

TREATMENT OF ARTICULAR CALCANEAN FRACTURES - EPIDEMIOLOGICAL ANALYSIS

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Abstract: Calcanean fractures have important morbidity and their treatment involves high socio-economic costs. There are still many issues regarding the treatment of these fractures: indication for surgery, timing, type of fixation etc. There is no definitive indication for surgical or orthopaedic treatment. Even if the surgical treatment seems to offer many advantages related to quality of reduction, duration of treatment, there are no clear data in literature regarding the functional outcome, incidence of early and late complications. This is a retrospective observational cohort study including 168 consecutive patients with the diagnosis of calcanean fracture treated between 2010 and 2015. The purpose of this study is to find correlations between age, gender, comorbidities, complications, duration of hospitalization, treatment. We find significant differences in male patients over 50 years vs. under 50, regarding the presence of early complications. Patients with surgical treatment stay statistically significantly longer in hospital than patients with orthopaedic treatment.

INTRODUCTION

Calcanean fractures are 2% of all fractures, but with important morbidity and with high socio-economic costs.(1,2) The intraarticular fractures of the calcaneus need in 40-85% up to nine months of treatment, and 20% of the patients do not return to the previous activity.(3) There are still many issues regarding the treatment of these fractures: indication for surgery, timing of surgery, type of fixation etc.(4) Studies are showing an important rate of postoperative complications: deep infections, wound problems, deep vein thrombosis.(5,6)

There is no definitive indication for surgical vs. orthopaedic treatment. There are many factors influencing this decision, considering the type of fracture, but also comorbidities, age, mental status, local soft tissue lesions etc.

Even if the surgical treatment seems to offer many advantages related to quality of reduction, duration of overall treatment, there are no clear data in literature regarding the functional outcome, incidence of early and late complications.(7) The surgical treatment decreases the total cost for the treatment of these fractures in the absence of local complications, but severe complications like deep infection are an important issue.(8)

PURPOSE

The purpose of this study is to find correlations between age, gender, comorbidities and associated lesions, complications, duration of hospitalization, type of treatment, which can influence the outcome or the cost of the treatment.

MATERIALS AND METHODS

This study includes 168 consecutive patients with diagnostic of calcanean fracture treated in the Department of Orthopaedic and Trauma Surgery of the University County Emergency Hospital of Sibiu, age 20-90 years old. Data were collected from patients' observational sheets and hospital archives. This is a retrospective observational cohort analysis for a period of 6 years, from January the 1st, 2010 to December 31th, 2015. The data we have analyzed includes: age, gender,

treatment, comorbidities and associated lesions, complications, hospitalization. The patients were divided considering groups of age, type of the fracture according to Bohler classification (9), orthopaedic treatment with cast immobilization or surgical treatment with open reduction and internal fixation. The collected data were included in a table and then analyzed with Graph Pad, statistical analysis. For p value and comparison between variables, we have used Chi square Test and Pearson Test.

RESULTS AND DISCUSSIONS

There were 86.31 % males and 13.69% females in our group. 69.05% of the patients were from cities. Age related analysis shows that even if this fracture is present in all age groups, 31% of the patients were between 50 and 59 years old at the moment of the trauma. The analysis of patients considering their age and gender shows that women over 50 years old are 12% of all the fractures, but in contrast, women under 50 years old are only 2%. The same distribution is present also in males group, 49% of all patients are over 50 years old males.

Table no. 1. Comorbidities

Comorbidities	Percentage
Obesity	25.96%
High Blood Pressure	20.19%
Ischemic Heart Disease	18.27%
Digestive Diseases	8.65%
Behaviour Disturbances	7.69%
Respiratory Diseases	6.73%
Arrhythmia	6.73%
Diabetes	5.77%

Associated or concomitant lesions were other fractures like maleolar fractures, talar fractures (43.86%), and 56.14% of these patients presented lesions of the soft tissue around the hindfoot. The main comorbidities presented at the patients included in this study were: obesity (25.96%), High Blood Pressure (20.19%) and Ischemic Heart Disease (18.27%) (table no 1).

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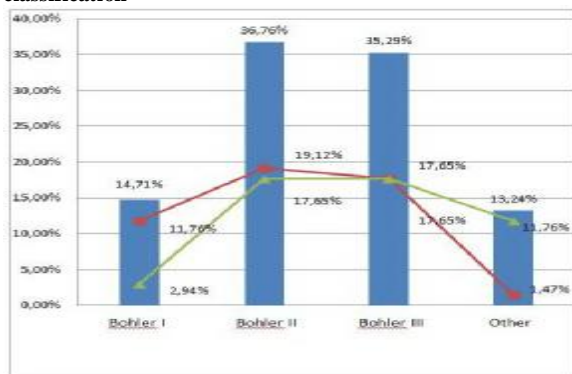
CLINICAL ASPECTS

Using the Pearson (Two-Tailed) Test we found no significant statistical differences regarding the correlation between the comorbidities and surgical treatment versus orthopaedic treatment: $p < 0.9434$ ($p = 0.05$ reference value: $r = 0.005519$; 95% confidence interval: -0.1568 to 0.1460).

