

# Epidemiological study of ankle's fractures of public servants state of São Paulo

## Estudo epidemiológico de fraturas do tornozelo de servidores públicos estaduais de São Paulo

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### ABSTRACT

**Objective:** To determine the epidemiological profile of ankle fractures surgically treated at our hospital and establish prevention strategies to reduce the social and economic impact. **Methods:** We collected data from all patients with unstable fractures of the ankle and who underwent surgery. Data were collected prospectively for 11 years. **Results:** Of 488 cases included, most of patients were women (65.9%). Patients' mean age was 53±16 years; the youngest patient had 13 years and the oldest 89-year-old. The mean age of women was 56.5±14.9 years, i.e., age was significantly higher than men's age, which was 46.37±15.7 years ( $p<0.01$ ). **Conclusion:** Elderlies, especially women, were the main victims of ankle fractures in the assisted population. Osteoporosis, which was mainly observed among postmenopausal women, seems to be related with occurrence of these fractures. Further studies are needed to determine the real influence of low bone mineral density as an adjuvant factor in the development of ankle fracture and the best way to prevent such fractures.

### Keywords:

Ankle fractures/ epidemiology; Fractures, bone/epidemiology

### RESUMO

**Objetivo:** Traçar o perfil epidemiológico das fraturas de tornozelo tratadas cirurgicamente em um hospital e estabelecer estratégias de prevenção, a fim de diminuir seu impacto social e econômico. **Métodos:** Os dados de todos os pacientes portadores de fraturas instáveis de tornozelo submetidos a tratamento cirúrgico em um hospital foram coletados prospectivamente durante 11 anos. **Resultados:** As mulheres, com 488 casos (65,9%), foram maioria dentre os pacientes operados. A média da idade foi de 53±16 anos, sendo que o paciente mais novo tinha 13 e o mais velho 89 anos. A idade média entre as mulheres foi de 56,5±14,9 anos, ou seja, foi significativamente maior que a dos homens, que foi de 46,37±15,7 anos ( $p<0,01$ ). **Conclusão:** Os idosos, principalmente mulheres, foram as principais vítimas das fraturas de tornozelo na população atendida. A osteoporose, presente principalmente nas mulheres na pós-menopausa, provavelmente está relacionada com a ocorrência destas fraturas. Novos estudos são necessários para esclarecer qual a real influência da baixa densidade mineral óssea como fator adjuvante no desenvolvimento da fratura de tornozelo e qual a melhor forma de preveni-las.

### Descritores:

Fraturas do tornozelo/epidemiologia; Fraturas ósseas/epidemiologia

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## INTRODUCTION

Ankle fractures are the most frequent among those located at the end of the lower limb and one of the most common of all fractures.<sup>(1)</sup> They are often caused by stumbles or falls and in some cases by direct trauma.<sup>(2)</sup> Several studies have shown important morbidity related to these injuries in both young and elderly individuals.<sup>(3,4)</sup> Epidemiological studies show that there is a tendency for the rate of these fractures to increase, especially in elderly women.<sup>(5,6)</sup>

Numerous risk factors are related to ankle fractures, such as smoking, diabetes, obesity, very high or low levels of physical activity and low bone mineral density.<sup>(2,7)</sup> In elderly patients there are additional risk factors such as female sex, comorbidities and polymedication.<sup>(7)</sup>

There are few published epidemiological data on ankle fractures in Brazil.

The aim of this study was to outline the epidemiological profile of ankle fractures treated surgically in a hospital and establish prevention strategies in order to reduce their social and economic impact.

## METHODS

This is a prospective cross-sectional study that collected data from all the patients with unstable ankle fractures who underwent surgical treatment at the Hospital do Servidor Público Estadual (HSPE) in the city and state of São Paulo. HSPE is a hospital under the administration of the Government of the State of São Paulo, which provides medical treatment to civil servants of the state and extends care provision to dependents, including parents, children, spouses, and in-laws.

