HOW ARE TIBIAL OPEN FRACTURES TREATED IN BRAZIL? A CROSS-SECTIONAL STUDY

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SUMMARY

This cross-sectional study was performed during the 36th Brazilian Congress of Orthopaedics and Traumatology, aiming to know the Brazilian orthopaedic surgeons' opinion regarding the standards of care in cases of tibial diaphyseal open fractures in adults. Five hundred and seven questionnaires were considered and the results show agreement in the following topics: classification, 78.5% uses the Gustilo-Anderson; surgical treatment indication, with the majority (76.3%) preferring to operate all kinds of fracture with manual irrigation (80.3%) and saline solution (85.4%); stabilization method, predominantly the external fixator, with 52.1%, 74.4%, 88.6%, and 89.0% for types II, IIIA, IIIB, and IIIC, respectively, and; primary closure indication, chosen by 74.2% for the type I. There was no consensus regarding the timing of soft tissues reconstruction and the duration of antibiotics treatment. Surgeons' opinions agreed with literature only for classification, surgical treatment indications, irrigation pressure, and indication for primary closure. The irrigation product, stabilization method and duration of antibiotics treatment differed from literature current evidences.

Keywords: *Tibial fractures, Open fractures, Surgery, Cross-sectional study.*

INTRODUCTION

Although the tibia is the most commonly affected site in an open fracture[1,2,3], its treatment still remains controversial[4,5]. A century and half ago, tibial open fractures were often treated with amputation, with a high probability of patients evolving to sepsis and death[6,7]. Today, fracture stabilization with an intramedullary nail enables an early rehabilitation, minimizes hospitalization time and the number of postoperative complications. Due to the evolution of fixation methods for this kind of fracture, to the technological development, and studies addressing the use of antibiotics and the treatment of soft parts, prognosis for those experiencing this kind of fracture has improved a lot.

It is well established that open fractures must be treated with surgical cleaning, debridement, fracture stabilization, antibiotics use and early coverage of soft parts [7]. However, there are some variations regarding those concepts in literature, with the majority of controversial aspects being related to: the real surgical need for open, type-I fractures and gunshot fractures[8,9,10]; the best irrigation product and pressure for surgical cleaning[11,12]; the best moment for wound closure and coverage of soft parts[13,14,15]; time of antibiotics use[16,17]; and the best method for fracture stabilization[5].

There are many methods for stabilizing those kinds of fractures, with external fixators, intramedullary nails and plates being mostly used. The clearest evidence in literature suggests the blocked intramedullary nail as the method of choice for stabilizing those fractures [5]. However, a different reality is present in Brazil and in other developing countries. The high costs of implants, the lack of availability of equipment for emergency situations and the technical difficulties regarding use (learning curve) restrain the use of intramedullary nails. Thus, other methods such as external fixators, plates and plastered immobilization are still most commonly used.

It is acceptable that open fractures treatment should be performed with cleaning and surgical debridement[7], with liquid soap[12] and low irrigation pressure[11]. Wounds should be left opened, being performed a late primary closure, except in Gustillo's type-I fractures[18,19], in which the wound primary closure may be performed[15,20,21]. The best moment to reconstruct soft parts is between one and two weeks[13,14,22,23], and the use of antibiotics must be restricted to 24 hours for types I and II, and to 48-72 hours after the last surgical procedure for type III[16,17].

The objective of this study is to verify how a Brazilian orthopaedist treats those fractures regarding: classification, surgical indication, cleaning method (irrigation product and pressure), fixation method, primary closure indications, time to reconstruct soft parts, and duration of antibiotics use.

MATERIALS AND METHODS

Five hundred eighteen participants were interviewed during the 36th Brazilian Congress of Orthopaedics and Traumatology, oc-

Study conducted by the Department of Orthopaedics and Traumatology, Federal University of São Paulo (UNIFESP) / Paulista Medical School (EPM)

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curred in 2004, in Rio de Janeiro. The questionnaire was composed of 14 multiple-option questions addressing the main topics on tibial open fractures treatment: classification, surgical indication, irrigation product and method used, stabilization method, primary closure indication, time for soft parts coverage, and time of antibiotics use. Participation happened in a voluntary fashion and answers were kept confidentially. The results were calculated and submitted to a statistical analysis.

RESULTS

Five hundred eighteen questionnaires were collected, but eleven were disregarded because one was answered by a foreign orthopaedist (Portugal) and ten were incomplete. Consequently, 507 questionnaires were considered as valid for final statistical analysis.

