

# Total Knee Arthroplasty For Non-Union



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# Disclosures

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**Fellowship Support – Arthrex**

**Fellowship Support – Smith & Nephew**

**Associate Editor – Orthopaedic  
Journal of Sports Medicine**

**Editorial Board – American Journal of  
Sports Medicine**

**Editorial Board – Journal of Knee Surg.**

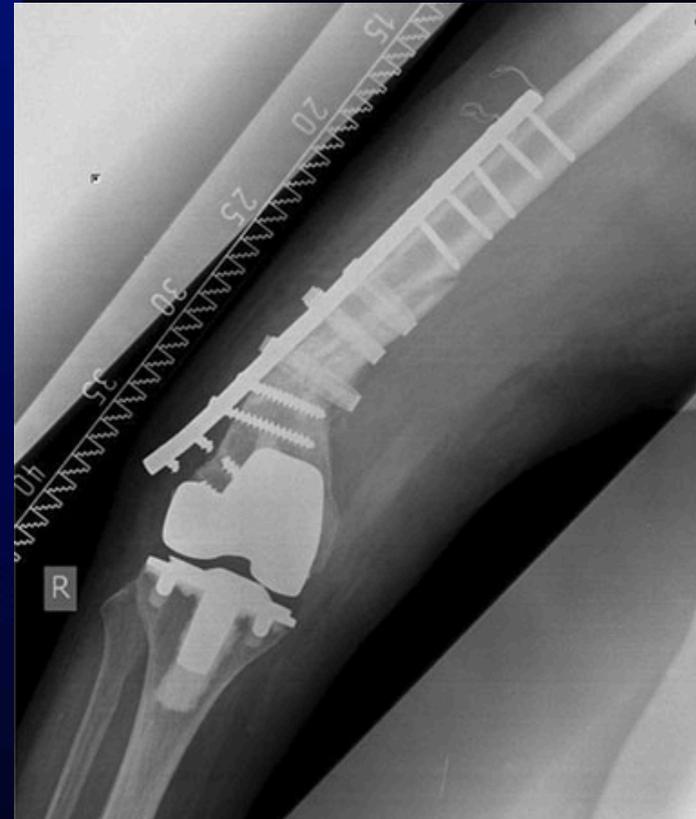
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# TKA for Non-Union

**Very Little Literature**

**Case Reports**

**Included in Series  
Of Peri-Articular  
Fractures**



**Holl, KSSTA 2012**

# Tibial Plateau Non-Union

Rare After Low  
Energy Fractures  
Metaphyseal Bone  
Abundant Blood Supply  
4 - 10% in  
Severe Fractures



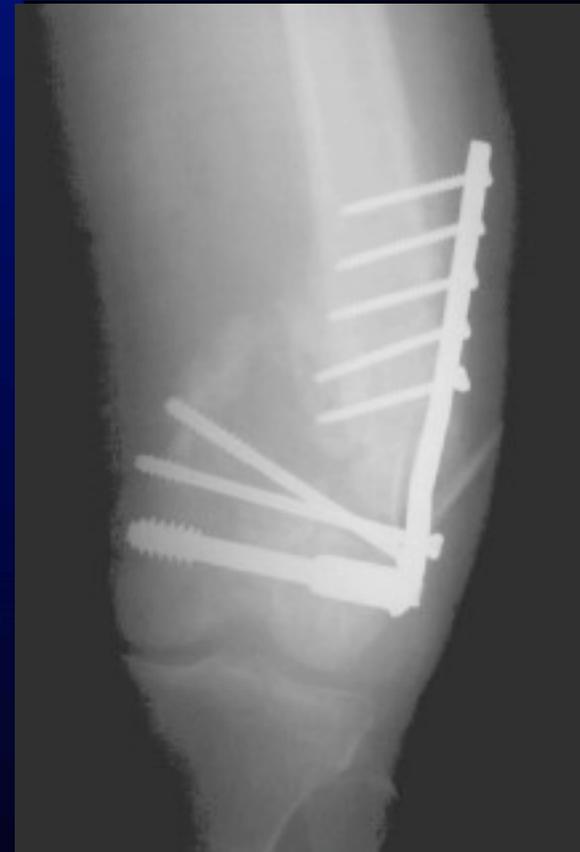
Weiner, J Ortho Trauma 1995  
Ruffolo, J Ortho Trauma 2015