Between January 2005 and August 2016, 740 patients underwent surgical treatment of unstable ankle fractures. These patients were divided into three groups: diabetic, elderly ( $\leq 65$  years) and others (not elderly - NE).

The inclusion criterion was patients with fractures considered unstable (all bimalleolar/trimalleolar fractures or those in which the medial clear space was greater than 5mm). Patients with fractures considered unstable, but who were not operated on due to insufficient clinical conditions, and patients with open physes, were excluded.

Data on sex, age, laterality, Danis-Weber classification,<sup>(8)</sup> immediate and late complications were collected prospectively. Consideration was given to the immediate complications of wound dehiscence or infection requiring surgical intervention and episodes of deep vein thrombosis (DVT), whether or not accompanied by pulmonary thromboembolism (PTE). The need for removal of synthesis material

and the development of surgically treated posttraumatic arthrosis were considered late complications. Patients who died had the causes of their death recorded.

The data were stored in an Excel® for Windows spreadsheet and subsequently imported to the Statistical Package for Social Science (SPSS), version 23 for MAC, for statistical analysis. Categorical data were described by their absolute number of occurrences and their respective percentage.

The project was approved by the Plataforma Brasil database, under CAAE (Certificado de Apresentação para Apreciação Ética) [Ethics Evaluation Submission Certificate] number: 45884215.6.0000.5463

## RESULTS

The 740 patients who underwent surgery were divided into 3 categories: elderly (aged 65 or older), diabetic and NE (under 65 years). The distribution of these patients is shown in table 1.

**Table 1** | Distribution of ankle fractures

Patient	n (%)
Elderly ( $\geq 65$ years)	125 (16.9)
Diabetic, regardless of age	102 (13.8)
Not elderly (<65 years old)	513 (69.3)

Women, with 488 cases (65.9%) formed the majority of the patients who underwent surgery. The distribution is shown in table 2.

The mean age was  $53 \pm 16$  years, with the youngest patient aged 13 and the oldest 89 years. The mean age among the women was  $56.5 \pm 14.9$  years, significantly higher than that of the men, which was  $46.37 \pm 15.7$  years ( $p < 0.01$ ).

In regard to the Danis-Weber classification, type B was the most common ( $p = 0.001$ ).

Forty-nine patients underwent further surgical interventions, with a mean time of  $649 \pm 743$  days between the first and second operations. Removal of synthesis material was the most frequent type of surgery and occurred in 27 patients. Eight patients required osteosynthesis review due to loss of reduction or inadequate reduction. Four patients progressed with posttraumatic arthrosis requiring surgical treatment. Three of them underwent tibiotalar arthrodesis and one underwent total ankle arthroplasty. The other surgical reinterventions, all with one case each, were transtibial amputation, surgical asepsis, wound resuturing, treatment of pseudoarthrosis of the medial malleolus and treatment of pseudoarthrosis of the lateral malleolus.

**Table 2** | Distribution of ankle fractures in relation to sex, time to surgery and classification

	Elderly ( $\geq 65$ years)	Diabetic, regardless of age	Not elderly ( $< 65$ years)
Female, n (%)	102 (20.9)	82 (16.8)	304 (62.3)
Days to surgery, mean $\pm$ standard deviation	371 $\pm$ 585	861 $\pm$ 979	635 $\pm$ 701
Danis-Weber classification, n (%)			
A	2 (6.1)	2 (6.1)	29 (87.9)
B	120 (19.3)	89 (14.3)	413 (66.4)
C	3 (3.5)	11 (12.9)	71 (83.5)

There were four episodes of DVT, all in women aged 60 years or older. Three progressed with PTE. None of them was fatal. There were eight deaths among the operated patients, all unrelated to the ankle fracture.

