Specific Management of Periprosthetic Tibial Fractures

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President | 2019 - 2022
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President | 2019 - 2022
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President | 2020 - 2022
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Periprosthetic Tibia Fracture

Why our colleagues rarely speak on this topic ?

- Uncommon
- Incidence :

  - 0.4 - 1.7 % after primary TKA

  - 0.9 % in revision TKA

Very few publications on this topic
Small population size on the available studies

TKA increase by 673% by 2030 so this complication will rise accordingly

Incidence - up to 38 % after revision

Periprosthetic Tibia Fracture

A Problem on the Rise

- **Presented with new, difficult fracture patterns**
- Elderly patients with grossly deficient bone
- Struggles to rehabilitate after such injuries

Inconsistent treatment strategies

Rate of re-operation post ORIF 13 % - 23 %

The Problem

- Almost always occur around a loose tibial component

  - 19 % of fractures caused intraoperatively during implantation of prosthesis

- Revision arthroplasty is usually indicated

By the time it happens : “You are not well prepared”

Periprosthetic Factors
Around Proximal Tibia

Incidence 0.4 % - 1.7 %

- Intraoperatively
- Postoperatively

Risk factors

- Malposition
- Cementless TKA
- Ligamentous imbalance
- Joint stiffness
- Infection

Technical Risk Factor:
Intraoperative

- Varus fixation correlated with medial plateau fracture
- Care should be taken not to place the tibial component in the excessively lateral aspect of the knee

Lotke & Ecker, JBJS-A, 1977

Technical Risk Factor:
Revision

- Forceful retraction of well-fixed tibial component
- Eccentric cement removal
- Trial reduction / preparation of stem tibial component
- Aggressive impaction of tibial component
- Performing tibial osteotomy

Management

- Diagnostics
- Classification & Planning
- Surgical technique
- Rehabilitation

No Rush, Be Prepared

“Fail to Prepare is Prepare to Fail”

Treatment Guiding **Factors**

- **Pre-fracture ambulatory status**
- **Fracture pattern**
- **Vascular injury**
- **Quality of bone stock**
- **Stability of knee prosthesis**
- **Type of knee prosthesis**

Classification and Planning

- **Felix classification**
- **Unified Classification System (UCS)**

Combined with Orthopedic Trauma Association (OTA) is helpful in planning process for reduction & fixation

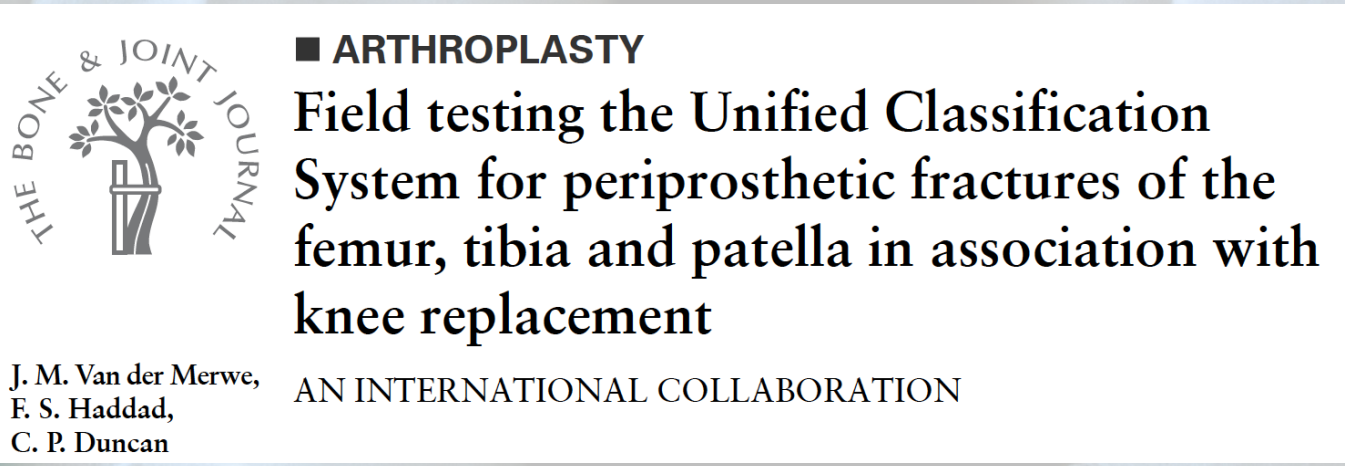
Correct Classification Is Important

High complication & failure rate due to :

