

Fracture-free ankle dislocations: four cases

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Purpose. We performed a clinical-radiological review of several patients with fracture-free ankle dislocations.

Cases. Descriptive retrospective study of 4 cases, 2 open and 2 closed. A description is made of the etiologies, mechanisms of injury, inter-malleolar distance, talar coverage rate, time to weight-bearing, final joint balance, radiographical sequelae and final Gay & Evrard score.

Results. Mean age was 23.25 years; road accidents accounted for 80% of injuries. Mean values for inter-malleolar distance and talar coverage were 0.49 and 0.56 respectively, with standard deviations of 0.40. Mean immobilization time was 5.6 weeks and full-weight bearing was authorized at 4.2 months. The mean Gay & Evrard score was 8 points, with a Standard deviation of 2.91 points.

Conclusions. Posteromedial dislocation leads to a higher risk of open trauma, collateral damage as well as cutaneous and radiological sequelae with clinical involvement. Anterolateral dislocation, closed in our series, has a better prognosis. Immediate action is fundamental for a good prognosis.

Key words: *dislocation, ankle.*

Luxaciones de tobillo sin fractura: cuatro casos

Objetivos. Se realiza una revisión clínico-radiológica de cuatro pacientes que presentaron luxaciones de tobillo sin fractura.

Casos. Estudio descriptivo, retrospectivo, sobre 5 casos, 3 abiertos y 2 cerrados, en 4 pacientes. Se detallan las etiologías, mecanismos, relación maleolar, índice de cobertura astragalina, tiempo para iniciar la carga, balance articular final, secuelas radiográficas y evaluación final de Gay y Evrard.

Resultados. La edad media fue de 23,25 años. La etiología fueron los accidentes de tráfico en un 80%. Se observó una relación maleolar y un índice de cobertura de 0,49 y 0,56, respectivamente, con desviaciones típicas de 0,40. La media de inmovilización fue de 5,60 semanas y, la carga completa en 4,2 meses. Según los criterios de Gay-Evrard se obtuvo una media de 8 puntos y una desviación típica de 2,91 puntos.

Conclusiones. La luxación posteromedial conlleva un mayor riesgo de lesiones abiertas, daños colaterales, secuelas cutáneas, radiológicas y con afectación clínica. La luxación anterolateral, cerrada en nuestra serie, tiene mejor pronóstico. La actitud inmediata es fundamental en el pronóstico.

Palabras clave: *luxación, tobillo.*

Ankle dislocation without fracture is an infrequent entity (less than 100 cases are described in the worldwide literature)¹ that is generally caused by violent trauma such as that suffered in traffic or sports accidents². The prognosis is variable, according to the degree of soft tissue involvement, and favorable in closed dislocations; in open dislocations there may be skin necrosis, functional limitation and an eventual risk of amputation³.

The aim of this study is to review 5 cases of ankle dislocation without fracture, in which clinical and radiological

assessments were performed, with a maximum follow-up of 5 years in one of the cases.

CASE REPORTS

This is a descriptive retrospective study of 4 patients with ankle dislocation without fracture (figure 1). Cases in which some indication of malleolar fracture was seen were excluded.

We present 4 cases with details of the cause, mechanism, direction, syndesmotomic involvement, their X-ray assessment (including the malleolar index and the talus coverage index, according to the description of Elise et al⁴ [Figure 2]), time of immobilization, start of weight-bearing, collateral damage, final joint balance, X-ray sequelae and final clinical assessment according to the criteria of Gay and Evrard⁴ and described by Elise et al⁴ (considering pain, instability, mobility, trophic sequelae and professional activity after trauma) (Table 1).

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Figure 1. X-ray of a postero-medial dislocation showing integrity of the distal tibia and fibula.

Case report 1

A woman of 18 years of age who suffered a motorbike accident and presented with a large deformity, a 15 cm-long

wound with incision, contusion and exposure of the tibiofibulotalar joint but no distal vascular involvement.

Surgical cleaning was performed and the patient was given intravenous cephalozine and gentamicin as well as tetanus prophylaxis. The dislocation was reduced, the talofibular ligament and the anterior and posterior capsule were sutured, the fibular sheath was also restored. The ankle was immobilized with a rearfoot splint. At 2 months certain ankle instability was seen but complete weight-bearing was authorized 3 months after surgery (Figure. 1).

Case report 2

A man of 21 years of age who came to the emergency room after suffering a motorbike accident, with open dislocation of both ankles. Surgical washing, tetanus and antibiotic prophylaxis, reduction and immobilization were carried out.

Eleven days later an area of skin necrosis was seen on the right ankle that led to an escharectomy and the application of a skin graft that evolved satisfactorily. Complete weight-bearing was permitted at 7 months with limitation of



Figure 2. A. To assess the malleolar index it is necessary to draw 3 parallel lines, one through the syndesmosis and the other 2 through the distal extremities of both malleoli. The malleolar index is the result of the distance from the syndesmosis to the extremity of the internal malleolus divided by the distance from the syndesmosis to the extremity of the external malleolus. Calcification of the deltoid ligament is apparent several months after initial trauma. B. Assessment of the talar coverage angles. A ratio is established between the coverage angle whose limits are the anterior and posterior extremities of the lower tibiotalar joint, and the angle that represents the anterior and posterior extremities of the whole upper articular surface of the talus.

