

A. Volna

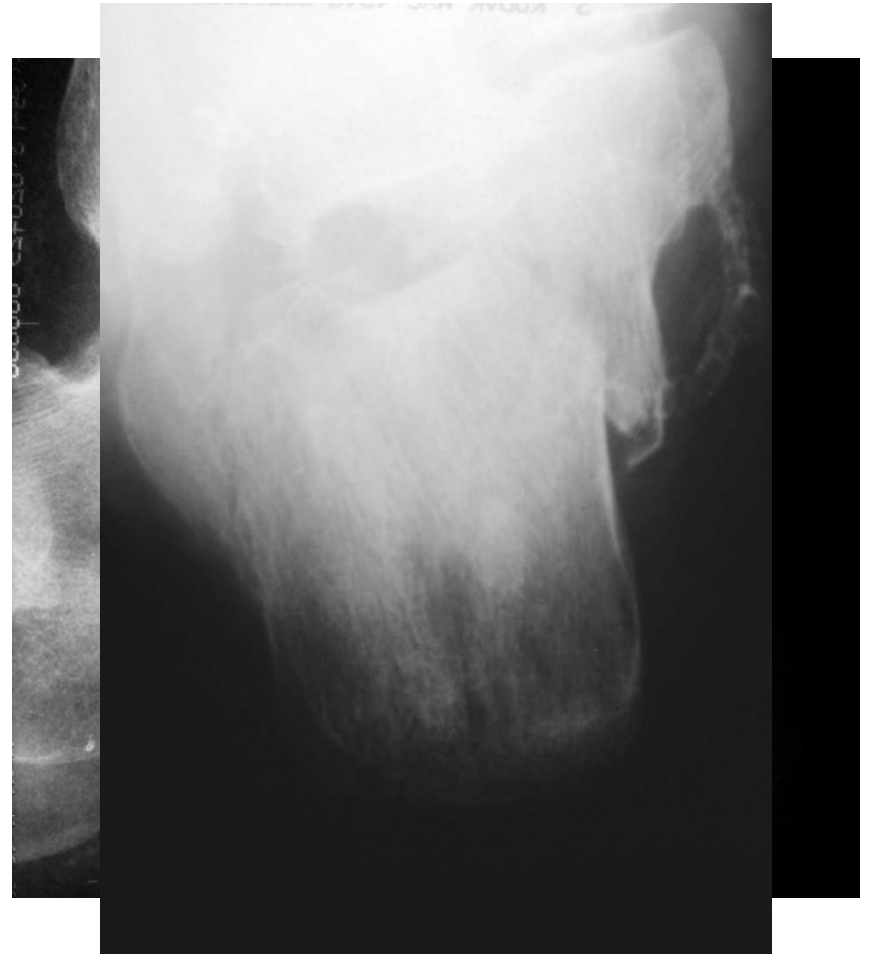
# Calcaneal fractures — predicting and avoiding problems

**Избранные вопросы лечения около и внутрисуставных  
переломов  
Волгоград, 15 декабря 2017 года**



# Clinical case 1. Displaced intra-articular calcaneus fracture (DIACF)

- Male patient, trucker
- Fell down from a height of 2 meters
- Isolated injury
- Serous blisters
- Non-smoker
- Healthy