# Distal Femur Non-Union

**0 – 20%**  
**With Lateral  
Locking Plates**

## **Risk Factors**

**Obesity**  
**Open Fracture**  
**Infection**  
**Stainless Steel Plate**



**Rodriguez, Injury 2013**

# TKA for Distal Femur Non-Union

**Recent  
Systematic Review  
Only 5.9%  
Of Distal Femur  
Non-Unions  
Treated With  
Arthroplasty**



**Ebrahim, Ortho Surg 2013**

# Causes of Non-Union

## Bad Mechanics

Fracture Pattern

Fixation Method

## Bad Biology

Patient Factors

Environment

Table 1  
Risk factors contributing to non-union

General risk factors	Local risk factors
Gender	Fracture personality
Age	Type of fracture
Diet	Exposure
Diabetes	Infection
Osteoporosis	Multiple
Muscular mass	trauma/fracture
Smoking	
Alcohol NSAIDS	

# Non-Union Scoring System

**Bone**

**Soft Tissue**

**Patient**

Table 1 Non-Union Scoring System		Score <sup>a</sup>	Max. score
<b>The bone</b>			
Quality of the bone	Good	0	
	Moderate (e.g. mildly osteoporotic)	1	
	Poor (e.g. severe porosis or bone loss)	2	
	Very poor (Necrotic, appears avascular or septic)	3	3
Primary injury - open or closed fracture	Closed	0	
	Open 1 <sup>st</sup> grade	1	
	Open 2-3 <sup>rd</sup> A grade	3	
	Open 3 <sup>rd</sup> B-C grade	5	5
Number of previous interventions on this bone to procure healing	None	1	
	<2	2	
	<4	3	
	>4	4	4
Invasiveness of previous interventions	Minimally-invasive: Closed surgery (screws, k wires, ...)	0	
	Internal intra-medullary (nailing)	1	
	Internal extra-medullary	2	
	Any osteosynthesis which includes bone grafting	3	3
Adequacy of primary surgery	Inadequate stability	0	
	Adequate stability	1	1
Weber & Cech group	Hypertrophic	1	
	Oligotrophic	3	
	Atrophic	5	5
Bone alignment	Non-anatomic alignment	0	
	Anatomic alignment	1	1
Bone defect - Gap	0.5-1 cm	2	
	1-3 cm	3	
	>3 cm	5	5
<b>Soft tissues</b>			
Status	Intact	0	
	Previous uneventful surgery, minor scarring	2	
	Previous treatment of soft tissue defect (e.g. skin loss, local flap cover, multiple incisions, compartment syndrome, old sinuses)	3	
	Previous complex treatment of soft tissue defect (e.g. free flap)	4	
	Poor vascularity: absence of distal pulses, poor capillary refill, venous insufficiency	5	
	Presence of actual skin lesion/defect (e.g. ulcer, sinus, exposed bone or plate)	6	6
<b>The patient</b>			
ASA Grade	1 or 2	0	
	3 or 4	1	1
Diabetes	No	0	
	Yes - well controlled (HbA1c < 10)	1	
	Yes - poorly controlled (HbA1c > 10)	2	2
Blood tests: FBC, ESR, CRP	FBC: WCC > 12	1	
	ESR > 20	1	
	CRP > 20	1	3
Clinical infection status	Clean	0	
	Previously infected or suspicion of infection	1	
	Septic	4	4
Drugs	Steroids	1	
	NSAIDs	1	2
Smoking status	No	0	
	Yes	5	5

<sup>a</sup> Higher score implies more difficult to procure union.