Table 1. Gay and Evrard Scale (described by Elise et al⁴)

Clinical finding	Meaning	Assessment (points)
Pain	Absence of pain	3
	Pain when walking on an irregular surface	2
	Pain that limits usual activity	1
	Pain that causes incapacity to carry out any activity	0
Instability	Lack of instability	3
	Instability on irregular surfaces	2
	Usual instability, sensation of lack of security	1
	Instability that requires the use of a cane/crutches	0
Mobility	Normal mobility	3
	Mobility greater than or equal to 50% of normal	2
	Mobility below 50% of normal	1
	Anchylolysis or foot deviation	0
Edema and trophic problems	Absence of edema	3
	Slight or intermittent edema	2
	Marked edema on effort	1
	Marked permanent edema	0
Occupation	Professional activity the same as before trauma	3
	Occupation preserved, but with adaptation in the workplace	2
	Change of occupation or activity	1
	Impossibility to carry out professional activity	0

In the Gay and Evrard assessment, several points in the scale, from 0 to 3, depend on parameters that determine pain, instability, mobility, trophic sequelae and professional activity after trauma. This scale was originally used for tibial pilon fractures. Elise et al⁴ modified the results decreasing the score by 3 points if the distance walked is less than or equal to 100 m, decreasing it by 2 points if walking is limited to a distance of between 100 and 500 m and decreasing it by 1 point if it is limited to between 500 and 1,000 m. In this manner the results are considered very good (if the sum total of points is between 13 and 15 points), good (between 10 and 12 points), moderate (between 7 and 9 points) and poor (if the sum total is less than 6 points).

mobility and signs of incipient degeneration in both ankles, with calcifications of the deltoid areas.

Case report 3

A 26 year old man who, after a traffic accident, presented with a fracture-free dislocation of the right ankle. Reduction was carried out under general anesthesia and the joint was immobilized for 6 weeks. The patient underwent rehabilitation for 3 months and achieved almost normal ankle mobility.

Case report 4

A 28 year old patient who suffered closed lateral dislocation of the ankle while playing basketball. After reduction and immobilization of the ankle with a splint for 3 weeks, the patient began weight-bearing 2 months after trauma. No great limitations of the mobility of the affected limb were seen.

RESULTS

The mean age of the patients was 23.25 years. There were 3 men and 1 woman. Mean follow-up was 2.92 years, with a standard deviation of 2 years (1-5 years).

Eighty percent of cases were caused by traffic accidents, a high-energy mechanism; inversion was the cause of 100% of cases. In the open cases there was postero-medial dislocation with involvement of the syndesmosis; this was not the case in the closed cases.

The mean value of the malleolar index was 0.49, with a standard deviation of 0.40 (0.45-0.56). The mean coverage index was 0.56 with a standard deviation of 0.40 (0.51-0.60). Mean immobilization time was 5.60 weeks with a standard deviation of 1.51 weeks.

Full weight-bearing was achieved at a mean time of 4.20 months, with a standard deviation of 2.58 months (2 months for the closed case and 7 months for the bilateral open dislocations). Mean rehabilitation time was 2.25 months. We wish to highlight the skin necrosis observed in 1 case, which required escharectomy and a graft, whereas in the closed cases there was no collateral damage.

The final joint balance seen in the open cases showed a restriction to extension of up to approximately 10°, with sclerosis and narrowing of the tibiofibulotalar mortise. However, these clinical and radiological findings were not seen in closed cases. Clinical assessment according to the Gay and Evrard scale, described by Elise et al⁴, showed good results in the closed cases and poor results in the open cases, with a mean value of 8 points and a standard deviation of 2.91 points (5-12) (Table 2).

DISCUSSION

Ankle dislocation without fracture is an unusual entity. Seventy-three cases are discussed in the literature¹⁻¹³, of these, 36 cases are open dislocations (49%) and 37 are closed cases (51%), the mean age of the patients is 31 years