## DISCUSSION

Women had a significantly higher number of fractures than men (65.8%). This can be partly explained by the fact that women form the majority of civil servants in the State of São Paulo. Population-based epidemiological studies, however, show that the rate of ankle fractures is higher among elderly women than in men. Our sample group confirms this trend. Among patients under 50 years, there was a slight predominance of males, with 129 cases versus 108 among females. In patients aged over 50 years, however, women accounted for 75.5% of the cases. We are of the opinion that the development of osteopenia and osteoporosis among postmenopausal women is related to the increased rate of ankle fractures in this age group, as has already been suggested in other population-based studies.<sup>(6,9)</sup>

Danis-Weber type B fractures (84.1%) predominated absolutely over type C (11.5%) and A (4.5%) fractures. Studies that investigated the rate of fractures according to the Danis-Weber classification also presented type B as the most common. In one of these studies, conducted in Rochester, US, there were 314 ankle fractures over a 3-year period, 41% of which were Danis-Weber type B.<sup>(7)</sup> A population-based study, conducted in Aalborg, Denmark, collected 212 fractures over a 1-year period, with 24 type A (11%), 139 type B (65%) and 29 type C (13%) fractures.<sup>(10)</sup> In another series carried out in Sweden, of the 611 fractures 25% were type A, 56% type B and 13% type C.<sup>(11)</sup> All of these studies included both surgically treated unstable fractures and stable fractures. Our sample group includes only unstable fractures, which may explain the low percentage of Danis-Weber type A fractures.

The rate of DVT, with or without development of PTE, was very low, with 4 cases in 740 fractures, corresponding

to 0.54%. Studies that investigated the rates of DVT and PTE in patients undergoing osteosynthesis of ankle fractures presented results ranging from 0.8 to 2.99%.<sup>(12,13)</sup> We did not perform routine drug prophylaxis, and both our results and those of the literature do not indicate that prophylaxis is mandatory.

Only 27 patients (3.64%) underwent synthesis material removal. These numbers do not include removal of the transyndesmal screws performed in the outpatient setting under local anesthesia. Only cases in which a procedure at a surgical center was required were considered. We do not recommend routine withdrawal, even if the patient experiences some discomfort. In a retrospective study of 126 patients, almost half of those who had pain in the lateral region of the ankle and had the material removed still experienced the symptoms after surgery.<sup>(14)</sup>

Four patients (0.54%) progressed with severe pain secondary to post-traumatic arthrosis and required further surgical interventions, with three undergoing tibiotarsal arthrodesis and one undergoing total ankle arthroplasty. We consider this number surprisingly low and three factors help explain such a low rate of symptomatic arthrosis. The first is that the mean age of patients in our series was higher - approximately 53 years. A considerable number of patients were already retired, were low demand and opted for nonsurgical treatments when they felt pain. Another factor is that high energy fractures, caused by falls from a height, auto accidents or sports injuries, are very rare in this population. The absolute majority of patients had low energy fractures caused by falls from standing height. The third factor is that all the operations were performed by foot and ankle specialists or by residents under the direct guidance of the specialists. These last two factors also help to explain why only eight patients required secondary surgery for osteosynthesis review, and only two progressed with pseudoarthrosis.

Deep infection, which required asepsis, occurred in only one case. Patients with superficial infections treated with oral or topical antibiotic therapy were not counted.

The strong points of our study are the large number of patients monitored and the long follow-up time. The weak point is that late events, such as removal of synthesis material or performance of procedures to treat post-traumatic arthrosis, may be underestimated if patients have visited other departments for these procedures. If this occurred, we believe that few cases were involved, since patients receiving treatment at HSPE are not likely to migrate to the unified health system (Brazilian SUS) or to supplementary health services.

## CONCLUSION

Elderly individuals, particularly women, were the main victims of ankle fractures in the population treated at the Hospital do Servidor Público Estadual. Osteoporosis, present mainly in postmenopausal women, was probably related to the occurrence of these fractures.

Postoperative complications, such as deep vein thrombosis and pulmonary thromboembolism, or complications requiring further surgical procedures, were rare in our population, both in early and late stages.

Further studies are needed to clarify the true influence of low bone mineral density as an adjuvant factor in the development of ankle fractures and how best to prevent them.

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