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Ankle presentations in Awka, Nigeria; Treatment methods and outcome

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Abstract

Introduction: The ankle joint, integral to dynamic movement, is prone to a variety of pathologies due to its complex structure and the substantial load it bears during activities such as sprinting, where it can carry up to thirteen times the body's weight. Stability is maintained through passive components like ligaments and bony contours, as well as dynamic forces, including muscle action. Injuries, which can be categorized by systems like the Danis-Weber AO and Lauge-Hansen classifications, are common in diverse settings and can lead to conditions like post-traumatic osteoarthritis. This study explores the prevalence, management, and outcomes of ankle injuries in an orthopaedic hospital setting, aiming to enhance understanding and treatment approaches for these conditions.

Methodology: This prospective study analyzed all ankle cases at an orthopaedic hospital in Awka, Nigeria, from 2017 to 2023. Patients were evaluated and diagnosed via history, physical examinations, and investigations, including X-rays classified by the Danis-Weber system. Treatments ranged from surgery, including ORIF and arthrodesis, to casting for undisplaced fractures.

Result: This study found the mean age of patients presenting with ankle injuries to be 41.44 years, affecting a wide demographic from 10 to 78 years. Males comprised 60.6% of the cases, and civil servants, who constituted 33.3%, were predominantly affected. The major causes were road traffic accidents (45.5%) and falls (33.3%).

Ankle injuries, primarily right bimalleolar fractures, were common and involved significant trauma history. Treatments included ORIF, arthrodesis, and casting, with a high success rate of 97% inpatient recovery and satisfaction, indicating effective treatment protocols for various ankle pathologies, including closed and open injuries.

Conclusion: The study illustrates that ankle injuries, predominantly resulting from road traffic accidents and falls, affect a diverse demographic across all ages and occupations, with a majority being male and often involving previous trauma, with closed injuries being the most common and effectively treated primarily through ORIF.

Keywords: Ankle Injuries; Orthopaedic Treatment; Danis-Weber Classification; Epidemiology, Patient Outcomes

1. Introduction

The ankle joint, a sophisticated synovial hinge joint, consists of the tibiotalar (talocrural), subtalar (talocalcaneal), and transverse-tarsal (talocalcaneonavicular) joints, allowing for dynamic movements such as plantarflexion–dorsiflexion, abduction–adduction, and inversion–eversion across various planes [1]. It carries loads up to thirteen times the body's weight during vigorous activities like sprinting, predisposing it to a wide range of pathologies including inflammatory, traumatic, infectious, degenerative, and neoplastic disorders, often exacerbated by systemic conditions such as diabetes [2]

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Factors maintaining ankle stability can be categorized into passive and dynamic mechanisms. Passive stability is primarily provided by the medial and lateral ligament complexes, tibiofibular ligaments, tendons crossing the joint, bony contours, and capsular attachments. These elements collectively form a robust framework that holds the ankle in place and prevents excessive movement that could lead to injury.

Dynamic stability, on the other hand, is influenced by active forces such as gravity, muscle action, and ground reaction forces. Stability is particularly dependent on the continuous action of the soleus muscle, which is aided by the gastrocnemius muscle. This muscle action enhances stability when leaning forward and decreases when leaning backwards. The posterior malleolus also plays a crucial role by acting as a restraint against the posterior translation of the talus. Fractures that involve approximately 25% of the articular surface of the posterior malleolus can lead to posterior instability [3]

The Danis-Weber AO Classification, introduced by Robert Danis in 1949 and later modified by Bernhard Weber in 1966 before being adopted by the Arbeitsgemeinschaft für Osteosynthesefragen (AO group), categorizes ankle fractures based on the level of the fibula fracture relative to the ankle joint and the condition of the syndesmosis, the fibrous joint connecting the tibia and fibula. This system distinguishes between three types of fractures: Type A features a transverse fracture of the fibula at or below the level of the ankle joint without syndesmotic injury; Type B is characterized by a spiral fracture of the fibula starting at the joint level, accompanied by partial syndesmotic injury; and Type C involves a fracture of the fibula above the ankle joint with significant disruption of the syndesmosis. While this classification is favoured for its simplicity and clear distinctions between types, it lacks a detailed staging system to grade the severity of injuries within each type [4,5,15]