**Calori, Injury 2008**

# Non-Union Treatment

**Improve Stability**

**Revision ORIF**

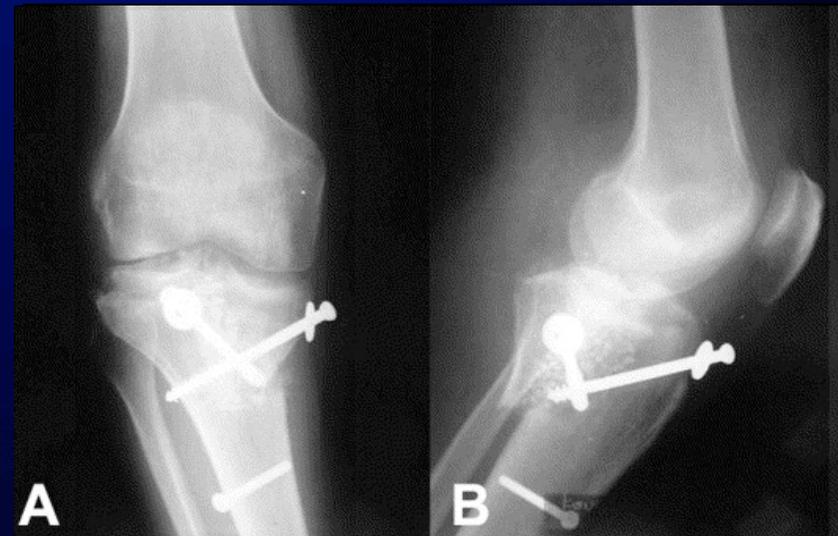
**Improve Biology**

**Infection Treatment**

**Bone Grafting**

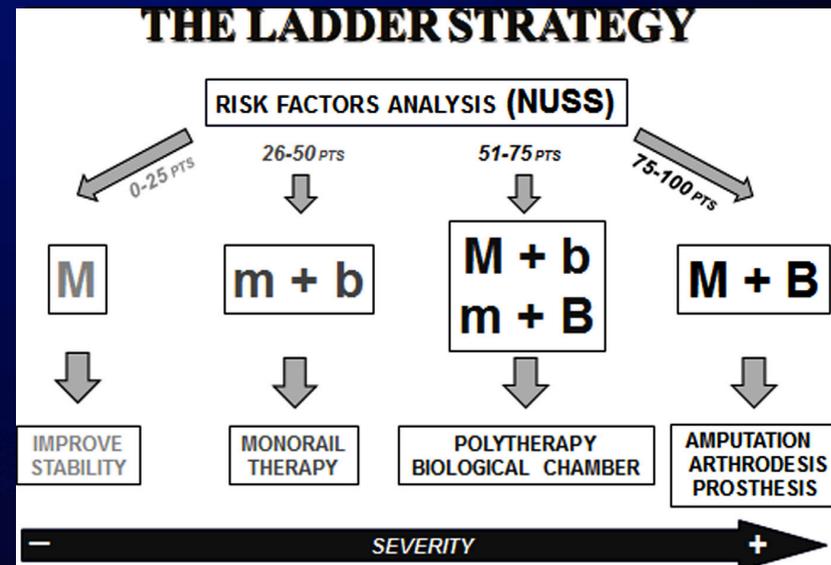
**BMP-1**

**Smoking Cessation**



# Non-Union Scoring System

Prosthesis Should  
Only Be Considered  
In Cases of  
Major Mechanical  
and  
Major Biological  
Problems



