




**COMPLICATIONS IN ORTHOPAEDICS AND TRAUMATOLOGY**  
 ORTHOPAEDICA BELGICA 2019  
 25-26 APRIL 2019  
 Kursaal Oostende




**NONUNIONS**  
**Special Circumstances**  
**Case Based Presentation**

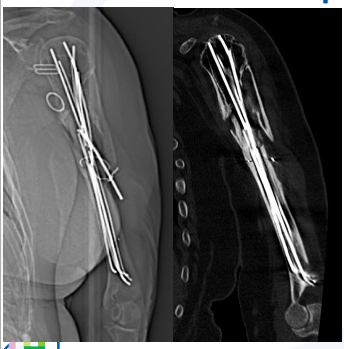



Dan Putineanu, MD, PhD  
 Cliniques Universitaires St Luc  
 Brussels

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**Who is our patient?**







- 75 YO women
- Skin melanoma left arm, surgical resection
- extensive scar tissue middle third of the arm
- extension evaluation negative
- Traumatic humerus fracture 2 years ago, surgery
- Type II Diabetes
- Vitamin D deficiency, ongoing treatment
- Thyroid insufficiency, ongoing treatment

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**What are the complaints?**







- Pain at the elbow – « falling pins » - 2 surgeries for 2 pins already...
- « Bending arm » when using
- No force....
- Neurovascular intact

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**What the patient wants?**





**Doctor, can you take out »my falling pins «?**

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Andrzejewski and Giannoudis  
*J Orthop Traumatol* (2019) 20:21  
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Journal of Orthopaedics and Traumatology

**REVIEW ARTICLE** **Open Access**

**The 'diamond concept' for long bone non-union management**

Paul Andrzejewski and Peter V. Giannoudis\*



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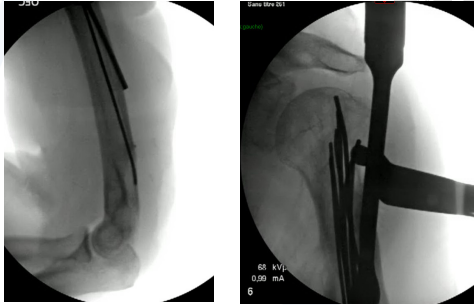
**Table 1 Risk factors for non-union**

Patient dependent	Non-modifiable	Patient independent
<b>Modifiable</b> Smoking Alcohol Nutritional deficiency (including vitamin D) High BMI	Age Male gender Genetic predisposition <sup>b</sup> Diabetes (metabolic disease) Peripheral vascular disease Osteoporosis Chronic inflammatory disease Renal insufficiency Insulin <sup>a</sup> Opiates <sup>a</sup> NSAIDs <sup>a</sup> Steroids <sup>a</sup> Antibiotics <sup>a</sup> Anticoagulants <sup>a</sup> Chemotherapeutics <sup>a</sup>	Open reduction (poor quality of primary ORIF) <sup>a</sup> Open fracture (more bone loss and soft tissue injury) Wedge and multi-fragmentary fracture pattern Initial displacement Compartment syndrome <sup>a</sup> Affected bone: highest in tibia Fracture site in relation to vascularisation zone Presence of fracture gap post-surgery <sup>a</sup> Poor mechanical stability by initial implant <sup>a</sup> Infection <sup>a</sup>

Potentially modifiable. <sup>a</sup>Inconclusive—under research

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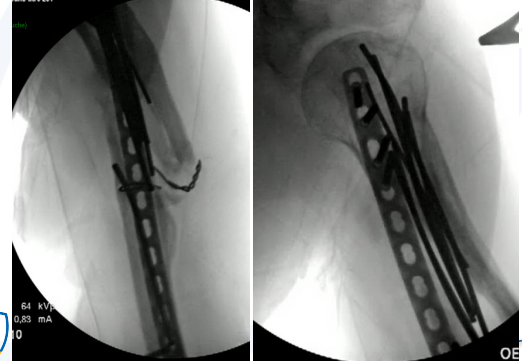
## We took out everything we could...