**Is it worth operating (plating)?**

# Clinical case 1. Displaced intra-articular calcaneus fracture (DIACF)

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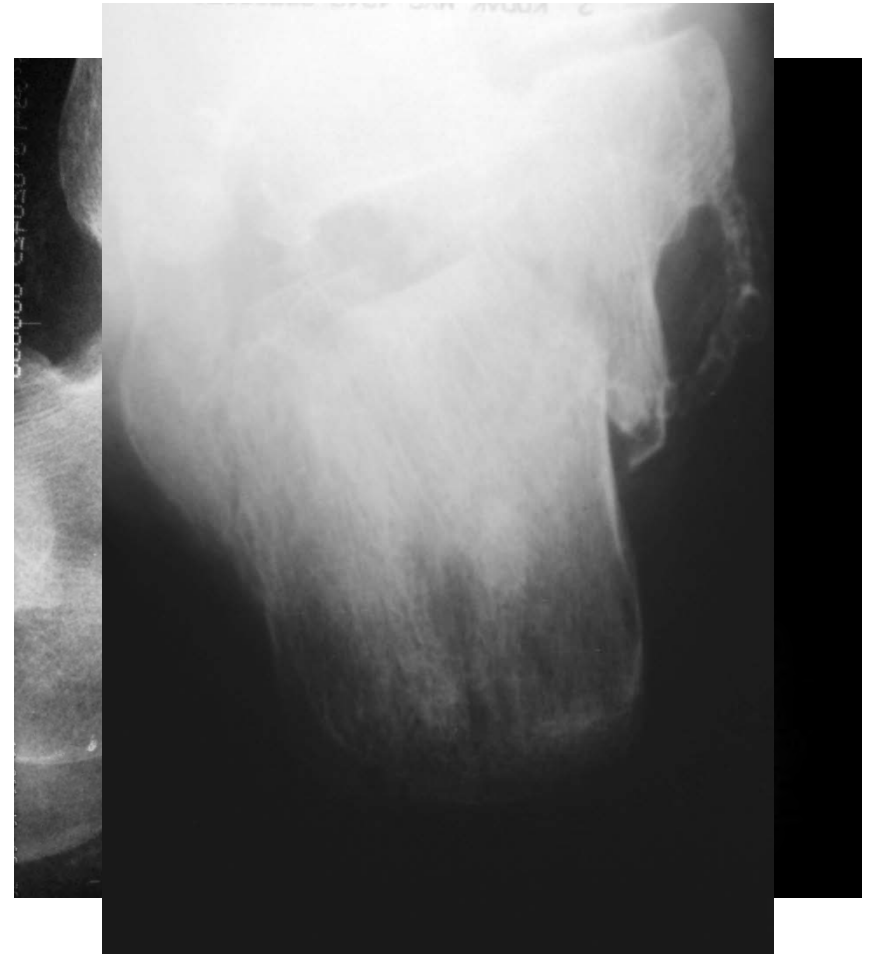
# Clinical case 1. Displaced intra-articular calcaneus fracture (DIACF)



Is it worth operating?

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- Male patient, trucker
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- Serous blisters
- Non-smoker
- Healthy
- **HOWEVER**, he is 56 yo



**Is it worth operating?**

## Clinical case 2. Displaced intra-articular calcaneus fracture (DIACF)

- 36-year-old roofer
- Fell down from a height of 4 meters
- Isolated injury
- Hemorrhagic blisters
- Healthy



**Is it worth operating?**

## Clinical case 2. Displaced intra-articular calcaneus fracture (DIACF)

- 36-year-old roofer
- Fell down from a height of 4 meters
- Isolated injury
- Hemorrhagic blisters
- Healthy
- **HOWEVER**, he is heavy smoker, >30 cigarettes p/d



**Is it worth operating?**

# Clinical case 3. Displaced intra-articular calcaneus fracture right(DIACF), non-displaced left

- 53-year-old male patient
- Fell down from a height of 6 meters
- Isolated injury, bilateral calcaneal fractures
- Hemorrhagic blisters
- Healthy
- Smoker



**Is it worth operating?**

## Aims and objectives

- Provide both simple and informative clinical criteria for surgical risk assessment
  
- Apply ABCDEF ORIF Calcaneal Risk Scale for patients selection (within the group of patients where surgery is indicated concerning the fracture site)

# Articular fractures treatment.

## AO Principles

- Anatomical reduction
  - Stable fixation
  - Preservation of blood supply
  - Early active motion
- 1958

# Articular fractures treatment. Should we follow the same rules in case of DIACF?

- Anatomical reduction
  - Stable fixation
  - Preservation of blood supply
  - Early active motion
- **NO**
  - *“Without stratification of the groups, the functional results after nonoperative care of displaced intra-articular calcaneal fractures were equivalent to those after operative care”* Buckley R, Tough S, McCormack R et al. J Bone Joint Surg Am. 2002 Oct;84-A(10):1733-44
  - *“Results were equivalent between conservative and operative treatment and demonstrate similar findings to those at one year follow-up”* Ibrahim T., Rowsell M., Rennie W. et al. Injury, 2007;(38):848-55