The distribution of the patients regarding the type of treatment (orthopaedic versus surgical) shows that 57.14% were treated conservatively and 42.86% with open reduction and internal fixation.

Figure no. 1 shows the distribution of the treatment regarding Bohler Classification. The violet line shows the percentage of the patients with surgical treatment and the orange line shows the patients with orthopaedic treatment: fractures Bohler type I (14.71%) were treated orthopaedically 11.76% and surgically, 2.94%. Fractures type Bohler II (36.76%) were treated orthopaedic 19.12%, and surgical 17.65%. Fractures type Bohler III (35.29%) were treated orthopaedically 17.65% and surgically, 17.65%. The fractures that could not be classified in Bohler types (13.24%), 11.76% were treated surgically and 1.47% orthopaedically.

Figure no. 1. Type of treatment related to fracture classification



Hospitalization time was between 1 and 51 days, but 46.43% of the patients stayed for less than 5 days in hospital. Using Pearson Test we found a statistical significant association between surgical treatment and duration of hospitalization over 10 days, but with no correlation for gender or age ($p < 0.0001$, $p = 0.05$ reference value; $r = 0.5363$; 95% confidence interval: 0.4190 - 0.6361).

Figure no. 2. Correlation between type of treatment and duration of hospitalization for male patients

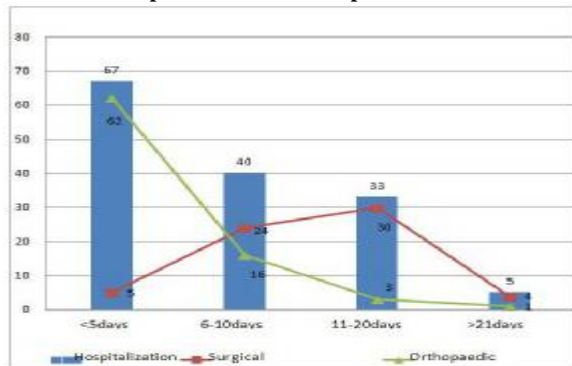
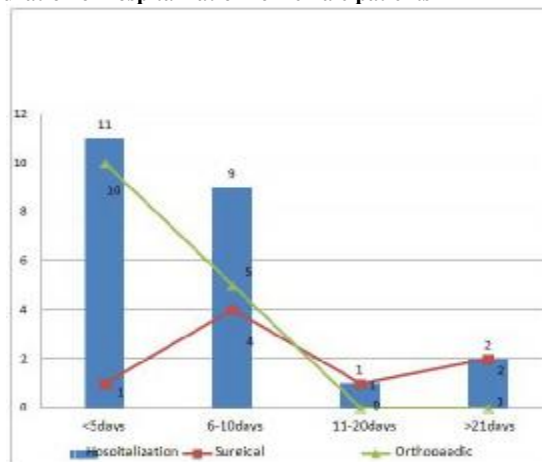


Figure no. 2 represents the distribution of days of hospitalization related to male patients. The graphic shows that in case of less than 5 days in hospital 62 out of 67 patients were treated orthopaedic, but this relation is reversed with the

extension of the hospital days, as in patients with more than 21 days 4 out of 5 were treated with open reduction internal fixation.

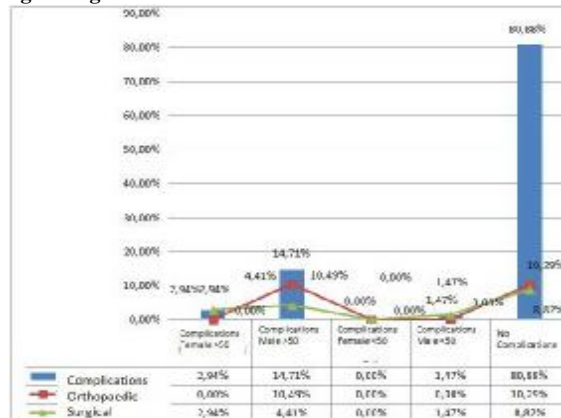
Figure no. 3 represents the distribution of days for hospitalization related to type of treatment in female patients. There is the same pattern for less than five days. 20 out of 23 female patients had less than 11 days for hospitalization.

