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## Etiopathogenic aspects upon distal tibia articular fractures

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### ABSTRACT

The paper propose a complex annalysis regarding etiopathogenic approach of the tibial pilon. The study was made upon the articular fractures of distal tibia, hospitalised and treated in Orthopaedic-Traumatology Clinic of Constanta Emergency Clinical Hospital, between 2007-2011, and consist of 245 patients. The lesional graduality will be found in the anathomo-clinical forms of the fractures. The grade of soft tissue devitalisation will influence the local evolution and will promote the appearance and extension of skin necrosis in case of irreversible ischemia. In case of direct trauma, but with low energy or in case of indirect trauma, perfracture lesions are restrained and evolution can be favourable to cicatrization. The correct dyagnosis of these fractures are a mandatory stage of the presurgical planning and was made by annalysing the x-rays made in 2 incidencies, in emergency, and which were repeated when it was needed.

The lesional graduality of bone and soft tissue structures is direct proportional with the type of traumatic mechanism and with the level of energy which produced the fracture. The traumatic mechanism can produce lesional characteristics, by direct mechanism (work accidents, falling from high or same level) or by indirect mechanism with forces transmitted through

talus (forced inversion/eversion).

The fracture type must be evaluated upon the clinical and prognostical criteria of AO and Ruedi-Allgower classification, which suggest the therapeutical manners too. The evaluation of soft tissues is made by the Gustilo-Anderson classification, the only one which can establish correctly the graduality and the severity of lesions.

Keywords: tibial pilon fracture, etiopathogeny, dyagnosis

### Introduction

The tibial pilon fractures has very often an unfavourable evolution, which explain the frequency of complications dominated by the healing of tegument problems and consolidation disorders. The soft tissues have a high risk of ischemic problems, especially on internal side, where the skin is soft, very few mobile and bad vascularity. The absence of tibial muscle insertions explain why the periostal vascularity is poor.

The cutaneous problems and those related to osteosynthesis explain the difficulties of a precise therapeutic standardisation and impose prudence and rigurocity in choosing the therapeutic method [1,2,3]

The paper propose a complex annalysis regarding etiopathogenic approach of the tibial pilon.

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## Material. Methods.

The study was made upon the articular fractures of distal tibia, hospitalised and treated in Orthopaedic-Traumatology Clinic of Constanta Emergency Clinical Hospital, between 2007-2011, and consist of 245 patients.

Inclusion criteria:

- articular distal tibia fractures

exclusion criteria:

- non-articular distal tibia fractures
- malleolar tibial fractures

## Results

The patient group we studied consist of 245 patients, 186 men (76%) and 59 women (24%), treated between 2007-2011 in our Clinic. The mean age was 44.2 years (17-81 years), fractures produced in the following circumstances: car accidents, falling from high, falling from same level, sport accidents and other causes.

According Ruedi si Allgower classification were: 33.46% type I I, 32.65% type II, 33.89% type III. 61 fractures were open.

184 cases (75%) were closed fractures, 61 cases (25%) were primary open fractures, 67 cases (27.34%) were fractures with limited cutaneous disorders (phlyctena, superficial skin necrosis, traumatic oedema and microcirculatory damage compartmental sindrom-like) and 33 (13.46%) fractures were secondary open.

