

Epidemiological profile of patients undergoing surgical treatment of ankle fractures in a tertiary hospital

Perfil epidemiológico dos pacientes submetidos a tratamento cirúrgico das fraturas de tornozelo em hospital terciário

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ABSTRACT

Objective: To evaluate the epidemiological profile of ankle fractures treated surgically in a tertiary hospital.

Methods: A retrospective epidemiological study was performed. The medical records of patients with ankle fractures who underwent surgery between January and December 2017 were reviewed. The parameters assessed included age, gender, injured side, exposure (open vs closed), *Arbeitsgemeinschaft für Osteosynthesefragen* (AO) fracture classification, trauma mechanism, time to definitive treatment, and early postoperative complications.

Results: The male gender was predominant (64.6%). Twenty-two fractures (50%) resulted from traffic accidents, 16 (36.4%) of which involved a motorcycle. The mean age of these patients was 28.25 years. The AO 44-B ankle fracture was the most common injury (70.4%). Eight (18.2%) were open fractures. The mean time to definitive treatment was 5.9 days. Early postoperative complications occurred in two patients (4.5%).

Conclusion: Ankle fractures treated in a tertiary hospital affect young victims of high-energy accidents, mainly involving motorcycles.

Level of Evidence IV; Therapeutic Studies; Case Series.

Keywords: Fractures, bone; Ankle; Ankle injuries; Health profile.

RESUMO

Objetivo: Avaliar a epidemiologia das fraturas do tornozelo tratadas cirurgicamente em hospital terciário.

Métodos: Estudo epidemiológico retrospectivo. Revisados os registros médicos de pacientes com fraturas do tornozelo e submetidos à cirurgia entre janeiro e dezembro de 2017. Parâmetros avaliados: idade, sexo, lateralidade, exposição, classificação da fratura pelos critérios AO, o mecanismo do trauma, o tempo para tratamento definitivo e complicações pós-operatórias precoces.

Resultados: O sexo masculino era predominante (64,6%). Vinte duas fraturas (50%) resultaram de acidentes de trânsito, sendo 16 (36,4%) envolvendo motocicleta. A idade média destes pacientes era 28,25 anos. A fratura AO 44-B foi o tipo mais comum (70,4%). Oito (18,2%) foram fraturas expostas. O tempo médio para o tratamento definitivo foi de 5,9 dias. Houve complicações pós-operatórias precoces em 2 pacientes (4,5%).

Conclusão: Fraturas do tornozelo tratadas em um hospital terciário afetam jovens vítimas de acidentes de alta energia, principalmente envolvendo motocicleta.

Nível de Evidência IV; Estudos Terapêuticos; Série de Casos.

Descritores: Fraturas ósseas; Tornozelo; Traumatismos do tornozelo; Perfil epidemiológico.

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INTRODUCTION

Sports injuries are among the leading causes of foot and ankle fractures, but high-energy trauma is responsible for the most severe sequelae. Despite the technological evolution of automobiles, where various systems to protect drivers' and passengers' lives have been introduced, injuries to the feet and legs have not decreased in frequency and severity^(1,2). In polytrauma patients, fractures and dislocations of the ankles and feet are among the most frequently undiagnosed injuries during the acute phase⁽³⁾.

Among weight-bearing joints, ankle fractures are the most frequent type of fracture and have a bimodal incidence, affecting young and elderly individuals. In young patients, the main cause of fractures is high-energy trauma, such as sports trauma and traffic accidents. In the elderly, low-energy trauma, especially in the home, is the most prevalent cause⁽⁴⁾.

Regardless of the patient's age, ankle fractures are a cause of great morbidity. Particularly in young patients, there is a socioeconomic impact, given that fractures require an absence from work. In the elderly, fractures have great importance due to the morbidity that they cause, since patients develop difficulty waking and decrease or even cease leisure and social activities^(2,3).

Tibiotalar joint fractures are among the bone injuries most often treated by orthopaedic surgeons. Recent observational studies show a significant increase in these injuries between 1970 and 2000. In the US, these fractures are diagnosed in 8.3 of every 1,000 medical appointments⁽⁵⁾.