# Articular fractures treatment. Should we follow the same rules in case of DIACF?

- Anatomical reduction
  - Stable fixation
  - Preservation of blood supply
  - Early active motion
- **YES**
  - *“However, after unmasking the data by removal of the patients who were receiving Workers' Compensation, the outcomes were significantly better in some groups of surgically treated patients”* Buckley R, Tough S, McCormack R et al. J Bone Joint Surg Am. 2002 Oct;84-A(10):1733-44
  - *“Only ORIF provides excellent and good results in case of DIACF”* Crosby LA, Fitzgibbons TC. Foot Ankle Int. 1996 May;17(5):253-8.
  - *“ORIF with a lateral plate... has been established as a standard therapy for DIACF with good to excellent results in two-thirds to three-quarters of cases in larger clinical series”* Rammelt S, Zwipp H. Injury. 2004 May;35(5):443-61

# Articular fractures treatment. Should we follow the same rules in case of DIACF?



**“Achilles Dying”** sc. *E.G.Herter*, The Achilleion, Corfu , Greece

## The main problem of ORIF of DIACF

- Avoiding secondary soft tissue complications after surgical treatment:  
timing, precise and gentle surgical techniques, tourniquet time, tips and tricks

**HOWEVER !Patients selection within the group of patients where surgery is indicated concerning the fracture site!**

*Assessment of surgical risk*

# The Importance of surgical risk assessment in case of DIACF

- Young surgeons
- Educational needs
- Countries with developing trauma- and orthopedic surgery
- Western countries with settled trauma- and orthopedic surgery?

***Estimated numbers of fractures seen annually by trauma and orthopedic surgeons***

Number of fractures	Number of centres in the Netherlands	Number of centres in the Netherlands
	Trauma surgeons	Orthopaedic surgeons
None	30	35
1–2	3	12
3–5	12	25
6–10	28	17
11–15	9	5
16–20	7	1
More than 20	3	0

Schepers, E. M. M. van Lieshout, T. M. van Ginhoven, M. J. Heetveld, P. Patka  
 Current concepts in the treatment of intra-articular calcaneal fractures: results of a nationwide survey  
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## ***Number of patients treated per treatment modality by the responding orthopedic and trauma surgeons***

Treatment modality	Number of patients	%
Manual reduction	6	1
Primary arthrodesis	8	1
Essex-Lopresti manoeuvre	30	3
Forgon-Zdravec distraction	94	10
Conservative	356	39
<b>ORIF</b>	<b>426</b>	<b>46</b>
<b>Total</b>	<b>920</b>	<b>100</b>

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## ***Number of complications after intra-articular calcaneal fracture treatment***

Complication	Number of patients	%
Wound dehiscence	52	9
Superficial infection	90	16
Deep infection	13	2

# ABCDEF Calcaneal Risk Scale. What does it mean?

**A.Volna, Clinical Notes  
Orthopedic Trauma Directions 4/11, Volume 9, №4, July 2011, p 26**

**Andrey VOLNA, Edgar MATTIS, Nicolay ZAGORODNIY, Timofey LANTUKH,  
Vladimir DIRIN, Michael PANIN  
Displaced intra-articular fractures of the calcaneus in adult patients: is it worth to operate?  
Abstract SICOT Book, Prague, Czech Republic, September 2011, p 289**

# ABCDEF Calcaneal Risk Scale. What does it mean?

- **A**

- **Age**

- *“Contraindications included age over*

***sixty***” Zeman P, Zeman J, Matejka J,

Koudela K. Acta Chir Orthop Traumatol Cech. 2008 Dec;75(6):457-64.

- *“For predictable result patients should be*

*younger than* ***forty*** *years”*

Butković IJ. Acta Chir Iugosl. 2006;53(4):125-31.

