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EPIDEMIOLOGICAL PROFILE OF PATIENTS OPERATED ON FOR ANKLE FRACTURES IN A HOSPITAL IN THE MOUNTAINOUS REGION OF SANTA CATARINA

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Abstract: This study is a retrospective, observational, and descriptive investigation that aims to analyze the epidemiological profile of ankle fractures treated at a referral hospital in the Serra Catarinense region. The research aims to identify the main types of fractures, the trauma mechanisms involved, and their respective classifications according to the systems recognized in the orthopedic literature, with a focus on the Lauge-Hansen classification. The methodology employed consisted of a retrospective review of medical records of patients diagnosed with ankle fractures, complemented by a systematic review of the scientific literature for theoretical support. Searches were conducted in the main biomedical databases, such as the Virtual Health Library (BVS) and Scientific Electronic Library Online (SciELO), in addition to the classic orthopedic literature, in order to ensure the currency and robustness of the information used. The epidemiological analysis included variables such as gender, trauma mechanism, fracture type, and its respective classification. This study aims to contribute to the understanding of the epidemiological profile of ankle fractures with a local focus. The results obtained will be organized in such a way as to enable comparison with the data available in the literature and the reality presented by the study.
Keywords: Ankle fracture; Fracture classification; Trauma mechanism; Epidemiological profile;

INTRODUCTION

Ankle fractures are common orthopedic injuries, accounting for approximately 10% of all fractures in adults. It is the second most commonly fractured joint in the lower limbs, surpassed only by hip fractures. According to *Rockwood and Green,* their epidemiological profile shows a bimodal pattern: young adult males predominantly victims of high-energy trauma and elderly females, usually related to falls from their own height, often associated with osteoporosis. In addition, it is known that most ankle fractures occur due to a torsional mechanism, as described in the Lauge-Hansen classification.

The main risk factors for this type of fracture in adults are: age, male gender—who are at greater risk related to sports and occupational activities—and women over 60 years of age due to falls from standing height, high-impact physical activities, high BMI, neuromuscular conditions, osteoporosis and decreased bone density, use of medications such as chronic corticosteroids, alcohol consumption, smoking, and anatomical changes in the foot or ankle.

Types of ankle fractures range from isolated injuries of the lateral or medial malleolus to complex fractures involving the syndesmosis and joint dislocations. The involvement may be single-malleolar, double-malleolar, or triple-malleolar.

The Lauge-Hansen classification is a system used to categorize ankle fractures based on the mechanism of trauma, combining the position of the foot at the moment of twisting (supination or pronation) with the direction of the force applied (external rotation, abduction, or adduction). Developed by Niels Lauge-Hansen in 1950 from radiographic studies and cadaver experiments, this classification describes specific patterns of ligament injury and bone fractures that occur sequentially, allowing the extent of damage to be predicted even when not all injuries are visible on imaging. The four categories described are: supination-external rotation (SER), supination-adduction (SAD), pronation-external rotation (PER), and pronation-abduction (PAB), each with subdivisions into progressive stages of injury.

Considering the high incidence of ankle fractures treated in the emergency department of a referral hospital in the Serra Catarinense

region and the lack of specific epidemiological data for the region, the present study is justified. The available Brazilian literature mostly presents aggregated national data, while the international literature offers information that may not accurately reflect the local epidemiological profile. Given this scenario, this study aims to outline, through the analysis of retrospective data from medical records at the study site, the main types of ankle fractures treated at the institution during a one-year period, as well as their respective classifications based on Lauge Hansen. The systematization of these findings aims to fill gaps in the regional literature and add to the epidemiological data.

METHODS

The methodology of this study was characterized by an observational, descriptive, mixed-method approach—qualitative and quantitative—with a retrospective focus, in which patients with ankle fractures were evaluated over a one-year period and underwent corrective surgical treatment. The study was conducted at a trauma referral hospital located in the Serra Catarinense region. Adult patients of both sexes who presented acute ankle fractures resulting from trauma and who underwent surgical intervention at the aforementioned institution, with postoperative outpatient follow-up, were included. Those who opted for conservative treatment, refused surgical procedure, or presented clinical contraindications to surgery, as well as patients with skeletal immaturity, were excluded. Data collection was performed through documentary analysis of the medical records of eligible patients, supplemented by a systematic review of the scientific literature in indexed databases, such as BVS and SciELO, with the aim of theoretically substantiating the findings and contextualizing their clinical and epidemiological relevance. The data obtained were tabulated and statistically analyzed to construct an epidemiological profile of surgically treated ankle fractures in the service. The study was submitted to the UNIPLAC Research Ethics Committee for review, in accordance with the provisions of CNS Resolution No. 510/2016, ensuring the confidentiality, anonymity, and integrity of the information. This was a minimal risk study with potential scientific and social benefits.

RESULTS

The sample of the present study consisted of 117 patients diagnosed with ankle fractures, 59 (50.4%) of whom were male and 58 (49.6%) female, demonstrating an even distribution between the sexes, with no significant predominance.