In contrast, the Lauge-Hansen Classification, developed in 1950 by Lauge-Hansen, is based on a combination of cadaveric dissections of experimentally produced fractures, as well as clinical and radiological examinations. This classification system is founded on the position of the foot and the deforming force at the time of injury. Using fresh cadaver feet attached to boards and subjected to various stresses, Lauge-Hansen identified four basic types of ankle injuries: Pronation-Abduction, which initially presents as a transverse fracture of the medial malleolus, followed by lateral injury; Pronation-External Rotation, starting with a medial injury such as a medial malleolus fracture or deltoid ligament rupture, followed by disruption of the anterior and posterior tibiofibular ligaments and an oblique fracture of the fibula; Supination-Adduction, characterized by a transverse fracture of the distal fibula followed by an oblique fracture of the medial malleolus; and Supination-External Rotation, the most common pattern, which begins with rupture of the anterior tibiofibular ligament, followed by a spiral fracture of the fibula, a fracture of the posterior malleolus, and then injury to the medial malleolus or deltoid ligament. This system's value lies in its detailed sequence of the injury mechanism, making it a fundamental tool for assessing the sequence of events in ankle injuries [4,13, 14, 15]

The ankle joint is subjected to substantial forces during activity, bearing up to 1.5 times the body's weight during normal gait and exceeding 5.5 times the body weight during more strenuous activities. Thus, maintaining the ankle joint's congruency is vital for its long-term functionality and integrity.

Ankle injuries, prominent in both sports and military settings, account for a significant proportion of athletic traumas and non-combat injuries, frequently leading to post-traumatic osteoarthritis (PTOA) years after the initial injury due to chronic abnormal loading conditions or acute trauma. Treatment of ankle arthrosis is complex and should be customized to each patient, focusing on alleviating pain, restoring function, and preventing further articular degeneration through targeted interventions based on detailed diagnostics including radiographs and potentially MRIs or ultrasound.

The management of osteoarthritis involves addressing not just the symptoms but also the underlying biomechanical issues that may contribute to the condition, such as malalignment or instability. Early treatment strategies aim to relieve pain, restore normal function, and prevent deformity, potentially including surgical interventions for severe cases to correct anatomical deformities and improve joint congruence. This comprehensive approach ensures that both the symptoms and root causes of ankle issues are effectively addressed, improving the patient's overall mobility and quality of life.

The aim of this study is to investigate the pattern of ankle injuries and other pathology presentations to an orthopaedic hospital, their management and treatment outcomes.

2. Material and Method

This study was a prospective study of all ankle presentations to an orthopaedic hospital in Awka, Nigeria, between 2017 and 2023. All the patients presenting with ankle injuries, swellings and varying degrees of deformity were evaluated with history, physical examination and investigations. The patients who presented with injuries of varying degrees of pain and deformity were classified according to xray findings using the Danis-Weber classification system. Those who needed surgery were worked up for surgery based on their diagnosis. The surgeries offered were open reduction and internal fixation with 1/3 tubular plate, malleoli screws, or both Ankle arthrodesis with intramedullary, and external fixation. Undisplaced fractures were treated with application of cast, while infected cases had an ankle arthrodesis.

3. Result

Table 1 presents the socio-demographic characteristics of individuals with ankle presentations, including details on age, gender distribution, and occupational status. Let's discuss each aspect in detail:

3.1. Mean Age (years)

- The mean age of individuals with ankle presentations is 41.44 years.
- The standard deviation of ± 18.9 indicates the variability of ages around the mean.
- The age range spans from 10 to 78 years, showcasing a wide distribution of ages among the participants.

3.2. Gender

- Among the individuals with ankle presentations, there were 20 males and 13 females.
- Males represent the majority, accounting for 60.6% of the total, while females constitute 39.4%.
- This distribution provides insights into the gender composition of the sample population, indicating a higher prevalence of ankle presentations among males compared to females.

3.3. Occupation

The participants' occupations are categorized into four groups: Students: 8 individuals (24.2%)

- Business people: 9 individuals (27.3%)
- Civil Servants: 11 individuals (33.3%)
- Housewives: 5 individuals (15.2%)

Civil servants have the highest representation among the occupational categories, followed by business people and students. Housewives represent the smallest proportion.

Table 1 Socio-demographic characteristics of all ankle presentations

Variable	Frequency (n)	Percentage (%)
Mean Age (years)	41.44 ± 18.9	10-78
Gender		
Male	20	60.6
Female	13	39.4
Occupation		
Students	8	24.2
Business people	9	27.3
Civil Servants	11	33.3
Housewives	5	15.2

Table 2 provides a comprehensive overview of the clinical profile of patients with ankle pathologies, including details on aetiology, side of ankle pathology, types of pathology, treatment methods, complications, recovery status, functional outcomes, imaging used for diagnosis, and patient satisfaction. Let's discuss each aspect extensively.