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# ABCDEF Calcaneal Risk Scale. What does it mean?

- **A**

- **Age**

Criteria	Points
Under 29 years old inclusive	1
From 30 up to 44 years old inclusive	2
From 45 up to 59 years old inclusive	3
From 60 years old and elder	4

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# ABCDEF Calcaneal Risk Scale. What does it mean?

- **A**
- **B**



- **Blisters**

Criteria	Points
No and never been	1
Serous	2
Hemorrhagic	3
Hemorrhagic with local skin necrosis	4

# ABCDEF Calcaneal Risk Scale. What does it mean?

- **A**
- **B**
- **C**

- **Comorbidities**

<b>Criteria</b>	<b>Points</b>
<b>No</b>	<b>1</b>
<b>Yes (vascular diseases, diabetes mellitus, immunodeficiency), but not required to take the drugs constantly</b>	<b>2</b>
<b>Yes (vascular diseases, diabetes mellitus, immunodeficiency) and require a constant drug therapy</b>	<b>3</b>
<b>There are trophic disorders in cases of severe course of comorbidities</b>	<b>4</b>

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# ABCDEF Calcaneal Risk Scale. What does it mean?

- **A**
- **B**
- **C**
- **D**



- **Detrimental health habits**

Criteria	Points
No	1
Periodical or less than 5 years of tobacco smoking	2
From 5 up to 20 years of tobacco smoking	3
More than 20 years of tobacco smoking or drug addiction	4

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# ABCDEF Calcaneal Risk Scale. What does it mean?

- **A**
- **B**
- **C**
- **D**
- **E**

- **Energy of the injury**

Criteria	Points
Low-energy trauma	1
High-energy trauma	2
High-energy polytrauma or bilateral calcaneal fractures	3