Figure no. 3. Correlation between type of treatment and duration of hospitalization for female patients



We have analyzed the correlations between the type of treatment and the age of the patients. From all the patients under 50 years old, 49.23 % were males treated orthopaedically, 46.15% were males treated surgically, 1.54% were females treated orthopaedically and 3.08% females with surgical treatment. From all the over 50 years old 2.48% were males treated orthopaedically, 32% were males treated surgically, 12% were females treated orthopaedically and 8% females with surgical treatment. Comparing the two groups of age we can observe a higher prevalence of orthopaedic treatment in females over 50 years old. Using the Chi squared test, we found no significant statistical difference between surgical or orthopaedic treatment in the two groups of age (under vs. over 50 years) for female patients: $p = 0.3859$ ($p < 0.05$ reference value); OR: 0.3333 (< 1 there is no association between the two variables); 95% confidence interval: 0.02571 - 4.322 . There is no significant difference also in male groups: $p = 0.2998$ ($p < 0.05$ reference value), odds ratio 0.7040 (< 1 there is no association between the two variables), confidence interval 95%: 0.36 - 1.36 .

Figure no. 4. Correlation between complications, treatment, age and gender

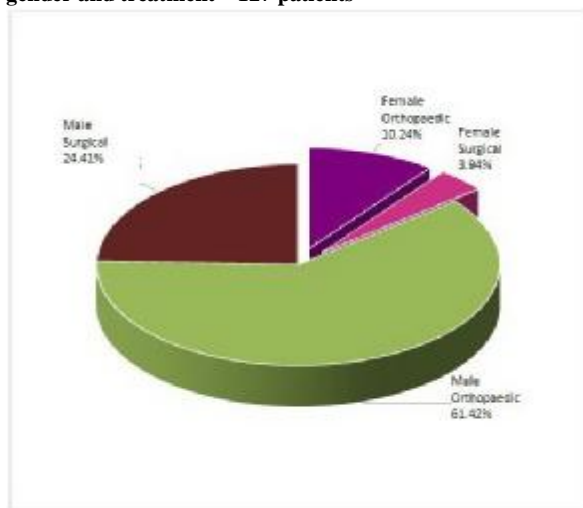


CLINICAL ASPECTS

Figure no. 4 represents the distribution of patients in correlation of complications (skin lesions, wound necrosis etc) related to treatment and age (under vs. over 50 years old). 80.88% of the patients were without complications. All females over 50 years old with complications (2.94%) were treated surgical. Male patients over 50 years old presented complications (14.71%), 10.49% with orthopaedic and 4.41% with surgical treatment. All males with complication (1.47%) were treated with open reduction internal fixation.

Analyzing the relation between immediate complications and comorbidities we found that in the group without complications, 22.06% of the patients presented simultaneous diseases. 2.94% of female patients over 50 years old presented complications, but there are none in the group under 50 years. Comorbidities are more frequent in patients over 50 years old with complications in our analysis, but we have not enough data for a relevant statistical analysis.

Figure no. 5. Hospitalization less than 10 days related to gender and treatment – 127 patients



We have created two groups of patients with less than 10 days of hospitalization and over 10 days, and then we have looked for correlations between duration of hospitalization, gender and type of treatment. Figure no. 5 represents these correlations for patients with less than 10 days of hospitalization. Using Chi Square Test we found statistical significant differences in females over 50 years for duration of hospitalization related to type of treatment (surgical vs. orthopaedic): $p = 0.0084$ ($p = 0.05$ reference value), odds ratio 0.02545 (< 1 there is no association between the two variables), confidence interval 95%: 0.001114 to 0.5817.

All 12 female patients under 50 years with orthopaedic treatment stayed in hospital less than 10 days. For females under 50 years, there is no statistical significant difference between days of hospitalization and type of treatment: $p = 1.000$ ($p = 0.05$ reference value), odds ratio 1.667 (< 1 there is no association between the two variables), confidence interval 95%: 0.02020 to 137.5.

For male patients over 50 years old we found statistical significant difference between days of hospitalization and type of treatment: $p < 0.0001$ ($p = 0.05$ reference value), odds ratio 0.03472 (< 1 there is no association between the two variables), confidence interval 95%: 0.007209 to 0.1672. 48 out of 50 male patients with orthopaedic treatment were under 10 days of hospitalization. We have also found a statistical significant difference between days of hospitalization and type

of treatment in male patients under 50 years old: $p < 0.0008$ ($p = 0.05$ reference value) odds ratio 0.07619 (< 1 there is no association between the two variables), confidence interval 95%: 0.01536 to 0.3779. Even if there is no significant difference in the surgical treatment group, 30 out of 32 male patients with orthopaedic treatment were less than 10 days in hospital.

From all the patients with less than 10 days in hospital the highest ratio was for males treated orthopaedic (61.42%), but this is tributary to our group of patients, 86,31% being males (145), 82 with orthopaedic treatment. The same aspect and for the same reason is found in patients over 50 years old.

CONCLUSIONS

We found no preference for orthopaedic or surgical treatment related to gender, age, comorbidities, type of the fracture.

The presence of comorbidities surprisingly does not increase early complications.

There is a significant statistical difference in male patients over 50 years old vs. under 50 years regarding the presence of early complications.

Patients with surgical treatment stay significantly statistically longer in hospital than patients with orthopaedic treatment.

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