Participants' characteristics

Three hundred eighty four participants (75.7%) were orthopaedists and one hundred twenty three (24.3%) were resident doctors in orthopaedics and traumatology.

Classification

The most frequently used classification was that of Gustilo et al.[18,19] with 78.5% of the choices. The AO-ASIF[24] classification was selected by 22.9%, the classification of Tscherne-Gotzen[25] by 2.6% and the other 2.6% of the participants reported using another classification.

Surgical indications

Most of the participants (76.3%) chose to operate all fractures; 17.2% report as unnecessary to perform surgical procedure in type-I fractures; 2.6% do not perform surgery in type-II fractures; 1.9% in type-IIIA, 0.9 type-IIIB, 0.9 type-IIIC, and; 4.7% reported using a non-surgical approach in fractures caused by gunshots.

Irrigation product and method

Saline solution (0.9% sodium chloride) was the irrigation product of choice (85.4%). The antiseptic solution was selected by 26.8%; Ringer lactate by 4.7%, distilled water by 2.2%, antibiotic solution by 1.8%, and 1.4% reported using other products. Manual irrigation was selected by 80.3% and pulsed irrigation by 18.9% of the participants.

Fixation method (Graph 1)

Type I

The three most commonly used methods were: the external fixator (32.0%), non-reamed blocked intramedullary nails (30.0%), and plastered immobilization (22.5%). There was no statistically significant difference among those three methods. Following, the reamed blocked intramedullary nail was chosen by 11.6%; plate by 7.3%, and plate-bridge by 7.1%. The other methods were selected by less than 4.0% of the participants.

Type II

The external fixator was the most indicated method, by 52.1% of the participants. The non-reamed blocked intramedullary nail was selected by 26.4%, the reamed blocked intramedullary nail by 7.5%, and other methods by less than 6.0%.

Type IIIA

The external fixator was the most commonly indicated method, with 74.4% of the choices. The non-reamed blocked intramedullary nail was chosen by 12.8%, and the reamed blocked intramedullary nail by 5.1%. Other methods were selected by less than 4.0% of the participants.

Type IIIB

The external fixator was selected by 88.6% of the participants. Other methods were selected by less than 5.0% of the participants.

Type IIIC

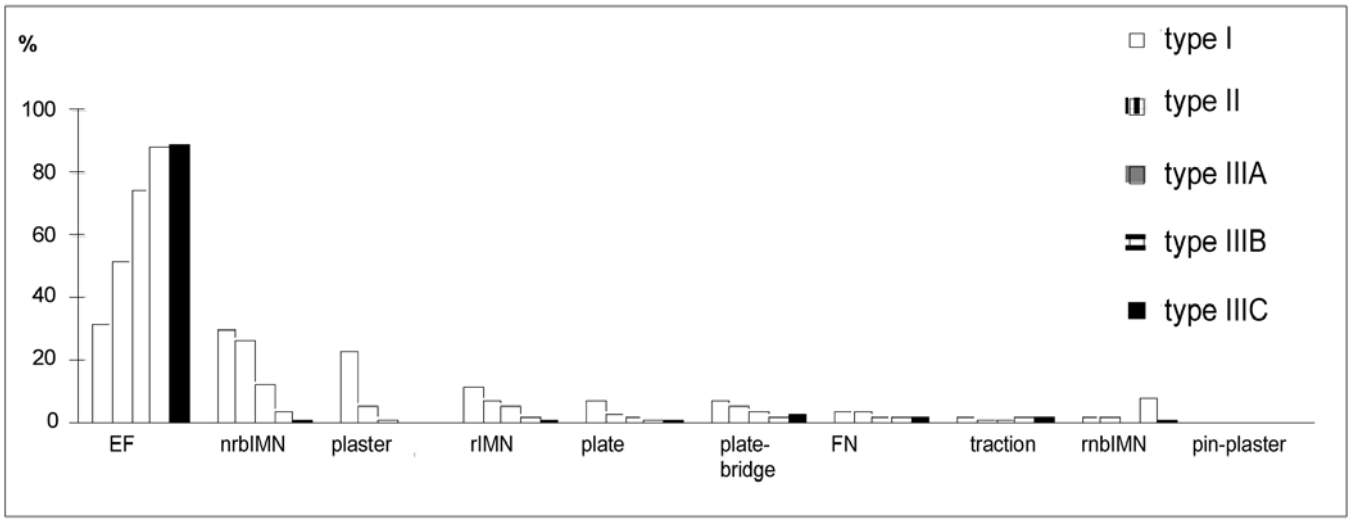
Again, the external fixator was the fixation method most frequently recommended, by 89.0% of the participants. Other methods were selected by less than 3.0% of the participants.