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## MIPO Anterior



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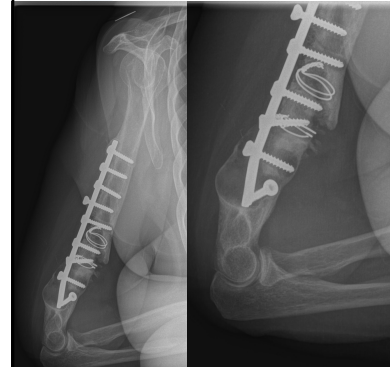
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## Who is our patient?



- 71 YO women
- Obesity
- Very active

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## What are the complaints?



- Increasing pain arm and elbow
- Increasing functional impairment
- Transient Radial nerve sensitive problems

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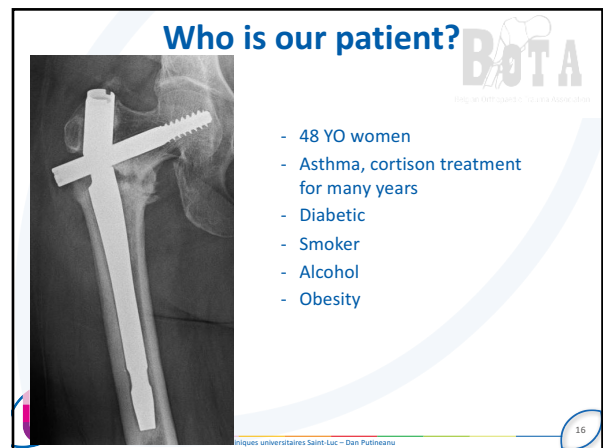
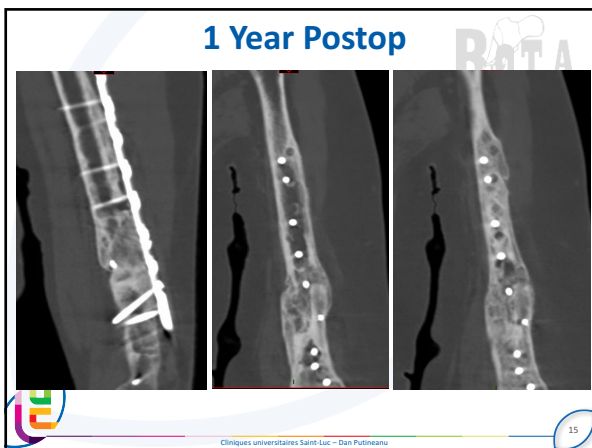
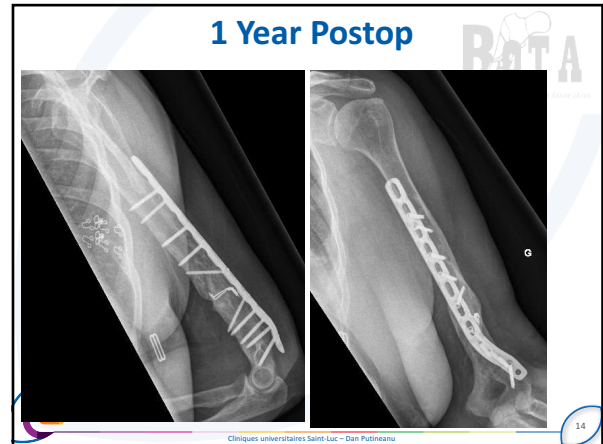
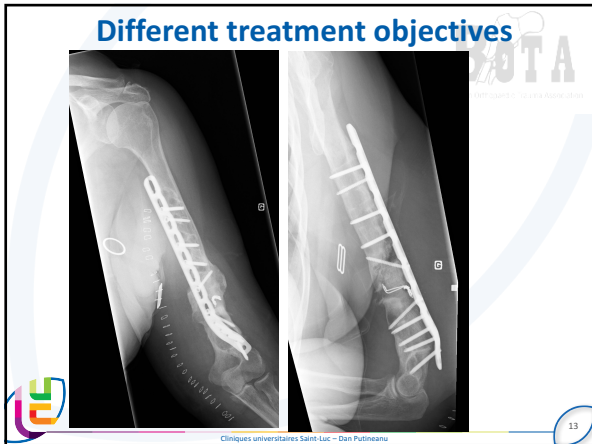
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Smoking	Age	Open reduction (poor quality of primary ORIF) <sup>a</sup>
Alcohol	Male gender	Open fracture (more bone loss and soft tissue injury)
Nutritional deficiency (including vitamin D)	Genetic predisposition <sup>b</sup>	Wedge and multi-fragmentary fracture pattern
High BMI	Diabetes (metabolic disease)	Initial displacement
	Peripheral vascular disease	Compartment syndrome <sup>a</sup>
	Osteoporosis	Affected bone: highest in tibia
	Chronic inflammatory disease	Fracture site in relation to vascularisation zone
	Renal insufficiency	Presence of fracture gap post-surgery <sup>d</sup>
	Insulin <sup>a</sup>	Poor mechanical stability by initial implant <sup>a</sup>
	Opiates <sup>a</sup>	Infection <sup>a</sup>
	NSAIDs <sup>a</sup>	
	Steroids <sup>a</sup>	
	Antibiotics <sup>a</sup>	
	Anticoagulants <sup>a</sup>	
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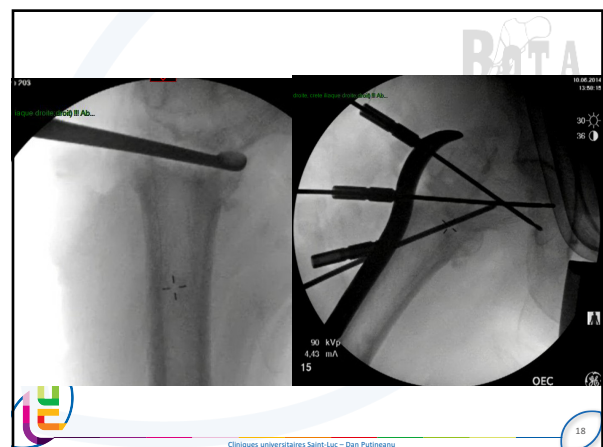