3.4. Aetiology of Ankle Presentations

- Road Traffic Crash (45.5%): This indicates that a significant proportion of ankle injuries resulted from traffic accidents.
- Fall (33.3%): Falls are another common cause of ankle injuries, representing a substantial portion of cases.
- Side of Ankle Pathology: An almost equal distribution between the right (54.5%) and left (45.5%) sides suggests a balanced occurrence of ankle pathology.
- Types of Pathology: Various types of ankle fractures are reported, with right bimalleolar fractures (21.2%) being the most common. Other types include open fractures, medial and lateral malleolar fractures, ankle dislocations, neuropathic ankle joints, and infected ankles, indicating diverse presentations of ankle injuries.
- Closed Ankle Injuries: Are the most prevalent, accounting for 66.7% of reported injuries with 22 cases, while open injuries are less frequent, making up 21.2% with 7 cases.

Cases of infections and neuropathic complications are relatively rare, constituting just 9.1% and 3.0% respectively.

Within the closed ankle injuries, they are further categorized into three Weber classifications: Weber A with 5 cases (15.1%), Weber B with 12 cases (36.4%), and Weber C with 7 cases (21.2%). Additionally, 11 cases (33.3%) fall under other injuries, encompassing open and neuropathic types.

3.5. Treatment Methods

The primary method is Open Reduction and Internal Fixation (ORIF), utilized in 57.6% of cases.

Scotch casting is used for non-displaced fractures in 15.2% of cases, while arthrodesis (joint fusion) is applied in 24.2% of cases.

External fixation, involving an external fixator, is the least commonly used method, implemented in just one case (3.0%).

3.6. Complications during or After Treatment

The majority (97.0%) of patients experienced no complications during or after treatment. However, one case (3.0%) resulted in non-union, indicating a relatively low incidence of complications.

3.7. Current Status of Ankle Recovery

The vast majority (97.0%) of patients were fully recovered from their ankle injuries, while one case (3.0%) experienced non-union, suggesting overall favorable recovery outcomes. Functional Outcomes:

Most patients (97.0%) regained the ability to bear full weight on their injured ankles, while a small percentage (3.0%) remained non-weight bearing, indicating satisfactory functional outcomes.

3.8. Infection

Seven of the patients (15%) developed superficial infections in their wounds, which were managed with sensitive antibiotics and wound dressings. There was no deep infection requiring debridement.

3.9. Imaging Used for Diagnosis and Follow-Up

X-rays were used for both diagnosis and follow-up in all cases (100.0%), highlighting the standard imaging modality for assessing ankle injuries.

3.10. Patient Satisfaction

The vast majority of patients (97.0%) reported being satisfied with their treatment outcomes, while a minority (3.0%) expressed dissatisfaction.

Table 2 Clinical Profile of Different Ankle Presentations

Variable	Frequency (n)	Percentage (%)
Aetiology of ankle pathology		
Road Accident	15	45.5
Fall	11	33.3
Chronic Arthritis Infected ankle	2	6.1
Paralysis with flail ankle Gunshot	3	9.1
	1	3.0
	1	3.0

Table 3 Clinical Profile of Patients with Ankle Injury

Variable	Frequency (n)	Percentage (%)
Side of Ankle pathology		
Right	18	54.5
Left	15	45.5
Types of pathology		
Right bimalleolar fractures	7	21.2
Right open ankle fractures	5	15.2
Right medial malleolar fractures	1	3.0
Right ankle fracture dislocation	1	3.0
Right lateral malleolar fractures	3	9.0
Left medial malleolar fractures	2	6.1
Left open ankle fractures	2	6.1
Left ankle fracture dislocation	6	18.2
Left ankle dislocation due to arthritis	2	6.1
Left neuropathic ankle joint	1	3.0
Infected left ankle with secondary arthritis with deformity.	2	6.1
Infected right ankle	1	3.0
Closed ankle Injuries	22	66.7
Those with open injury	7	21.2
Infected cases	3	9.1
Neuropathic case	1	3.0
Closed ankle Injury classification		
Weber A	5	15.1
Weber B	12	36.4
Weber C	7	21.2
Other injuries(open/neuropathic)	11	33.3
Treatment Method		

ORIF	19	57.6
The scotch casting of non-displaced fractures	5	15.2
Arthrodesis	8	24.2
External Fixation	1	3.0
Any Complication during or After Treatment		
None	32	97.0%
Non-union	1	3.0%
Current Status of Ankle Recovery		
Fully Recovered	32	97.0%
Non union	1	3.0%
Functional Outcomes		
Ability to Bear full Weight	32	97.0%
\Non-weight bearing	1	3.0%
Imaging Used for Diagnosis and Follow-Up		
X-rays	33	100.0
Infection		
No infection	26	85
Superficial	7	15
Deep	0	0
Is the Patient Satisfied?		
Yes	32	97.0
No	1	3.0

4. Discussion

The mean age of patients was 41.44 years, with a broad age range from 10 to 78 years. This wide age range suggests that ankle problems are not confined to any specific age group but can affect individuals across a broad spectrum.