# ABCDEF Calcaneal Risk Scale. What does it mean?

- **A**
- **B**
- **C**
- **D**
- **E**
- **F**



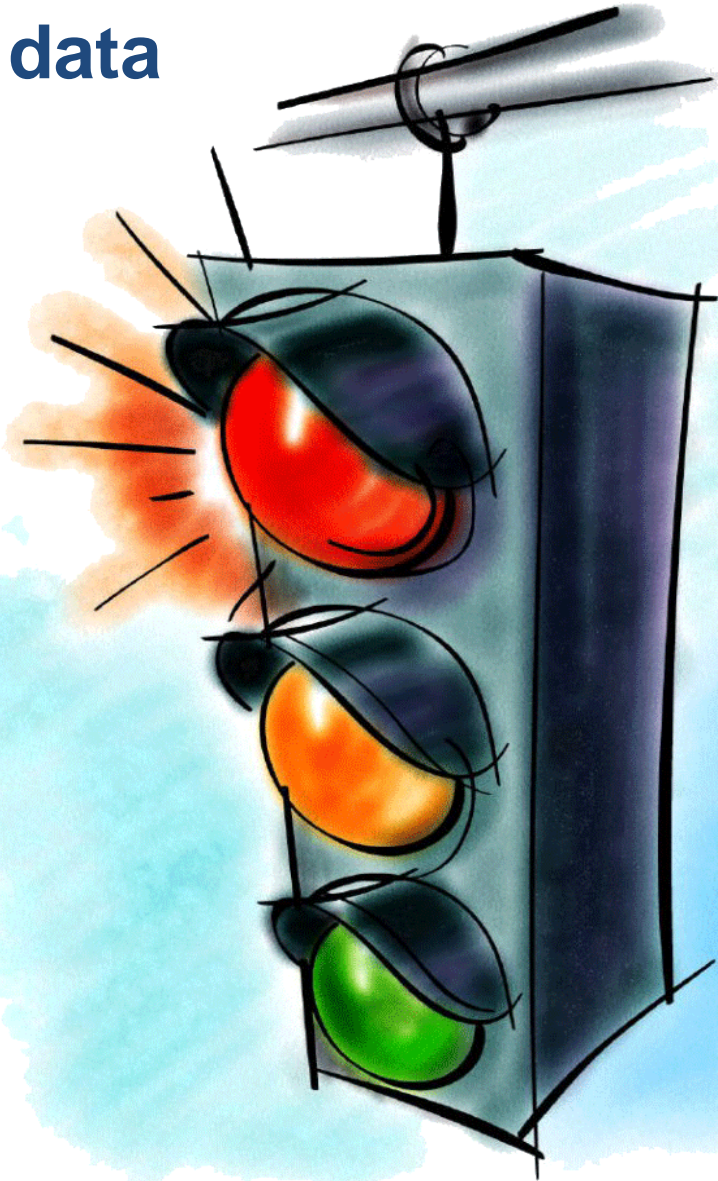
- **Fragments**

Criteria	Points
2 intraarticular fragments	1
3 intraarticular fragments	2
4 or more intraarticular fragments	3

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# Evaluation of ABCDEF Calcaneal Risk Scale data



- **From 15 and more points.** Risk of postoperative complications is unacceptable. Miniinvasive screw fixation, osteosynthesis by the Ex-fix or the conservative treatment are preferable
- **From 13 to 15 points.** Open reduction and an internal fixation using the plate are possible, but are connected with high risk of early postoperative complications
- **From 6 to 12 points.** Open reduction and an internal fixation using the plate are possible

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- Male patient, trucker
- Fell down from a height of 2 meters
- Isolated injury
- Serous blisters
- Non-smoker
- Healthy
- **HOWEVER**, he is 56 yo



**Is it worth operating?**

# Clinical case 1. Displaced intra-articular calcaneus fracture (DIACF)

- A – 3
- B – 2
- C – 2
- D – 1
- E – 2
- F – 3
- Sum – 13



Is it worth operating?

# Clinical case 1. Displaced intra-articular calcaneus fracture (DIACF)

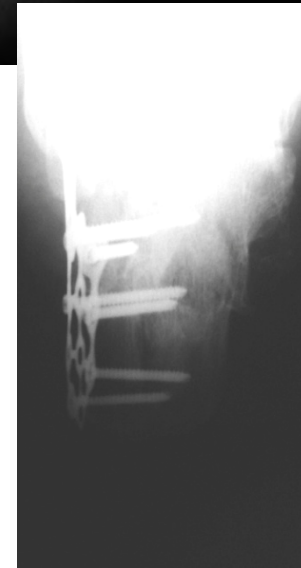
- **A – 3**
- **B – 2**
- **C – 2**
- **D – 1**
- **E – 1**
- **F – 3**
- **Sum – 13**



**Yellow Zone**

# Clinical case 1. Displaced intra-articular calcaneus fracture (DIACF)

- A – 3
- B – 2
- C – 2
- D – 1
- E – 1
- F – 3
- Sum – 13



**Yellow Zone**

## Clinical case 2. Displaced intra-articular calcaneus fracture (DIACF)

- 36-year-old roofer
- Fell down from a height of 4 meters
- Isolated injury
- Hemorrhagic blisters
- Healthy
- **HOWEVER**, he is heavy smoker, >30 cigarettes p/d



**Is it worth operating?**

## Clinical case 2. Displaced intra-articular calcaneus fracture (DIACF)

- A – 2
- B – 3
- C – 1
- D – 3
- E – 2
- F – 1
- SUM – 12



Is it worth operating?