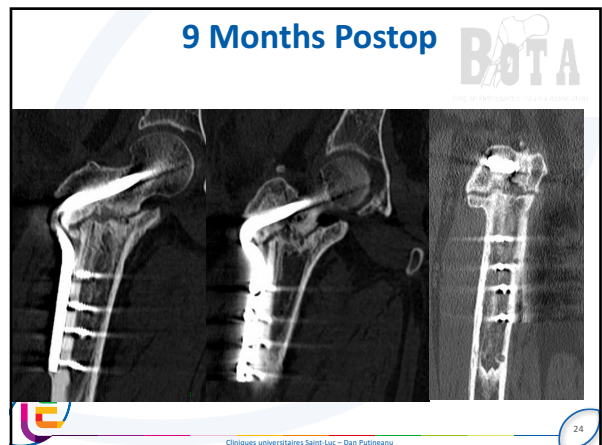
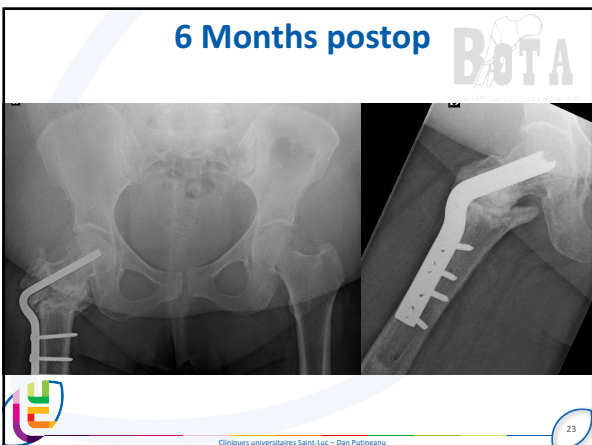
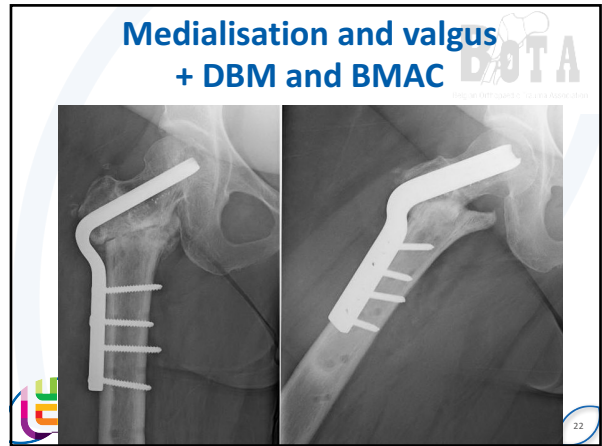
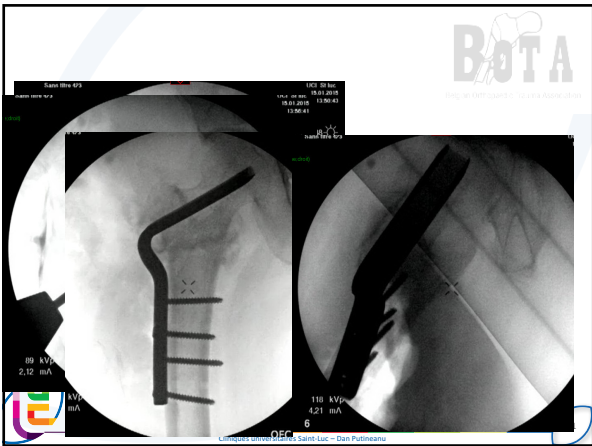
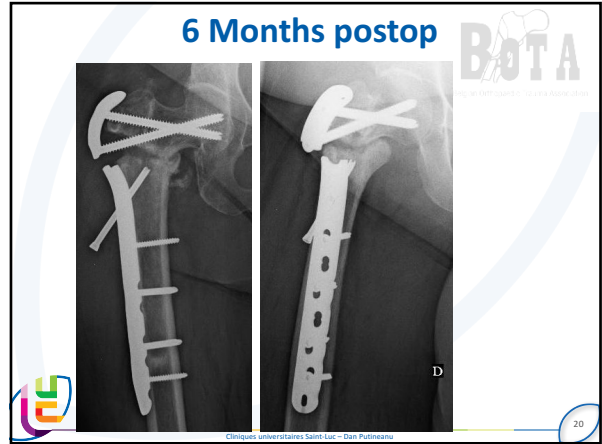
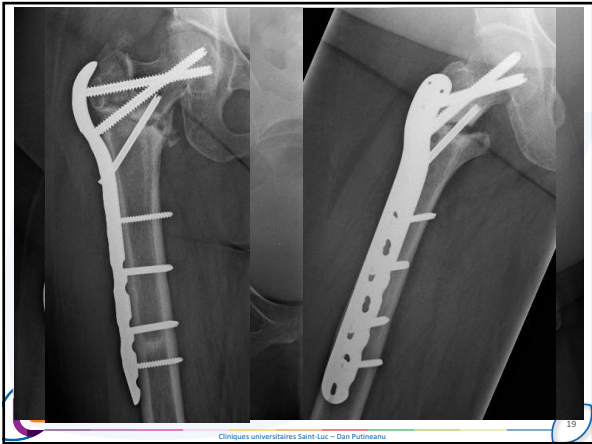
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<b>Modifiable</b>	<b>Non-modifiable</b>	
Smoking	Age	Open reduction (poor quality of primary ORIF) <sup>3</sup>
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High BMI	Diabetes (metabolic disease)	Initial displacement