The Brazilian medical literature includes few studies on ankle fractures. In a retrospective study, Sakaki et al.⁽⁶⁾ described 73 patients undergoing surgical treatment between 2006 and 2011 and found that men were affected more often, with a ratio of 1.7:1; the mean age was 27.5 years, and the most frequent mechanism of trauma was torsional (34 cases), followed by automobile accidents (20 cases) and motorcycle accidents (19 cases). In addition, the most frequent type of fracture, according to the *Arbeitsgemeinschaft für Osteosynthesefragen* (AO) classification, was type B (41 cases), followed by type C (27 cases), and type A (five cases). The most common subtype, also according to the AO classification, was type B2, with 21 cases recorded.

Another study, conducted by Luciano et al.⁽⁷⁾, addressed the epidemiological profile of foot and ankle injuries that occurred during recreational sports. In that study, 123

of the 131 patients treated were male, and the mean age of the male patients was 24.53 years. Sports are classified according to the American Medical Association as contact and non-contact, and 82.4% of the patients practised contact sports. The most frequent injuries were ankle sprains (49%), fractures (25%), bruising (17%), fasciitis (4%), tendon injuries (2%), dislocations (2%), and bursitis (1%). Among the patients with fractures, the most common were ankle fractures (72% of cases), followed by phalangeal fractures (21%), and metatarsal fractures (7%). However, that study did not detail the characteristics of malleolar fractures or the follow-up of patients, i.e., whether the treatment was conservative or surgical.

In a study by Leite et al.⁽⁸⁾, among the 236 patients with soccer injuries, 20.1% presented injuries in the ankle region, and sprain was the most common injury.

Another study evaluating athletes younger than 20 years ("Sub20"), revealed that among the 32 injuries observed, the ankle was affected in 18.7% of participants, and again sprain was the most common injury⁽⁹⁾. In a study by Sousa et al.⁽¹⁰⁾, the most common foot and ankle injury was lateral sprain, found in 22 of the 165 patients practising sport.

Steinman et al.⁽¹¹⁾ found that among 930 surfers in Brazil, 13 fractures and 42 sprains of the ankle were reported. A study by Carazzatto et al.⁽¹²⁾ showed that only 6% of judo injuries were fractures and that foot and ankle injuries were outnumbered by shoulder, knee, and hand injuries.

Debieux et al.⁽¹³⁾ examined 387 patients who suffered motorcycle accidents and found that 16% had a foot fracture and 12.7% had an ankle fracture. Baptista et al.⁽¹⁴⁾ evaluated the clinical and radiographic results of 70 patients surgically treated for malleolar fractures and found a patient satisfaction rate of 80%. Santin et al.⁽¹⁵⁾ studied the clinical and radiographic results obtained with surgical treatment of 35 patients with Danis-Weber type B fractures and found good results in 82.8% of the cases.

Recently, a study published by Stéfani et al.⁽¹⁶⁾ outlined the epidemiological profile of all orthopaedic surgeries of foot and ankle fractures performed from January 2005 to August 2016 at the State Public Servants Hospital (HSPE, in Portuguese) of São Paulo. In this study, ankle fractures were present in 72% of the cases evaluated and were more frequent in women (65%), with a mean age of 60.42 years.

A review of the literature yielded few Brazilian studies on the epidemiology of ankle fractures. Therefore, this study aims to evaluate the epidemiological data of ankle fractures treated surgically in a tertiary hospital.

METHODS

This study was approved by the Research Ethics Committee with registration in the Brazil Platform under CAAE number: 84252818.4.0000.5342.

This is a cross-sectional, individualised, observational, and retrospective epidemiological study using data from medical records of patients who were treated at a tertiary hospital. The data contained in the charts of ankle fracture patients undergoing surgical treatment between January and December of 2017 were analysed.