## Clinical case 2. Displaced intra-articular calcaneus fracture (DIACF)

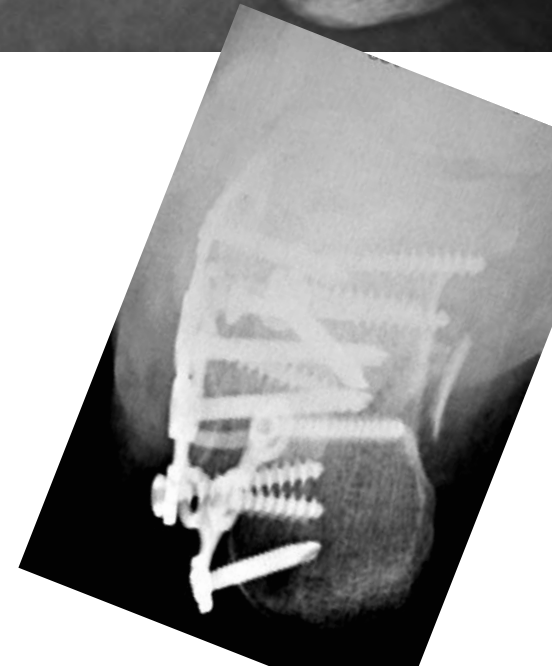
- A – 2
- B – 3
- C – 1
- D – 3
- E – 2
- F – 1
- SUM – 12



**Green Zone**

## Clinical case 2. Displaced intra-articular calcaneus fracture (DIACF)

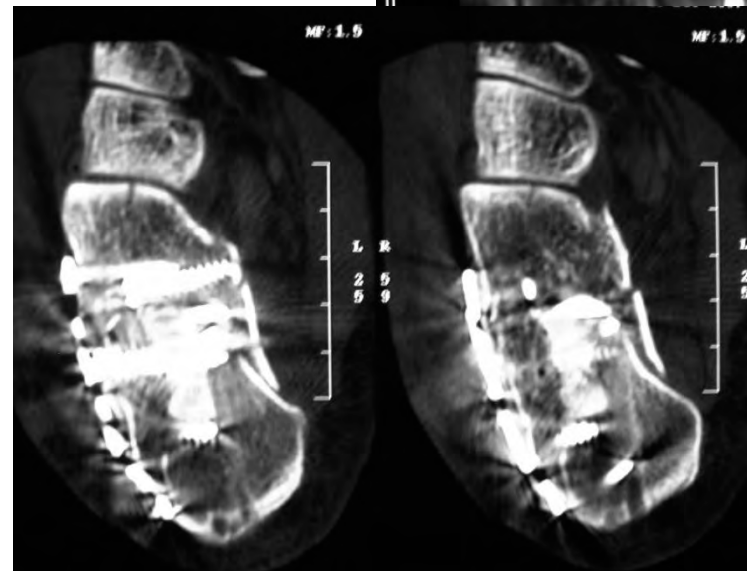
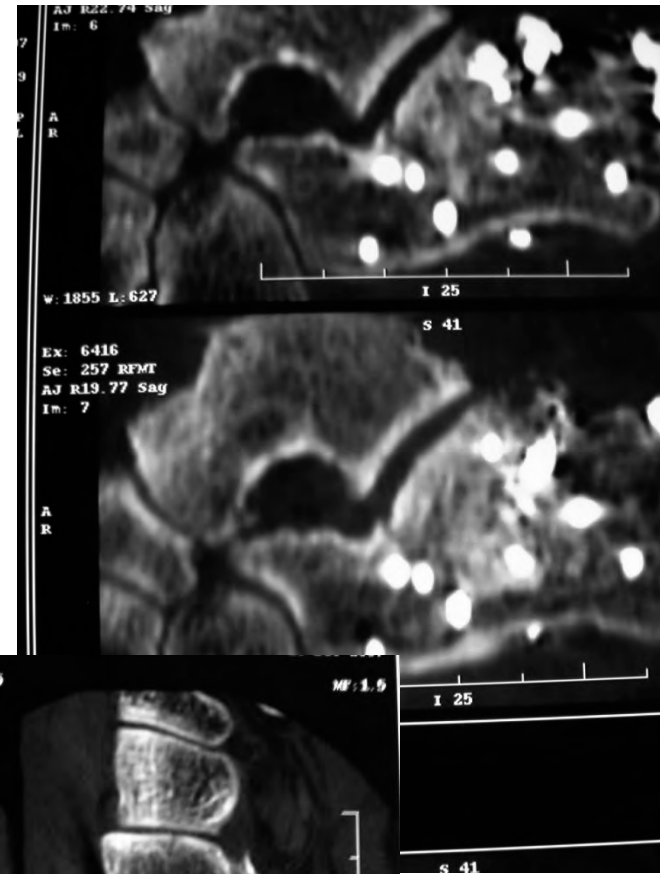
- A – 2
- B – 3
- C – 1
- D – 3
- E – 2
- F – 1
- SUM – 12