The study had more male participants (60.6%) compared to females (39.4%), reflecting possibly higher exposure to activities leading to ankle injuries among males [8]

The distribution across occupations—students (24.2%), business people (27.3%), civil servants (33.3%), and housewives (15.2%)—suggests that ankle injuries can affect all socioeconomic groups, though civil servants were the most represented.

The predominant causes of ankle injuries were road traffic accidents (45.5%) and falls (33.3%). These statistics highlight the impact of accidents and falls as major public health issues leading to significant orthopaedic injuries. While RTA is the leading cause in this study and, as corroborated by some scholars [11,22,26], soccer and contact sports seem to be the main aetiology in the Western world [23,24,25]

Out of the thirty-three patients who presented within the study period with different ankle pathologies, only a few presented with non-injury related complaints. However, there was always a history of previous injury to the ankle, which was treated at a local bone setters' place or poorly in a previous hospital. The history of trauma was corroborated by some scholars, showing the link between previous injury and the development of severe osteoarthritis needing surgical intervention; except for the patient who presented with a neuropathic ankle, most of the patients had a background history of trauma [20,21,22]

The pathology was almost equally divided between the right and left ankles, indicating no particular predisposition based on side.

This study showed a variety of ankle pathologies, with right bimalleolar fractures being the most common.

There were 22 cases of closed ankle injuries, constituting 66.7% of the total, which highlights them as the most common type encountered. Open injuries account for 7 cases or 21.2%, followed by infected cases with 3 instances making up 9.1%, and a single neuropathic case, representing 3.0% of the total. The open fractures, which largely affected the joint surfaces, were treated with arthrodesis, The neuropathic ankle with foot drop was fused to give the patient stability while walking.

The closed ankle injuries were further classified using the Weber system. Weber A, the least severe category, includes 5 cases or 15.1% of these injuries. Weber B injuries were more prevalent, with 12 cases accounting for 36.4%, indicating a moderate level of severity. Weber C, which typically indicates a more complex injury, includes 7 cases or 21.3% [14,15]

Additionally, there are 11 other injuries categorized as either open or neuropathic, making up 33.3% of the cases, which underscores the complexity and variety of ankle injuries that can occur beyond the closed type.

ORIF (Open Reduction and Internal Fixation) with 1/3rd tubular plate, malleoli screw or both were used for fixation, and it was the most utilized approach, followed by arthrodesis and scotch casting for non-displaced fractures. This has been effective and preferred in most of the ankle injuries. Scotch casting for non-displaced fractures is applied in 5 cases, covering 15.2% of the total, suitable for undisplaced and stable fractures. Arthrodesis was used in 8 cases, amounting to 24.2%, often reserved for more severe or chronically unstable injuries.

Lastly, external fixation, which was used in the most complex cases, is the least utilized method with just one case or 3.0%. [10,11,12,13, 19]

Despite experiencing superficial surgical site infection in about 15%(5 out of 33) of cases treated with only wound dressing and oral antibiotics, 97% of patients were satisfied post- treatment. This is indicative of effective surgical procedures and postoperative care. Nearly all patients recovered fully, demonstrating the effectiveness of the chosen treatments. The small percentage that did not achieve full recovery presents an area for further study to enhance treatment protocols [19]

High patient satisfaction with the treatment outcomes reflects success in the use of plates and screws in the management of ankle fractures and the use of intramedullary nails for arthrodesis. The external fixator was used on occasion for arthrodesis and still came out good. Only one case out of the eight who underwent arthrodesis and used intramedullary nails failed due to poor adherence to post-operation instructions and non-weight [19, 27]

5. Conclusion

Ankle pathologies and injuries can be treated using different methods tailored to the patient's needs. Open reduction and internal fixation of ankle fractures using one-third tubular is still very effective in the treatment of ankle injuries. Arthrodesis is also effective in complex ankle injuries with joint surface damage. Intramedullary nails have proven effective in this regard; scotch casting is effective for non-displaced ankle fractures and has been employed successfully, while external fixators are used in open ankle fractures with extensive soft tissue damage.

Compliance with ethical standards

Statement of ethical approval

Ethical approval was sought and received from Chukwuemeka Odumegwu Ojukwu University Teaching Hospital's Ethical Committee.

Statement of informed consent

This was freely given by all the patients.

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