Incorrect classification → pre-op radiology not reliable, need to check stability of fixation intra-op

A senior surgeon decides the best operative method only after the fracture is seen in the operating room, despite all the classifications available

Unified Classification System (UCS)



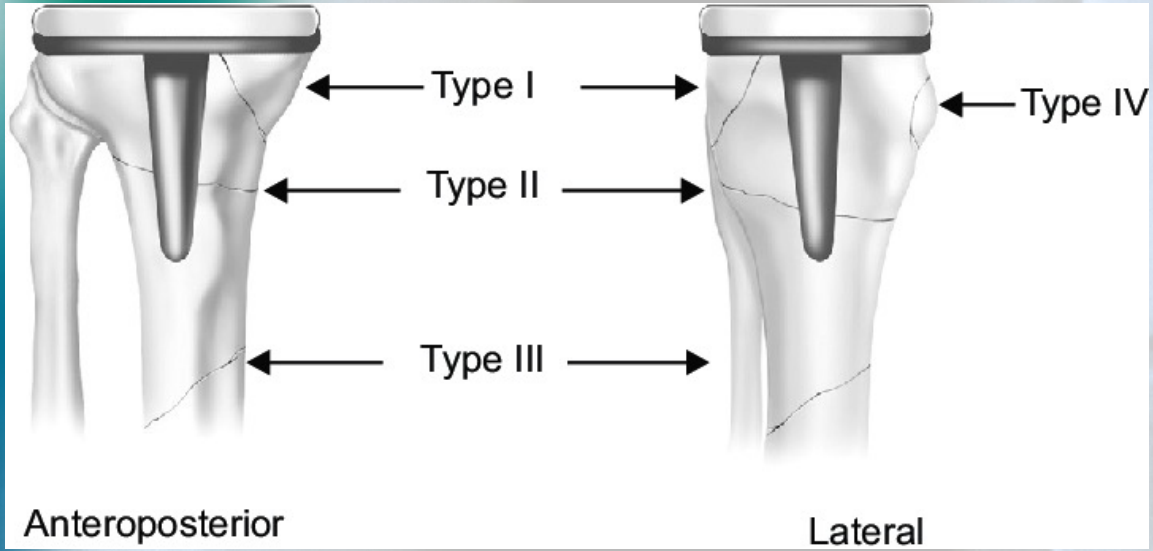
Conclusions:

UCS has **substantial & "near perfect" inter-observer reliability** when used for periprosthetic fractures of knee replacement in the **hands of experienced & inexperienced user**

Unified Classification System (UCS)

Type		V.3 Femur, distal	V.4 Tibia, proximal	V.34 Patella
A *Apophyseal* or extraarticular/ periarticular	**A1** Avulsion of	Lateral epicondyle	Medial or lateral plateau, nondisplaced	Disrupted extensor, proximal pole
	A2 Avulsion of	Medial epicondyle	Tibial tubercle	Disrupted extensor, distal pole
B *Bed* of the implant or around the implant	**B1** Prosthesis stable, good bone	Proximal to stable stem, good bone	Stem and component stable, good bone	Intact extensor, implant stable, good bone
	B2 Prosthesis loose, good bone	Proximal to loose stem, good bone	Loose component/ stem, good bone	Loose implant, good bone
	B3 Prosthesis loose, poor bone or bone defect	Proximal to loose stem, poor bone, defect	Loose component/ stem, poor bone, defect	Loose implant, poor bone, defect
C *Clear* of or distant to the implant	–	Proximal to the implant and cement mantle	Distal to the implant and cement mantle	–
D *Dividing* the bone between two implants or interprosthetic or intercalary	–	Between hip and knee arthroplasties, close to the knee	Between ankle and knee arthroplasties, close to the knee	Between ankle and knee arthroplasties, close to the knee
E *Each* of two bones supporting one arthroplasty or polyperiprosthetic	–	Femur and tibia/patella		
F *Facing* and articulating with a hemiarthroplasty	–	Fracture of femoral condyle articulating with tibial hemiarthroplasty	–	Fracture of the patella that has no surface replacement and articulates with the femoral component of the total knee arthroplasty