Table 2. Different clinical cases, their description and comparison

	Patient 1	Patient 2 (right ankle)	Patient 2 (left ankle)	Patient 3	Patient 4
Age	18	21	21	26	28
Gender	Female	Male	Male	Male	Male
Total follow-up	2 yrs 6 months	5 yrs	5 yrs	1 yr	1 yr
Etiology	Car accident	Car accident	Car accident	Car accident	Basketball
Mechanism	Inversion	Inversion	Inversion	Inversion	Inversion
Open/closed	Open	Open	Open	Closed	Closed
Dislocation direction	Posteromedial	Posteromedial	Posteromedial	Anterolateral	Lateral
Syndesmotic involvement	Yes	Yes	Yes	No	No
Malleolar index	12/24	12/25	11/24	12/24	14/25
Talus coverage index	100/165	82/160	90/160	85/160	90/150
Type of reduction	Open	Open	Open	Closed	Closed
Debridement	Yes, Friedreich	Yes, Friedreich	Yes, Friedreich	No	No
Ligament repair	Yes, talofibular	Joint capsule	Joint capsule	No	No
		ligament, anterior/ posterior joint capsule and fibular tendon sheath reconstruction			
Postsurgical immobilization	Posterior foot splint	Posterior foot splint	Posterior foot splint	Plaster boot	Plaster splint
Duration of immobilization	7 weeks	6 weeks	6 weeks	6 weeks	3 weeks
Time to full weight-bearing	3 months	7 months	7 months	2 months	2 months
Rehabilitation period	2 months	2 months	2 months	3 months	No rehab
Collateral damage	Cheloid scar	Cheloid scar Crepitus Skin necrosis that led to a right lateral malleolar sarcotomy and an autologous dermoepidermic graft	Cheloid scar Crepitus	Cheloid scar	Cheloid scar
Final articular balance	Extension limited to 10°	Flexion limited to 20° and extension limited to 10°	Extension limited to 15°	Full recovery	Full recovery
Radiographic sequelae	Deltoid ligament calcification Osteophytes Mortise narrowing Possible Südeck's atrophy	Deltoid ligament calcification Osteophytes Mortise narrowing	Mortise narrowing	No	No
Final clinical assessment: Guy & Evrard	6.Poor	5.Poor	7. Moderate	10. Good	11. Good

(10-73). There is a predominance of men (72%) over women (28%)¹, the same as in our series, which could be explained by the cause being traffic accidents or by the fact that men do more aggressive sports, which is a predisposing factor.

This entity can be classified according to talar displacement through the mortise; based on this Rivera et al² described anterior, posterior, medial and lateral types. In our series we saw 3 posteromedial, one anterolateral and one lateral dislocation. Wroble et al observed that medial dislocation was more frequent¹, although Soyer et al considered

lateral dislocations more frequent (27%)⁵. Pure rotational dislocations are an exception¹.

As to the mechanism that causes these dislocations it is usually inversion and axial loading, as has been demonstrated in cadavers by Fernández⁶. The tibiofibulotalar mortise is more unstable in plantar flexion³, and the medial or lateral displacement depends on whether the foot is in varus or valgus on impact⁵.

Risk factors are sports such as basketball and especially traffic accidents (motorbike accidents in 33% of cases)², even in sleeping subjects⁷. Ligament hyperlaxity, previous

dislocations, weakness of the fibular muscles, shortening of the tibial malleolus, or chronic ankle instability can contribute to these dislocations.

Modification of the malleolar index ($B/A = 0.58 - 0.62$) and of the talus coverage index $\pm (0.58-0.60)^{2,4}$ could be predisposing factors for these lesions.

As to treatment, in closed cases, it is necessary to carry out early reduction under general or even local², anesthesia⁸, immobilization with a splint for 6 weeks and avoidance of weight bearing for 1 to 2 months.

However, in open cases (50% of cases)³ it is necessary to carry out intravenous therapy with antibiotics (cephazoline, 1 g every 8 hours, together with gentamicin, 80 mg every 8 hours)⁹, tetanus prophylaxis and follow-up of the wound with cultures and antibiograms, together with debridement⁷ or ligament repair^{4,10} and/or capsular repair¹. Some authors delay closing for 2 to 4 days, or carry out a primary closure with Penrose drainages. For Elise et al⁴, according to the Cauchoix classification (types I, II and III), posterior skin coverage is necessary in type III. In open cases sub-patellar amputations¹ have been carried out due to soft tissue necrosis, wound infection, or damage to the posterior tibial artery³. Fibular osteotomies are an alternative to correct poor joint alignment⁴. Edwards and De Lee recommend the use of a tibio-fibular screw¹¹, although in our series we have not needed to place tibio-fibular screws.

Complications can be varied, and we must highlight amongst these: vascular lesions that affect the dorsal artery of the foot, entrapment of the *hallucis longus*¹⁰, infectious arthritis, Südeck disease, permanent *talipes equinus*⁴ or neurological damage¹², loss of dorsiflexion, arthritis, instability, calcifications, joint impingement¹, and skin or talar necrosis (90% of cases)¹³. Avascular necrosis can be managed conservatively, reserving talar excision and arthrodesis⁹ for cases of advanced necrosis.

In summary, prognosis is usually good if early treatment is carried out¹⁴, although in open cases, repeated posteromedial dislocation influences the prognosis since it has a greater effect on syndesmosis, involves a greater risk of skin necrosis, leads to more X-ray lesions and has a greater effect on mobility. However in closed cases, in which it has been noted that anterolateral or lateral dislocation are more frequent, syndesmosis is less affected, and there is less repercussion on soft tissues and joint tissues. All of this im-

plies that fewer restrictions to weight-bearing are necessary in closed cases, which have a better prognosis according to Gay and Evrard. Finally, we think that this lesion may be more frequent than is described in the literature since it tends to be underdiagnosed due to the spontaneous reductions that take place before the x-ray results are seen in the emergency room.

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Conflict of interests

The authors have declared that they have no conflict of interests.