	Peripheral vascular disease	Compartment syndrome <sup>4</sup>
	Osteoporosis	Affected bone: highest in tibia
	Chronic inflammatory disease	Fracture site in relation to vascularisation zone
	Renal insufficiency	Presence of fracture gap post-surgery <sup>2</sup>
	Insulin <sup>2</sup>	Poor mechanical stability by initial implant <sup>2</sup>
	Opiates <sup>2</sup>	Infection <sup>3</sup>
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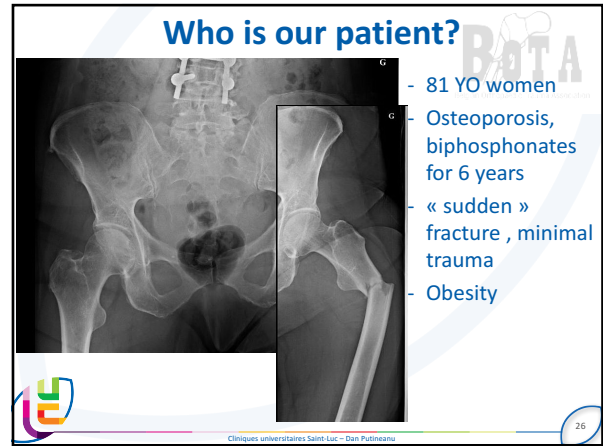
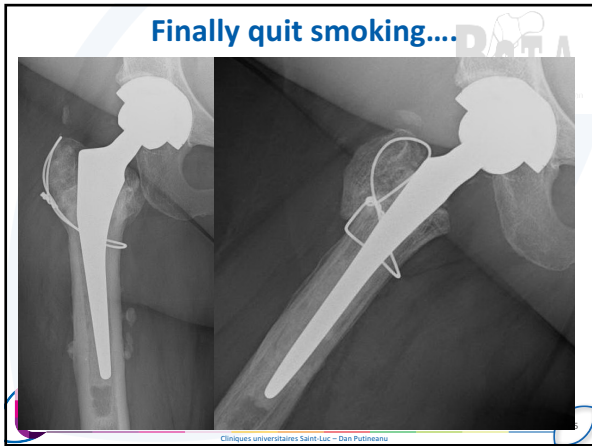
Potentially modifiable, <sup>2</sup>inconclusive—under research