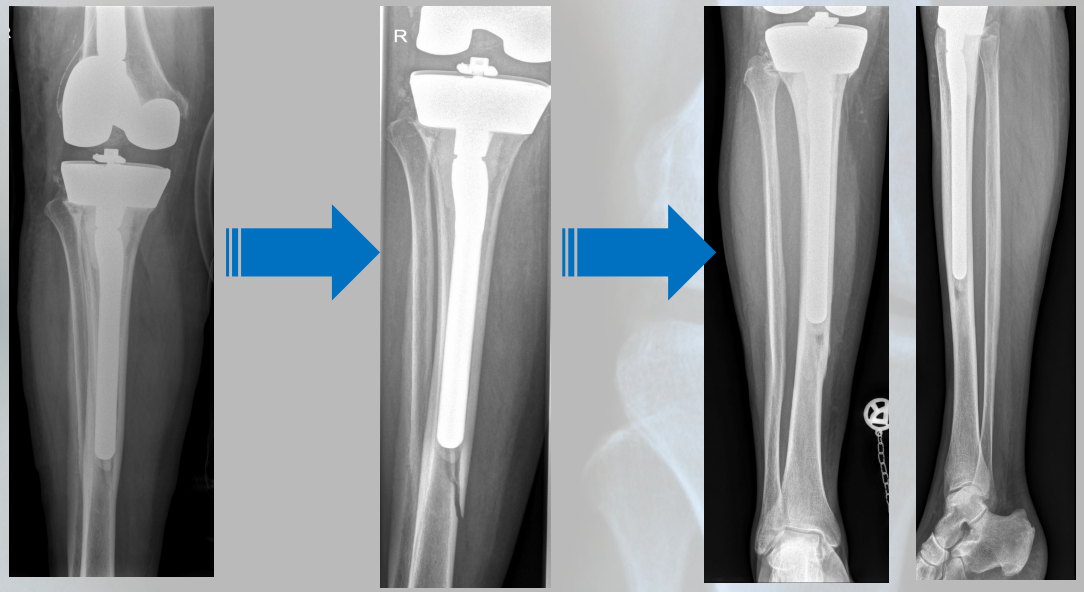
Felix Classification



A - well fixed prosthesis
B - loose prosthesis
C - intraoperative fractures

Non-Operative Treatment

- **Appropriate for minimally displaced fracture with stable component**
- **Typically, in a brace or cast for 6 weeks**



Type 3A or 3C considered for internal fixation - high risk for pseudoarthrosis

In 2025 …

All periprosthetic fractures **should be operated**

Unless :

- **Patient too medically unfit**
- **Fracture completely undisplaced**

Surgical Treatment

Well fixed tibial component (I-III)

Internal fixation

Proximal fragment often small and of poor bone quality
Loose tibial component ± poor bone quality (B2, B3)

Revision arthroplasty

Surgical Treatment

Large segmental bone defects

↓

Long stem + sleeves / structural allograft
(tumor prosthesis ?)

↓

Internal fixation

↓

Replacement of loose prosthesis

Surgical Treatment
Tips

Due to relatively thin soft tissue layer, **percutaneous fixation** of the distal plate to the diaphysis after **“mini open” or “minimally invasive”** reduction is easy to achieve & allows a maximum preservation of the local blood supply.

Risk of soft tissue complication including
DEEP INFECTION IS MUCH HIGHER THAN ON THE DISTAL FEMUR

Operative Management

- Intra-op fissure & insufficient osteosynthesis
- Tilting & loosening
- Sufficient ligaments
- Revision LCCK / PS
- Impacting grafting & cementless stem

Courtesy of Sebastien Parratte

PS Inlay

Be careful of insufficient osteosynthesis

Operative Management

Revision Total Knee Arthroplasty for Failure of Primary Treatment of Periprosthetic Knee Fractures

