneous use of blades to remotely fix the fracture site through minimal exposure is an alternative procedure for the treatment of tibial fractures. (6) The purpose of this article is to deepen the evaluations from the first results with the use of this technique in the service.

## Results

Most of the patients treated with minimally invasive surgery for their tibia fractures are male (85.52%) and their age is generally between 40 and 60 years (48.15%) (Table 1). The most affected anatomical region was the distal third of the tibia (Figure 1)

**Table 1: Distribution of patients with tibial fractures operated by minimal access according to age and sex.**

Age (years)	Sex				Total	%
	Female		Male			
	Nro.	%	Nro.	%		
18-40	0	0	8	29,63	8	29,63

40-60	3	11,11	10	37,04	13	48,15
Over 60 years	1	3,70	5	18,52	4	14,81
Total	4	14,81	23	85,19	27	100

Source. Data collection model.

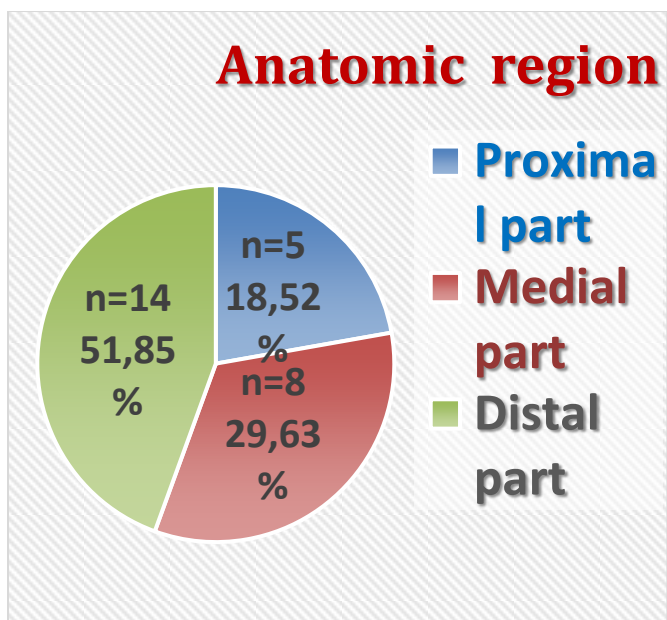


Figure 1. Distribution according to anatomical region of patients with tibia fractures operated by minimal access.

To date, there have been two minor complications of the 27 cases studied (Table 2), related to superficial sepsis of one of the wounds and the other case is related to our first case in the series that presented a Morell Lavalleé effusion. This motivated us to use elastic bandages in the immediate and mediate postoperative period, thus avoiding this complication. The surgical time for tibial osteosynthesis was drastically reduced at the institution to 43.15 minutes.

Table 2. Relationship between the surgical times, the complications that appeared according to the classification of fractures.

Surgical time	Complications						Total	
	Transverse		Oblique Spiroid		Comminuted			
	Yes	No	Yes	No	Yes	No	Nº	%
less than 40 minutes	-	1	1	5	-	5	12	44,44
Between 40 and 59 minutes	-	1	1	8	-	3	13	48,15
More than 60 minutes	-	-	-	2	-	-	2	7,41
Total	-	2	2	15	-	8	27	100

Source. Data collection model.  
Average surgical time: 43.15 minutes.

In 13 of the cases presented, the state of the soft tissues was not good. From 6 to 8 screws were used in each case, using as a rule to fix 6 proximal and 6 distal cortices, the size of the surgical wounds was reduced to an average of 4.6 cm. Hospital stay decreased. The surgical technique used allowed bone consolidation in all treated cases, without directly exposing the fracture site and respecting the new interpretations of the principles of OA. During follow-up, the absence of delayed union or nonunion was confirmed.

### Discussion

Any surgeon when proposing a surgical technique seeks the greatest possible benefit for the patient and consequently the least general and local aggression. The so-called "minimally invasive" is not the antonym of "open approach" nor is it determined by the size of the incision. By using the word "minimal" we refer to the extent of tissue involvement and this is not proportional to the size of the approach as a general rule. The fundamental limitation of the technique is that it does not allow direct visualization of the fracture, therefore the surgeon is dependent on intraoperative fluoroscopy to confirm adequate reduction. The additional radiation exposure during osteosynthesis application and surgical time defies the surgeon's skill in using this technique. Still, this technique offers surgeons a good method of bone stabilization in patients with complicated tibial fractures, severely damaged soft tissue fractures, and injuries with intra-articular or periarticular extension. In the first place, it is avoided to work on the fracture site and therefore it is avoided to damage the fracture hematoma, it preserves vascular pedicles, it avoids the risk of infection, and it takes into account rapid mobilization of the patient's limb. These minimally invasive treatments, according to Vidović D et al, (7) provide adequate union rates, with few complications, as well as quite good functional results. (8) Indirect reduction techniques were developed to avoid further soft tissue injury at the fracture site and thus improve fracture healing rates. Regarding the weeks of consolidation, Izzet et al. (9) published a study with 30 patients treated with a minimally invasive technique in which a consolidation of 19.2 weeks was obtained, for the study carried out by Zhang J (10) the consolidation It occurred at around 16.7 weeks, Andalib et al. obtained similar results and performed an analysis of the effectiveness of the method (11). Despite the smaller sample size in the studies consulted and its retrospective design, the results of the present investigation support that the treatment of tibia fracture using the minimally invasive technique has a group of advantages, the surgical time is less, with less Damage to soft tissues, smaller surgical incisions, less painful and more aesthetic, all this reduces the hospital stay, blood loss and the rate of infections, in general the recovery is faster and postoperative pain is reduced. The review provides a different vision; we consider that minimally invasive surgery may be another alternative in our therapeutic arsenal, mainly in those fracture injuries of the tibia with multiple fragments, although its limitations should be considered if the principles of osteosynthesis. Case studies with a larger number of samples and longer periods of evolution are necessary.

### Conclusions

We consider that MIPO is an option for the treatment of tibia fractures taking into account its indications. The minimally invasive technique currently performed with DCP plates in our environment can be reproducible without the need for special instrumentation and as it is a biological osteosynthesis that preserves vascularization and the fracture hematoma has fewer risks of complications.

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## Conflict of interests

The authors of this article declare that they have no conflict of interest whatsoever with the objectives of the research.

## Declaration of the personal contribution of each author to the research. The authors of this article

participated in the diagnosis, treatment, study design, and writing of the first version, as well as the final version of the manuscript in equal parts.

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