Based on an analysis of the medical records, 44 cases of surgically treated malleolar fractures were identified in 44 patients. The parameters evaluated were age, gender, injured side, exposure (open vs closed), AO fracture classification, trauma mechanism, time to definitive treatment, and early postoperative complications.

RESULTS

A total of 44 patients were evaluated, including 28 men (63.6%) and 16 women (36.4%), corresponding to a ratio of 1.8:1. The patients' ages ranged from 20 to 80 years, with a mean age of 42.4 years. The most frequently injured side was the right side, as observed in 26 patients (59.1%). Of the 44 fractures, eight were open fractures (18.2%), and no information was available in the medical records regarding the Gustilo-Anderson classification. Of these eight cases of open fractures, seven were due to motorcycle accidents, and one case occurred in the patient's home. The distribution by age group is shown in Figure 1.

Regarding the trauma mechanism, half of the fractures occurred due to traffic accidents. Among these, 16 (36.4%) were motorcycle accidents (as a driver or passenger) and five (11.4%) were car accidents. Only one case involved being hit by a car. Of the 44 patients studied, 14 (31.8%) suffered the trauma at home, six (13.6%) injuries occurred while practising some type of sport, and three occurred at work, of which two (4.5%) injuries occurred while performing construction work, and one (2.3%) occurred in a shoe store, as shown in Figure 2.

The mean patient age was 42.4 years. However, when only motorcycle accident patients were considered, the mean age was 28.25 years. Patients who suffered fractures at home had a mean age of 64.07 years.

As an early postoperative complication, two cases of skin ischaemia were recorded based on the topography of the medial malleolus.

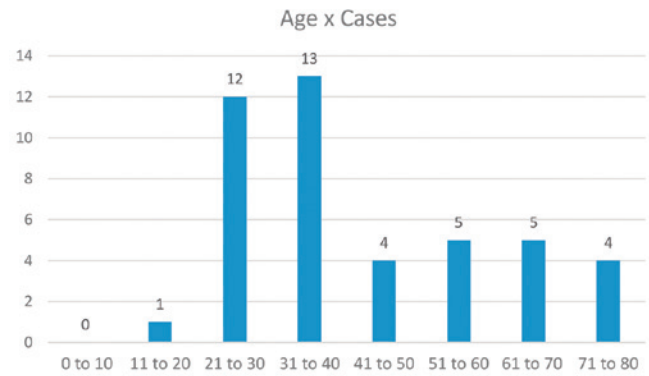


Figure 1. Distribution of cases according to age.

Source: Prepared by the author based on the study results.

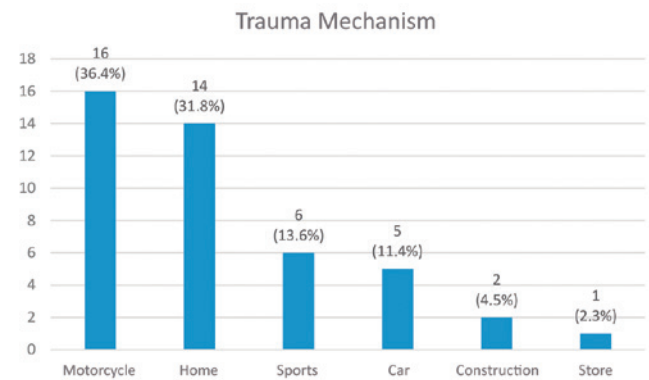


Figure 2. Distribution of cases according to the trauma mechanism.

Source: Prepared by the author based on the study results.

When analysed according to the AO classification, the most common fracture was type B, with 31 cases (70.45%), followed by type C, with 11 cases (29.54%). No surgical treatment of type A fractures was recorded. The most common subtype was B2, with 15 cases, accounting for 34.1% of all surgically treated fractures. The distribution of cases according to subtypes is shown in Figure 3.

Of the 44 patients evaluated, five (11.36%) underwent external fixation as initial treatment for damage control and later received internal fixation. However, the majority of the patients (39) used a short leg cast as temporary immobilisation until surgery. Of the 44 patients, none had internal fixation performed at the time of admission.