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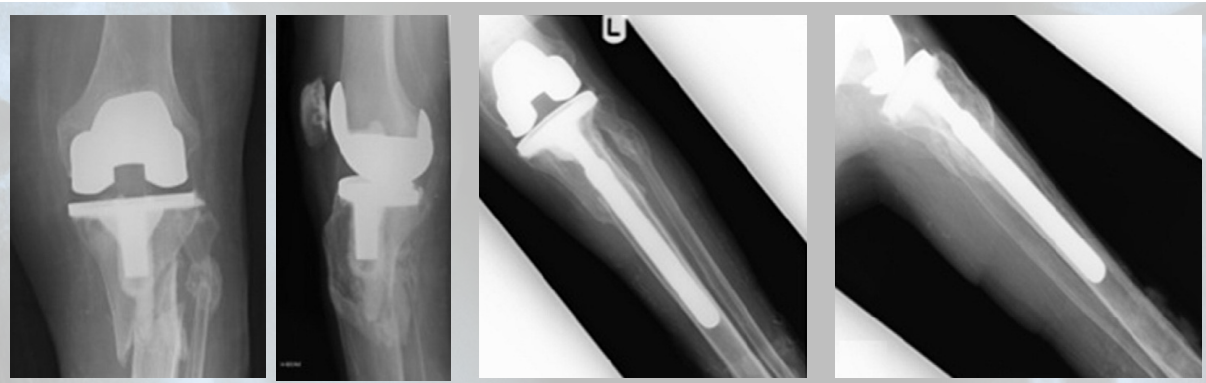
Cardiff and Vale University Health Board, University Hospital Llandough, Cardiff, UK

The Journal of Arthroplasty 29 (2014) 1996–2001



Consider revision arthroplasty for union complication

Reasons for
Post-Op Complications

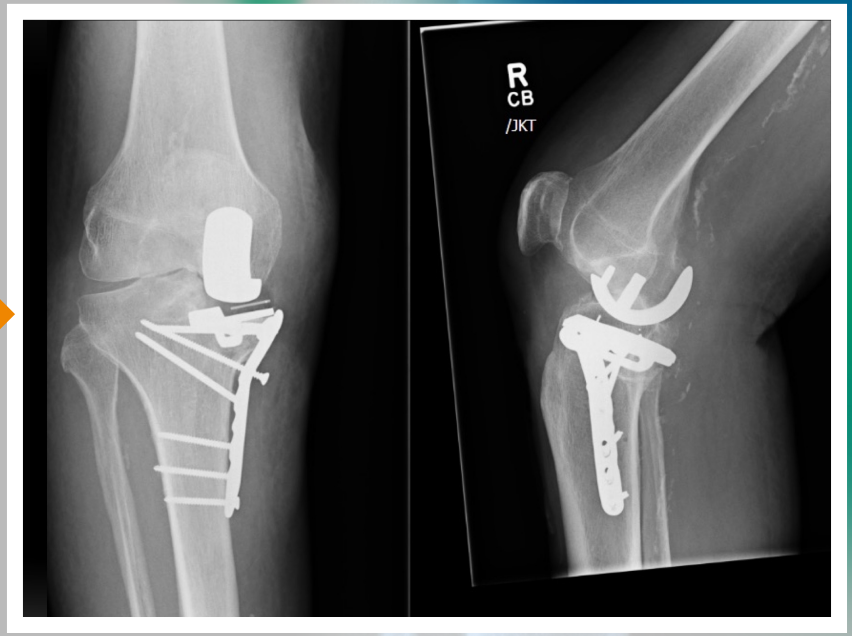
- Poor bone quality due to pre-existing osteoporosis
- Stable fixation difficult to achieve in areas of intramedullary implant
- Fracture healing is significantly delayed in aged patients
- Prosthesis loosening facilitate the resulting fracture

Complication rates up to 41%

CASE 1

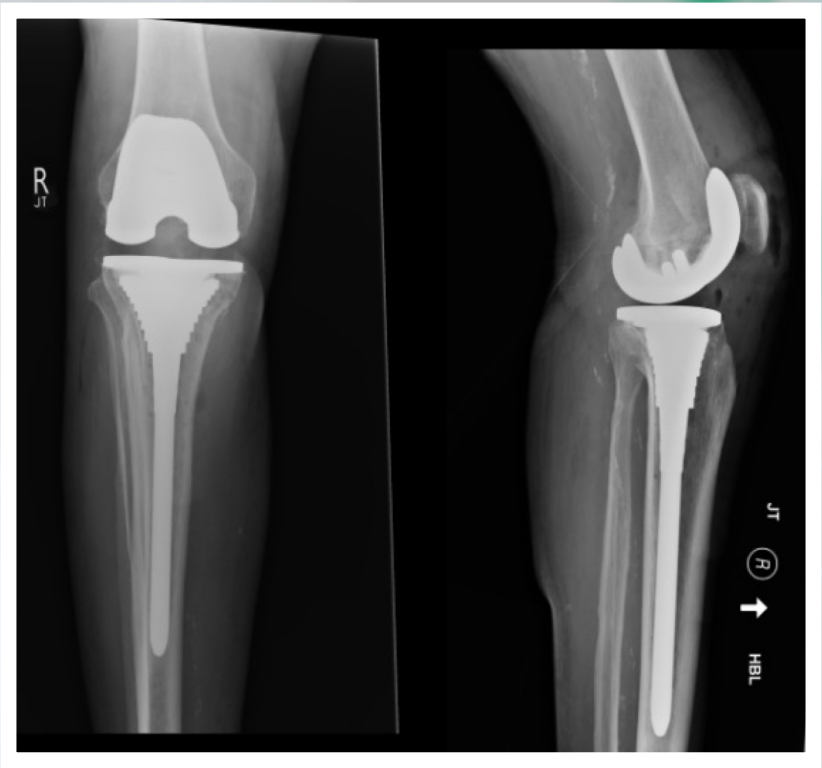
- 85 years old had a UKR done elsewhere
- Had a fall 1 week after surgery