**Green Zone**

# Clinical case 2. Displaced intra-articular calcaneus fracture (DIACF)

- A – 2
- B – 3
- C – 1
- D – 3
- E – 2
- F – 1
- SUM – 12



**Green Zone**

# Clinical case 3. Displaced intra-articular calcaneus fracture right(DIACF), non-displaced left

- 53-year-old male patient
- Fell down from a height of 6 meters
- Isolated injury, bilateral calcaneal fractures
- Hemorrhagic blisters
- Healthy
- Smoker



**Is it worth operating?**

# Clinical case 3. Displaced intra-articular calcaneus fracture right(DIACF), non-displaced left

- A – 3
- B – 3
- C – 1
- D – 4
- E – 3
- F – 1
- SUM – 15



**Red Zone**

# Clinical case 3. Displaced intra-articular calcaneus fracture right(DIACF), non-displaced left

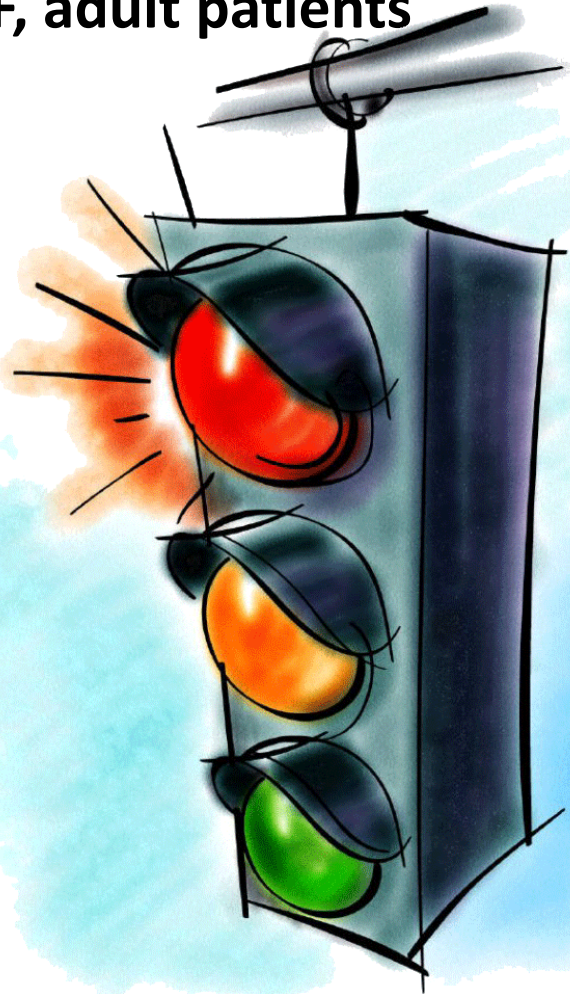
- A – 3
- B – 3
- C – 1
- D – 4
- E – 3
- F – 1
- SUM – 15



Red Zone

# Using of ABCDEF Calcaneal Risk Scale

closed non tongue-type  
DIACF, adult patients



2013 – 2015, DIACF, N=37

Zone and N of fractures	Treatment	Early wound complications
Red, 15	MIS – 7 Nonsurgical - 8	No
Yellow, 6	ORIF	2 local superficial skin necrosis
Green, 16	ORIF	No

## Conclusions

- ORIF Calcaneal ABCDEF Scale is a simple, useful and noncomplicated instrument for surgical risk assessment in case of DIACF
- It is only the first step of patient evaluation which also includes laboratory data, precise examination, patient needs etc.

## Take Home Message (A, B, C, D, E, F)

- A – **A**ge
- B – **B**listers
- C – **C**omorbidities
- D – **D**etrimental health habits
- E – **E**nergy
- F – **F**ragments

THANK YOU