The mean time from fracture to final surgery was 5.9 days, ranging from three to 12 days. For open fractures, the mean time to definitive surgical treatment was 7.5 days. In all 44 fractures, definitive treatment was performed through osteosynthesis, according to the standards re-

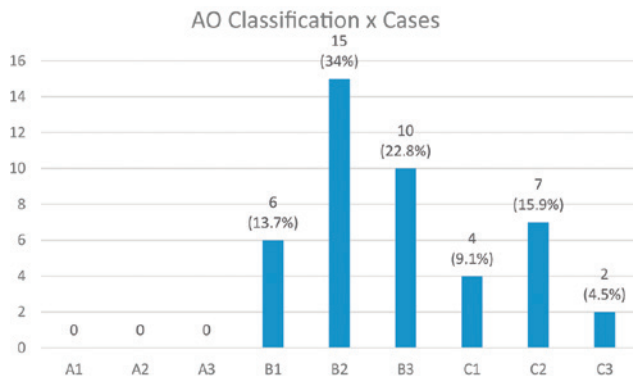


Figure 3. Distribution of cases according to the AO classification.
Source: Prepared by the author based on the study results.

commended by the AO Group. Patients who were treated conservatively were not included in our study.

We found that patients who suffered the most serious injuries had a much longer absence from work. Of the 31 patients with type B fractures, 27 patients were absent from work for 60 days, and four patients were absent for 45 days, which corresponds to a mean absence from work of 58 days. Of the 13 patients with type C fractures, 10 patients were absent from work for 90 days, and three patients were absent for 120 days; thus, the mean time of absence from work was 96.9 days.

DISCUSSION

Of our series of 44 patients, 63.6% were men. These data are consistent with a study by Sakaki et al.⁽⁶⁾, in which 63% of patients were male. A male predominance for malleolar fractures was also found in studies by Santin et al.⁽¹⁵⁾ and Luciano et al.⁽⁷⁾ with 62.8% and 58% of male patients, respectively.

Our study indicated a mean patient age of 42.4 years. In contrast, Sakaki et al.⁽⁶⁾ found a mean age of 27.5 years (56.2% under 40 years). Debieux et al.⁽¹³⁾ reported that 79% of motorcycle accident victims were less than 28 years old.

However, our results are consistent with studies by Santin et al.⁽¹⁵⁾ and Baptista et al.⁽¹⁴⁾ that found mean ages of 39.0 and 43.3 years, respectively. In a study by Stéfani et al.⁽¹⁶⁾, the mean age of ankle fracture patients was 60.42 years. It is noteworthy that in our study, the mean ages of patients whose fractures were caused by motorcycle and car accidents were 28.25 and 41.2 years, respectively, and those who suffered a fracture at home had a mean age of

64.07 years. These data corroborate the idea that young patients are more susceptible to high-energy injuries, and elderly patients are susceptible to low-energy trauma.

Regarding traumatic accidents, we found 22 fractures (50%) caused by traffic accidents and 14 fractures (31.8%) that occurred at home, which are much higher than the rates in all other studies in the Brazilian literature. Santin et al.⁽¹⁵⁾ reported only one fracture caused by a motorcycle accident (2.9% of the total).

In a study by Sakaki et al.⁽⁶⁾, 26% of all fractures were due to motorcycle accidents, whereas in our study, 16 (36.4%) of all fractures resulted from this type of trauma. We believe that this aetiological pattern of ankle fractures results from the continuous increase in the number of motorcycles in urban traffic. According to the most recent literature, including studies by Debieux et al.⁽¹³⁾ and Stéfani et al.⁽¹⁶⁾, the serious public health problem caused by the lack of regulation of motorcyclists cannot be overlooked. A large portion of this population consists of workers who deliver small objects in urban areas, mostly on motorcycles. These delivery motorcycle drivers, usually called "motoboy" in Brazil, are victims of the deregulation of their occupation. In addition to the use of a helmet, reflective vest, and a neck brace, we believe that the use of protective boots should become a mandatory item for these professionals.