Treated with ORIF,
but The Fixation Failed

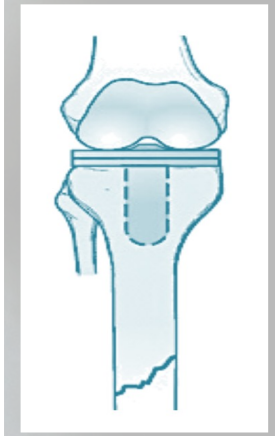


6 months post ORIF

Treated with
Revision TKR



CASE 2

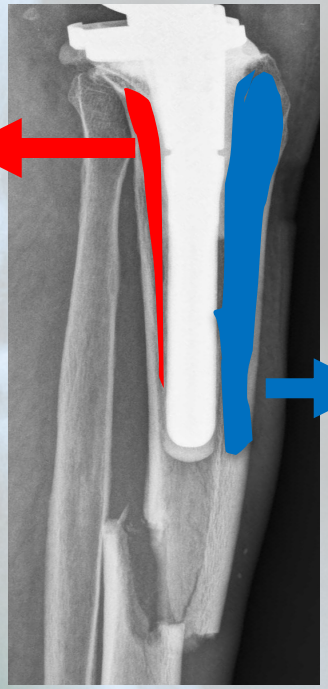


Type 3
77/F

CASE 2

Anterior proximally

Little on posterior



More space on anterior

CASE 3

Type 2

77/F

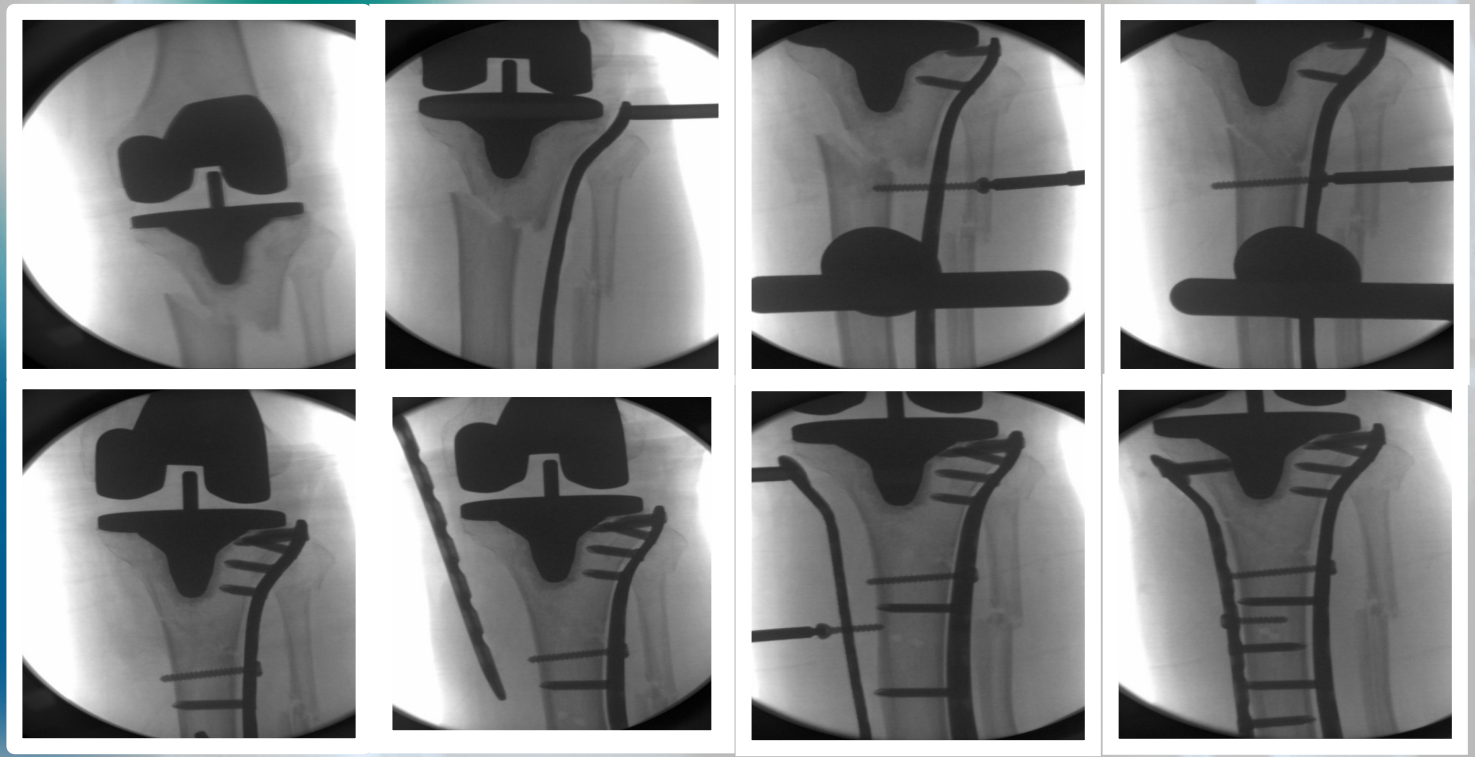