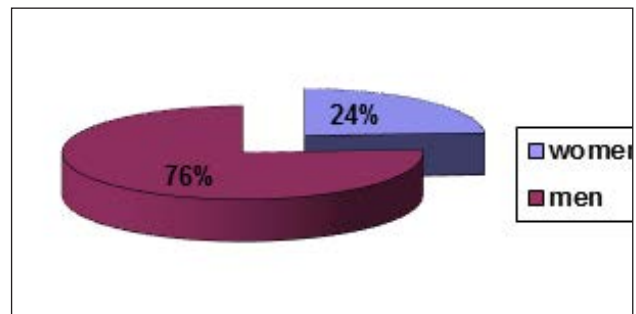


Figure 1 Sex incidence

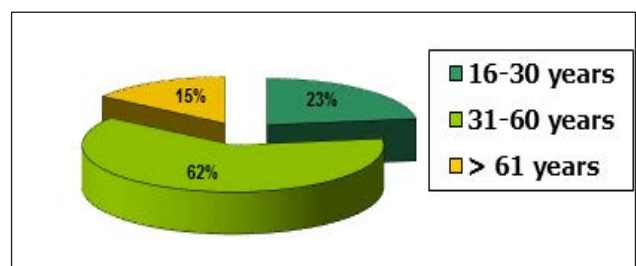


Figure 2 Age groups

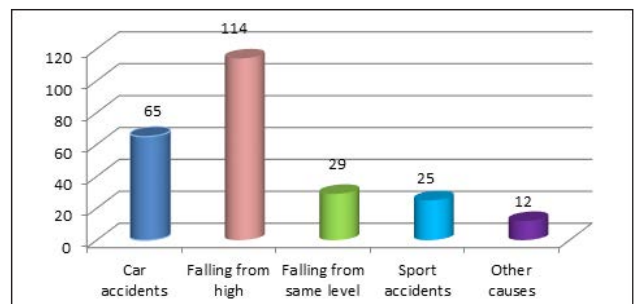


Figure 3 Etiology

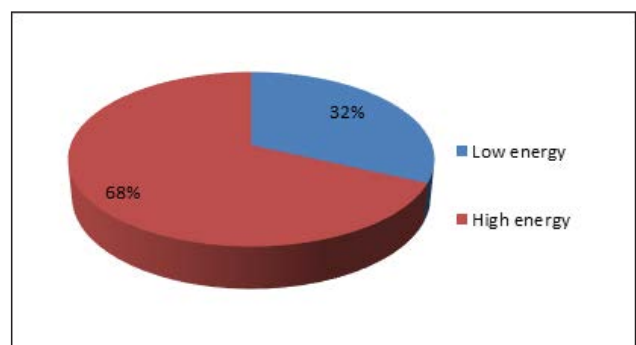


Figure 4 Traumatic energy

Table I Soft tissue aspect

Primary open fractures	Secondary open fractures	Closed fractures	Fractures with limited cutaneous disorders
61	33	84	67

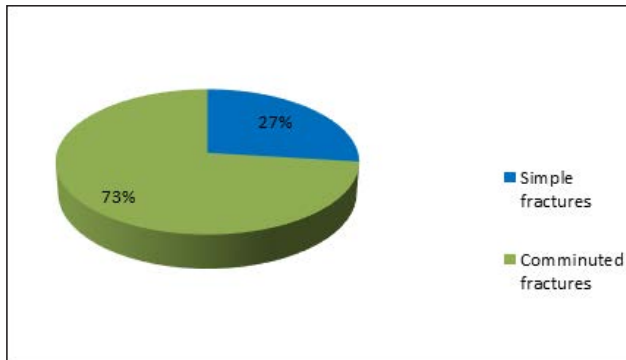


Figure 5 Fracture type

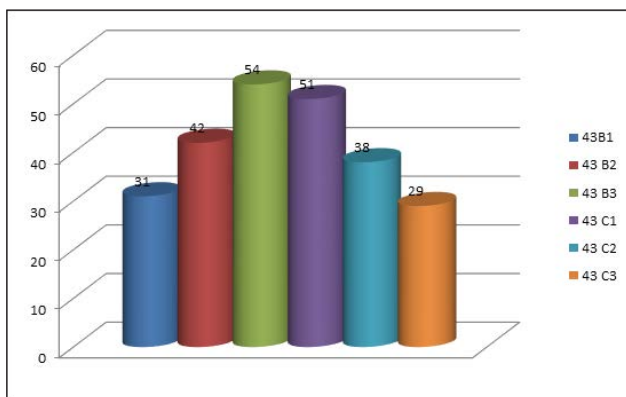


Figure 6 AO clasification

Table II Ruedi and Allgower classification with correspondence to AO

Ruedi și Allgower classification	AO classification		No	%
Type I	B1	31	82	33.46
	C1	51		
Type II	B2	42	80	32.65
	C2	38		
Type III	B3	54	83	33.89
	C3	29		

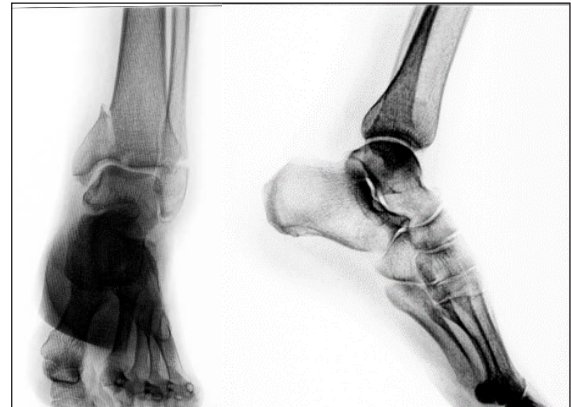


Figure 7 43-B1

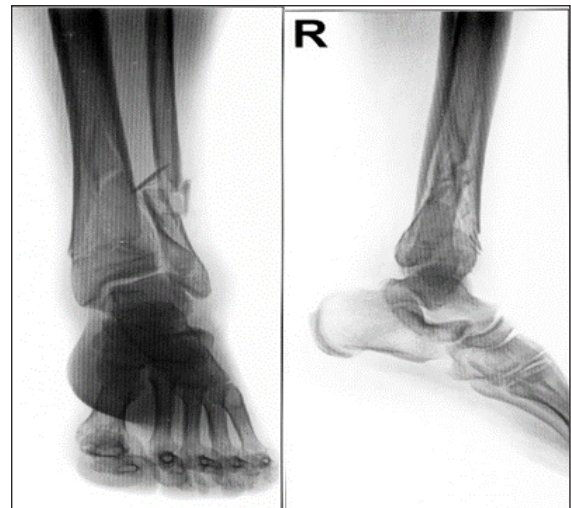


Figure 8 43-B2



Figure 9 43-B3



Figure 10 43-C1



Figure 11 43-C2



Figure 12 43-C3

Table III Fractures association

Fractures association	Cases
pilon + peroneal malleolus	96
pilon + tibial malleolus + posterior foot luxation	65
pilon + tibial malleolus + external foot luxation	42
pilon + peroneus	61
pilon + tibial malleolus	139
pilon with no other association	88
pilon + tibial dyaphysis extension	43