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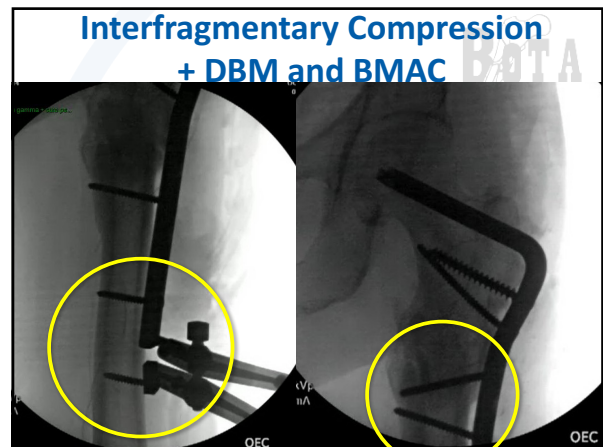
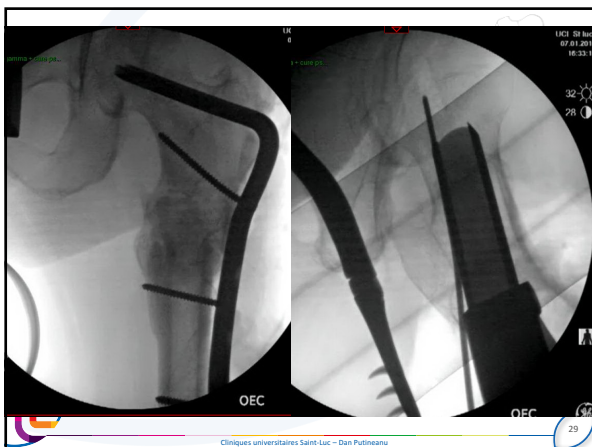
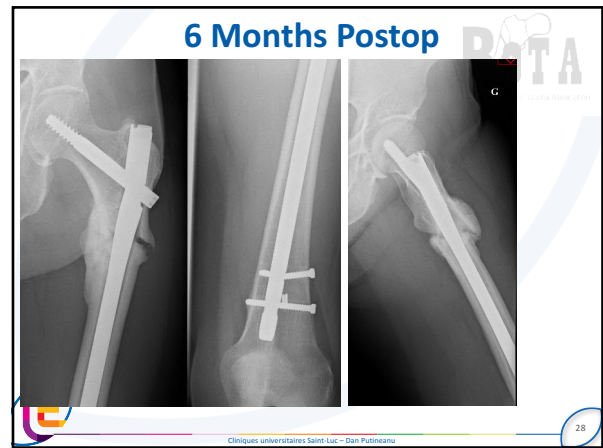


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## 13 Months Postop



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BIOLOGICAL ORTHOTRAUMA



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## Conclusions

- Every single non-union case is a « special » one
- Science is still searching for the best approach to treat long bone non-union
- Some are easy, others difficult to treat, with long-lasting treatment and high cost implications
- The diamond concept approach offers is an usefull tool for their management
- Correct the mechanical environment plus a potent biological stimulus locally by addition of a scaffold, growth factors and multipotent stem cells
- respect local blood supply and fracture biology by a gently technique
- patient-related comorbidities must be addressed

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