Calori, Injury 2008

# TKA for Articular Fracture Non-Union

**Small  
Periarticular  
Fractures**

**Excise Bone**

**TKA with Augments**



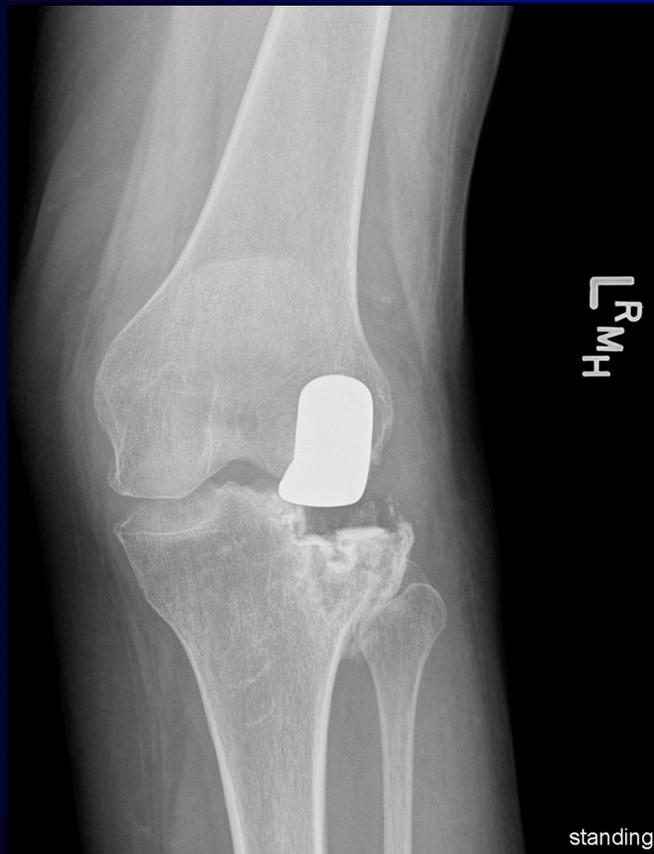
# Non-Union Tibial Plateau



# Non-Union Hoffa's Fx



# Non-Union UKA Fracture



# TKA for Non-Union

**Removal of  
Un-United Bone**

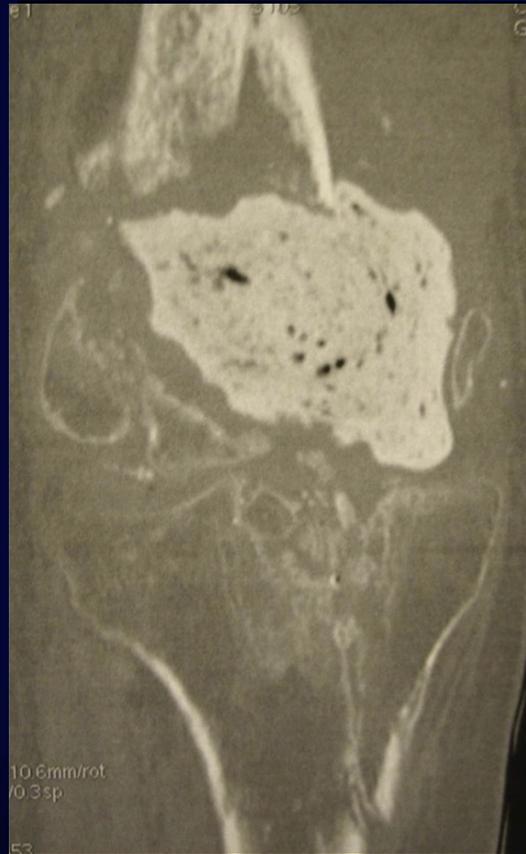
**Infection Treatment**

**Antibiotic Spacer**

**Megaprosthesis**

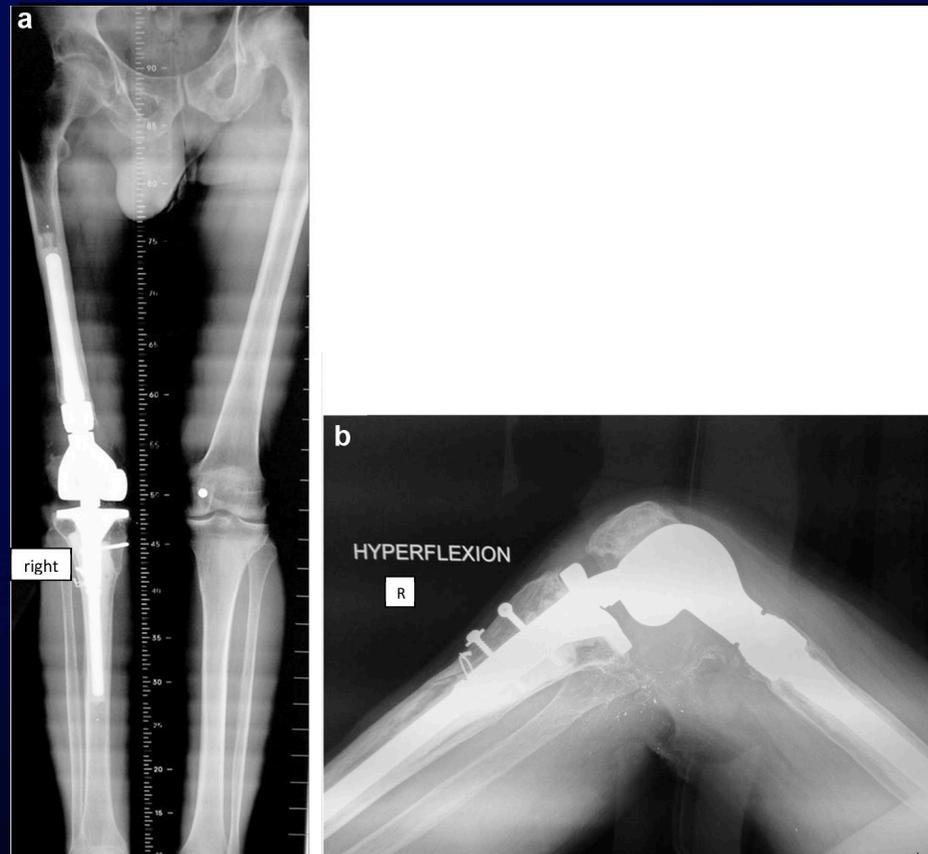


# s/p Hunting Accident



Herry, OTSM 2016

# TKA for Non-Union



Herry, OTSR 2016

# 62 y.o. Male Hunting Accident



Herry, OSTR 2016

# TKA for Tibial GSW



Herry, OTSR 2016

# TKA for PPF Non-Union

3.6 – 9.2%

Evaluate  
Adequacy of Fixation

Presence of  
Infection



Ristevski, J Ortho Trauma 2014

# 1<sup>st</sup> Stage

**Removal of  
Hardware & Infected  
Bone**

**Implantation of  
Antibiotic Spacer**



# 2<sup>nd</sup> Stage Reimplantation



# Outcomes

**No Good Data**

**Depends on  
Severity of  
Problem Treated**

**Often a Limb-  
Salvage Procedure**



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# Take Home Points

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- **Most Non-Unions Are Best Treated With Repeat ORIF + Graft**
  - **TKA Can Be Used In Extreme Cases**
  - **Augmented TKA for Small Defects**
  - **Resection & Antibiotic Spacer for Large Defects**
  - **2<sup>nd</sup> Stage Megaprosthesis When Infection resolved**
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# Thank You !!

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