Primary closure indication (Graph 2)

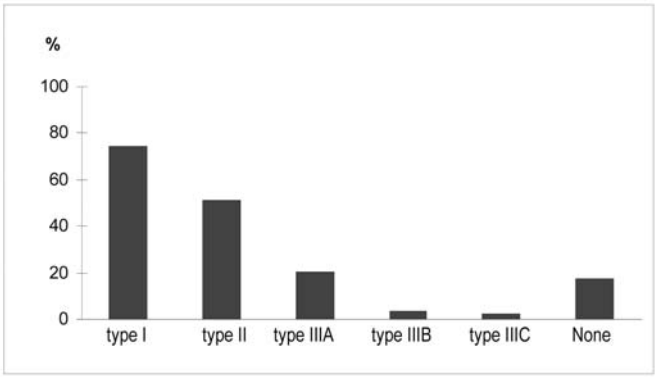
The primary closure was selected by 74.2% of the participants for type-I fractures, 51.1% for type-II, 20.1% for type IIIA, 3.7% for type IIIB, and 2.6% for type IIIC. 17.2% reported performing primary closure in none of the fracture types.

Time for soft parts treatment

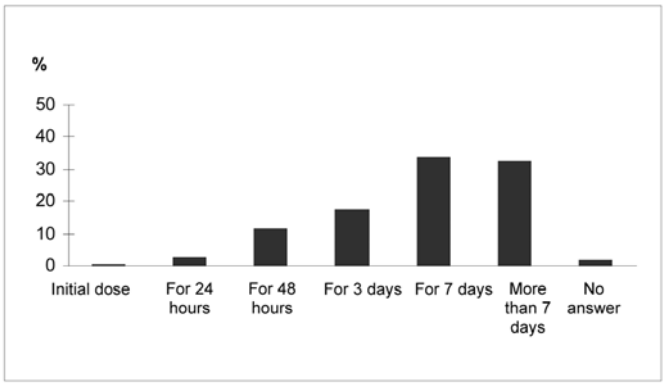
In this question, 36.3% of the participants reported performing soft parts coverage within a period of 1 to 7 days; 32.1% between 8



Graph 1 - *Preferences regarding stabilization methods versus types of open fractures. EF = external fixator, nrbIMN = non-reamed blocked intramedullary nail, rIMN = reamed blocked intramedullary nail, FN = flexible nail, rnbIMN = reamed non-blocked intramedullary nail.*



Graph 2 - *Preferences regarding primary closure indications.*



Graph 3 - *Preferences regarding the time of antibiotics use.*

and 15 days; 18.1% within more than 15 days, and; 10.5% at the initial moment of fracture treatment.

Time of antibiotics use (Graph 3)

The use of antibiotics for seven days was selected by 33.7% and for more than seven days by 32.3% of the participants. The use during three days was selected by 17.4%; 48 hours by 1.6%; 24 hours by 2.6%; and only an initial dose by 0.6% of the participants.

DISCUSSION

The most important findings in our study were the high incidence of the use of external fixators as a definitive method (32-89%), the extended time of antibiotics use and the high rate of primary closure for type-I and type-II open fractures. The different fixation methods can influence postoperative joint motion, care with soft parts wounds for cure or other surgical procedures, and regarding the amount of load to be allowed in that limb. The antibiotics use is clearly recognized as a factor reducing infection rates and its use is indicated for all kinds of open fractures. The moment for closing the wounds is another important aspect, because it certainly interferes in hospitalization period, in the number of surgical procedures to which the patient will be submitted, and in treatment costs.