Regarding the mechanism of trauma, falls from the same level were the most prevalent event, accounting for 49 cases (41.9% of the total). This type of trauma was predominant in females, representing 65.3% of cases in this category (n=32). This data suggests that women, possibly due to biomechanical and osteometabolic factors, are more exposed or more susceptible to this type of injury. In contrast, motorcycle accidents accounted for 16 cases (13.7%), with a significant male predominance (87.5%; n=14), reflecting greater exposure of men to traffic risk situations. Other trauma mechanisms observed included direct contusion (8.5%), unclear etiology (8.5%), soccer (8.5%), falls from height (6.8%), bicycling (4.3%), car accidents (2.6%), and being hit by a car (0.8%). Notably, trauma resulting from sports, such as soccer, was exclusive to males, while being run over occurred in only one female patient.

As for the classification of fractures according to the Lauge-Hansen system, the most frequent variation was Supination and External Rotation IV (SER IV), totaling 53 cases (45.3%), of which 28 were male and 25 female. This classification was also the only one with

a similar distribution between the sexes, suggesting a common fracture pattern independent of gender. The other classifications were significantly less prevalent, with Pronation and External Rotation IV (PER IV) 12%, Supination and External Rotation II (SER II) 8%, Pronation and External Rotation III (PER III) 5%, Supination and External Rotation III (SER III) 4%, and Pronation and Abduction III (PAB III) 6%. The other classifications, combined, represented 11% of cases. Some patients did not meet the requirements for Lauge-Hansen classification, with a total of 6 patients.

DISCUSSION

The findings of this study show a balanced distribution between the sexes among patients with ankle fractures, with a slight predominance of males. This distribution is consistent with data from the literature, which indicate a similar incidence between men and women, although the mechanisms of trauma and fracture patterns may vary significantly between the sexes.

Ankle sprains occurring at the same level were identified as the most prevalent trauma mechanism (41.9%), with a predominance in women. This observation is consistent with studies indicating greater susceptibility of females to low-energy falls, especially in older age groups, due to factors such as osteopenia, sarcopenia, and increased risk of postural instability. On the other hand, high-energy trauma, such as motorcycle accidents and sprains in sports activities (soccer), were more frequent in young men, reflecting behaviors of greater exposure to risks.

Regarding the classification of fractures according to the Lauge-Hansen system, a high prevalence of Supination and External Rotation IV (SER IV) injuries was observed, corresponding to 45.3% of cases. This finding is consistent with the literature, in which the supination-external rotation sequence is reported as the most common among unstable ankle fractures, representing up to 70% of cases in some series. The predominance of this classification can be explained by the pathophysiology of the injury, which involves rotational movements associated with supination of the foot, often present in both high- and low-energy trauma.

The high incidence of SER IV fractures is particularly relevant, as this type of injury is often associated with syndesmotic instability and deltoid ligament injury, and is therefore indicative of surgical treatment in most cases. In addition, Pronation and External Rotation IV (PER IV) fractures, also observed in a smaller proportion in this study (12%), have shown a higher rate of postoperative syndesmotic malunion, requiring greater attention during surgical planning.

Based on the clinical profile of the sample, it can be inferred that prevention should be individualized according to gender. In women, measures aimed at reducing the risk of falls and screening for osteoporosis are essential. In men, the emphasis should be on traffic education and the use of protective equipment during sports. Such strategies can contribute significantly to reducing the incidence and severity of ankle fractures.

CONCLUSION

The results of this study reinforce the multifactorial complexity involved in ankle fractures, showing that, although the distribution by sex is practically equal, the contexts in which these injuries occur are profoundly different. Women are more affected by low-energy trauma, such as falls from standing height, which raises questions about bone fragility, aging, and fall prevention in everyday life. In contrast, men, who are often involved in risky activities such as sports and motor vehicle driving, are more exposed to high-energy trauma. The predominance of the Supination

VARIABLES	TOTAL	MALE	FEMALE
GENDER	117	59	58

AFFECTED SIDE	LEFT	RIGHT
FEMALE	33	25
MALE	30	29
TOTAL	63	5

TRAUMA MECHANISM	MALE	FEMALE	TOTAL
MOTORCYCLE ACCIDENT	14	2	1
BICYCLE	4	1	5
SPRAIN AT THE SAME LEVEL	2	34	5
FALL FROM HEIGHT	2	6	8
CAR ACCIDENT	2	1	3
HIT BY A CAR	0	1	1
SPRAIN IN FOOTBALL	1	0	1
DIRECT TRAUMA	6	4	10
UNKNOWN	4	6	10

CLASSIFICATION DE LAUGE-HANSEN	MALE	WOMEN	TOTAL
PAB I	1	1	2
PAB II	2	2	4
PAB III	5	3	8
PER I	1	1	2
PER II	2	0	2
PER III	4	2	6
PER IV	10	5	15
SAD I	1	0	1
SAD II	3	0	3
SER I	0	0	0
BE II	4	6	10
SER III	1	4	5
SER IV	28	25	53
TOTAL	62	49	111

AGE	MALE	FEMALE	TOTAL
UP TO 25 YEARS	15	5	20
26 TO 40 YEARS	17	18	35
41	19	19	38
> 60 YEARS	8	16	24
TOTAL	59	58	117

and External Rotation IV classification highlights not only the prevalence of this rotational mechanism in the study population, but also the need for accurate diagnosis and individualized surgical management, considering the long-term functional repercussions. In addition to the diagnostic value of the Lauge-Hansen classification, clinical reflection points to the importance of integrated therapeutic approaches that take into account not only the bone injury, but also the social, behavioral, and biomechanical characteristics of patients. Thus, the study not only contributes to the epidemiological understanding of ankle fractures, but also raises the need for specific preventive strategies that are sensitive to the risk profile of each population.

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