Debieux et al.⁽¹³⁾ showed that only 32 of the 387 patients (8.3%) who were victims of motorcycle accidents wore protective boots at the time of the accident. This information is not available in our study database. The Brazilian Traffic Code considers only the non-use of the helmet as a violation and does not refer to other protective equipment. We assume that the use of stiff boots could decrease the number of ankle fractures or lessen their severity.

The distribution of injuries according to the AO classification, which added subtypes to the Danis-Weber classification, shows a predominance of type B fractures (70.45%). Among Brazilian studies, a report by Sakaki et al.⁽⁶⁾ details malleolar fractures according to the AO classification subtypes. Our study identified that 29.54% of fractures are type C. Therefore, they are severe fractures, with syndesmosis injury, and the treatment is more complex than that for type B fractures. We did not identify any patient with a type fracture A who underwent surgical treatment.

It is important to highlight the high incidence of open fractures in our case series. Of the 44 fractures, eight were open fractures (18.2%), of which seven were due to mo-

torcycle accidents. No information was available in the medical records about the Gustilo-Anderson classification for cases of open fracture. An occurrence rate of 18.2% is much higher than those found by Baptista et al.¹⁴ (5.7%) and Santin et al.¹⁵ (8.8%). Unfortunately, no reliable method exists to determine the fracture classification based on the Gustilo and Anderson criteria. However, indirectly, based on the antibiotic prophylaxis information available in the prescription records, we deduced that all cases were classified as Gustilo-Anderson type III.

Only five (11.36%) of the 44 patients studied in this case series underwent damage control surgery with the placement of an external fixator at the time of admission. Because the resident physician on call at the time of the trauma varied, different external fixator models were used. External fixation as a temporary immobiliser is a widely accepted procedure but has not been reported in most Brazilian studies¹¹⁻¹⁵, except for Sakaki et al.⁶, who applied this procedure in 24.7% of the included patients. The use of an external fixator is routinely indicated for the management of tibial pilon fractures, but with increasing traumatic energy in malleolar fractures, its use in this type of fracture has become increasingly common. Patients who are victims of high-energy accidents, especially those with open fractures, suffer an inflammatory reaction due to the trauma, which leads to an increased risk of developing infection. According to the practices adopted in the hospital studied, definitive surgical treatment is only performed after the oedema decreases, as indicated by wrinkling of the skin.

The mean time to definitive treatment of open fractures was longer (7.5 days) than the time to surgery for treatment of closed fractures (5.9 days). This occurred because the condition of the soft-tissue envelope must improve before surgery can be performed. Patients undergoing conservative treatment of fractures were excluded from our study.

Regarding the postoperative complications, in two cases, skin ischaemia was recorded due to the topography of the medial malleolus. Both patients had an open fracture, and the open wound was used as the access route for medial malleolus synthesis. The decision to use the open wound to approach the fracture was based on avoiding a second incision at a site where the skin was already injured due to the trauma.

Additionally, we found that more severe injuries resulted in a longer absence from work. Patients with type B fractures had a mean absence from work of 58 days, and the 13 patients with type C fractures had a mean absence from work of 96.9 days. Given the severity of type C fractures, some will inevitably progress to post-traumatic arthritis. In this study, we did not have the means to monitor these patients for a period longer than 12 months or to determine the need for treatment of sequelae.

Currently, the Brazilian literature presents data that raise awareness of the State and the population about the serious public health problem of motorcycle accident victims with sequelae. In this sense, greater regulation of this professional activity is needed to increase safety for these individuals.

CONCLUSION

Ankle fractures treated at a tertiary hospital in a city considered a regional centre affected mainly young adults and were mostly caused by traffic accidents (50%), notably motorcycle accidents (36.4%).

Trauma occurring at home was the second most frequent trauma mechanism (31.8% of the cases), and the elderly population was most often affected.

The eight cases (18.2%) of open fractures suggest that a substantial number of fractures are caused by high-energy trauma, and only two patients (4.5%) developed early postoperative complications.

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