Infectious processes are amongst the most frequent and feared complications of open fractures. Consequently, for many years, external fixation has been considered as the treatment of choice for tibial open fractures. This was one of the first recommendations of the AO-ASIF group in the 1960s. Even by the end of the 1980 decade, Bach and Hansen[26] still considered the external fixator as the method of choice for treating these fractures. The evolution of antibiotics, soft parts wounds manipulation techniques, development of new implants, equipment and surgical techniques, motivated the use of plates to achieve an anatomical reduction since the decade of 1970, achieving good results[27]. During the last 10 years, literature concluded that the use of blocked intramedullary nails provides a superior quality treatment for these fractures[5]. Medullary channel reaming during the treatment of lower limb diaphyseal fractures with intramedullary nails showed to be beneficial, reducing pseudoarthrosis rates and synthesis material failures[28], but, specifically for tibial diaphyseal open fractures, its advantages remain uncertain[5]. Although evidences in literature show the superiority of intramedullary nails, in our country, other fixation methods are mostly used, such as the external fixators[4]. Our study corroborate those data, showing that, in general, the participants indicated external fixation, especially for type-II and type-III open fractures, with 52.1% to 89.0% of the choices. For type-I fractures, preference for external fixator was superior, but this was similar to the use of non-reamed blocked intramedullary nail (30.0%) and plastered immobilization (22.5%). For type-IIIC fractures, the use of external fixation, as well as plates or intramedullary nails are acceptable due to the severity of the injury and to the need of a fast stabilization with the objective of preserving the limb. Literature has shown that the blocked intramedullary nail is the method of choice for type-I to type-IIIA open fractures of tibial diaphysis[5], also existing a trend towards considering it the best method for type-IIIB fractures[29]. In another cross-sectional study, conducted by Bhandari et al[4] with international participants, it was observed that the intramedullary nail was the treatment of choice (95.5% for type- I, 88.1% for type- II, 68.4% for type-IIIA, and 48.4% for type-IIIB). This difference can be justified by most of the participants being from the United States, Europe and Australia. Another finding was regarding participants from Africa, Asia and South America, who seemed to be more likely to use the external fixation, a finding confirmed by our study. The evidence in literature has been recognizing the superiority of a method, but it has not been practiced with a desirable frequency in our country. We believe it is necessary to better guide our orthopaedic community, as well as the investments for buying more implants and equipment enabling the performance of intramedullary nails. The development of more resistant and durable external fixators for definitive use could also enable the treatment of these fractures while transition is occurring.

Some studies addressed the use of prophylactic antibiotics in open fractures, but the kind of antibiotics to be employed and the duration of its use remain controversial. The kind of antibiotics may vary according to bacterial prevalence in each hospital, but first-generation cephalosporin is still recommended for type-I and type-II fractures, but there is a large variation for type-III open fractures in literature, either regarding the use of second and third-generation cephalosporin, or regarding the association of first-generation cephalosporin with aminoglicosydes[16,17]. The time of antibiotics use may be 24 hours for type I and II fractures, and approximately three days after the last surgical procedure in type-III fractures[16, 17]. Our study revealed a high prevalence of the long-lasting use of antibiotics, with 33.7% recommending it for seven days, and 32.3% for more than one week. Maybe the deficiency in other treatment stages, such as irrigation, stabilization, soft parts treatment, and individual characteristics of patients (such as malnutrition), may erroneously lead the doctor to recommend the use of antibiotics for long periods. This fact, besides increasing treatment costs, may enable the appearance of resistant bacteria, as well as increase the frequency of side effects in patients being submitted to orthopaedic treatment.

Controversies surrounding soft parts wounds closure are not recent. In the 1930s, Böhler[1] recommended the primary closure; in the decade of 1950, Oscar Hamptom recommended the late closure. Clancey and Hansen[20] and Graedel[21] determined that those wounds should be closed within 2 to 5 days, naming this procedure as late primary closure. More recently, with the development of better surgical techniques, antibiotics, and implants, some studies have demonstrated that those wounds could be primarily closed, without leading to an increase of infection rates[15,30]. Today, it is believed that most of the wounds in type II and type III fractures should be left opened, but implications related to hospitalization costs with a higher number of surgical procedures should encourage the development of further studies proving the potential safety of primary closure in all fractures cases. The results in our study showed that 17.2% of the participants chose to keep all kinds of wounds opened, and 74.2% prefer the closure of type I, while 51.1% perform the closure in type II. Maybe those results show the need of a definitive initial treatment, minimizing hospital costs in our country.

One of the limiting factors in this study is based on the participation of 24.3% of resident doctors, because questionnaire answers may create doubts regarding its validity because of the fact that they are still in a learning process. Positively, the study was performed with a high number of participants (507), and huge differences were found between the use of external fixators and the other methods, as well as the long-lasting time of antibiotics use and primary closure of type-I and type-II fractures.

Although diaphyseal fractures of the tibia are very common, some stages of its treatment are still controversial, and even within the most known aspects, such as the use of intramedullary nails for fracture fixation, this is not being performed as frequently as desirable in the country. Regarding the preference of the prolonged use of antibiotics and external fixation as a definitive fixation method, we believe that teaching and the acquisition of equipment are required. As for primary closure in type-I and type-II open fractures, literature remains controversial, and further studies should be conducted in order to confirm the real benefit of the late primary closure.

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