## Discussions

Etiology was dominated by the falling from high, from which 97 were work accidents and 17 suicidal temptations, followed by the car traffic accidents in 65 cases. The most common skeletal associated lesion was peroneal fracture (39%).

High frequency of tibial pilon fractures met to men, 186 patients (75.91%) can be explained by the traumatic circumstances characteristic to males (work with increased traumatic risk, car accidents, alcohol consumption).

The highest frequency was at the group age of 31 – 60 years (62%), followed by the age between 16-30 years (23%) and the age over 61 years (15%).

An important factor which can be favourable for the evolution of open fractures for the groups age under 51 years can be the capacity of tissue regeneration, a good biological status which can influence favourable for healing, in comparison elderly patients with possible associated disease, which can badly influence the evolution. The individual reactivity, from local microcirculatory point of view, can influence the evolution of lesions, being differences between young and old patients. [4,5]

The lesional graduality will be found in the anathomo-clinical forms of the fractures. The grade of soft tissue devitalisation will influence the local evolution and will promote the appearance and

extension of skin necrosis in case of irreversible ischemia. In case of direct trauma, but with low energy or in case of indirect trauma, perfracture lesions are restrained and evolution can be favourable to cicatrization. [6,7]

We found that comminuted fractures had the highest frequency, 179 patients (73%), comparison with simple fractures, 66 cases (27%), being a relation between the intensity of trauma and the type of soft tissue lesion. The fracture characteristics as grade of comminution and type of the opening can characterise indirectly the force of traumatic energy.

According AO classification were fractures 43 B1 12.65%, 43 B2 17.14%, 43 B3 22%, 43 C1 20.8%, 43 C2 15.51% și 43 C3 11.84%. According Ruedi-Allgower classification were 33.46% fractures type I, 32.65% fractures type II and 33.89% fractures type III. There is an anathomo-pathological correspondence between the 2 classifications as type I Ruedi Allgower with B1 and C1 AO, type II with B2 and C2 and type III with B3 and C3, correspondence which increase as grade for every type of fracture in same time with increasing of fracture complexity.

The most frequent association was between tibial pilon fracture and pure tibial malleolus fracture in 139 cases, fact explained by the complexity of the mechanism which produced the fracture and the high force of traumatic energy. In many cases, the fracture line is complex and involve the entire articular surface of the pilon, with detaching of the tibial malleolus. In 88 cases were tibial pilon fractures with no other association and in 96 cases the tibial pilon fracture were associated with peroneal malleolus fracture.

The soft tissue quality was evaluated using Gustilo-Anderson classification. In our group we remarked a high frequency of closed fractures in 84 cases, followed by primary open fractures 61 cases, secondary open fractures 33 cases and fractures with limited skin disorders 67 cases.

According Gustilo-Anderson classification were 19 open fractures type I, 17 open fractures type II, 14 open fractures type IIIA, 9 open fractures type IIIB and 2 open fractures type IIIC.

The correct diagnosis of these fractures are a mandatory stage of the presurgical planning and was made by analysing the x-rays made in 2 incidencies, in emergency, and which were repeated when it was

needed.

## Conclusions

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The anatomic characteristics of talo-crural joint impose the tibial pilon fractures typical lesional characteristics, multiple clinical aspects, therapeutical difficulties and sometimes an unclear prognosis. The biomechanical characteristics of tibial pilon impose anatomical reconstruction as perfect and stable as possible is, following the remake of the biomechanical axis and the articular congruency.

The lesional graduality of bone and soft tissue structures is direct proportional with the type of traumatic mechanism and with the level of energy which produced the fracture. The traumatic mechanism can produce lesional characteristics, by direct mechanism (work accidents, falling from high or same level) or by indirect mechanism with forces transmitted through talus (forced inversion/eversion).

The fracture characteristics are the consequences of intensity and the way was applied the traumatic mechanism. It is necessary the correct evaluation of the lesional graduality, at hospitalisation, in emergency and in the next days, mandatory to formulate a proper therapeutical strategy.

The fracture type must be evaluated upon the clinical and prognostical criteria of AO and Ruedi-Allgower classification, which suggest the therapeutical manners too. The evaluation of soft tissues is made by the Gustilo-Anderson classification, the only one which can establish correctly the graduality and the severity of lesions.

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