Surgery done 2+ years back

Fell on the staircase

The Issues

- **Limited space** for proximal fixation
- Weak construct of proximal segment
- **Double Plate Fixation ?**

CASE 3



CASE 3

FU 14 months

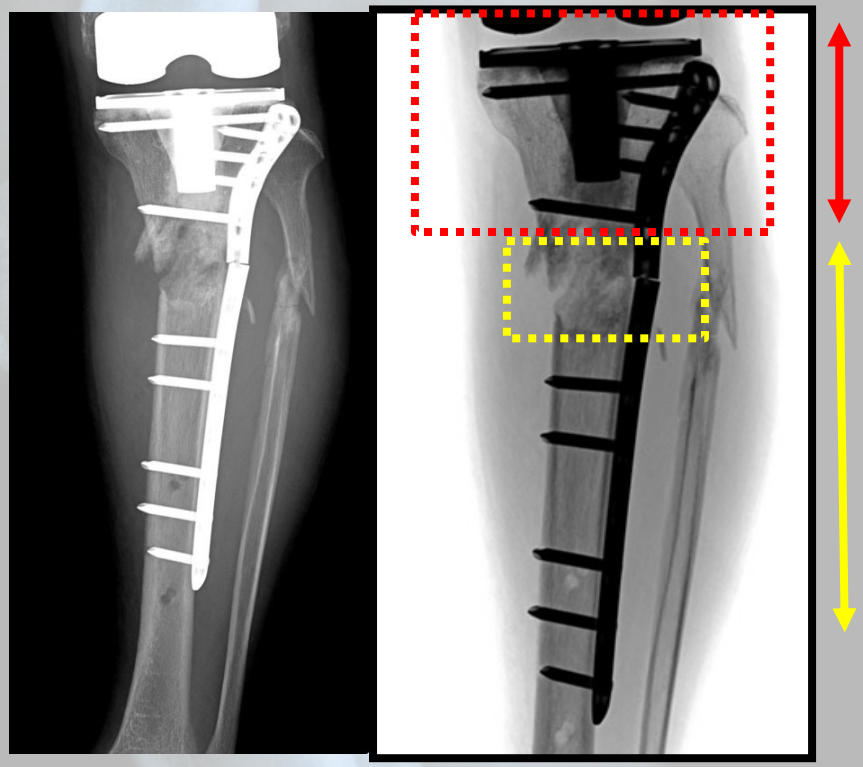
CASE 3

Type 2
65/F
Surgery done 5 years back
Independent walker

CASE 4

At 4 months

CASE 4

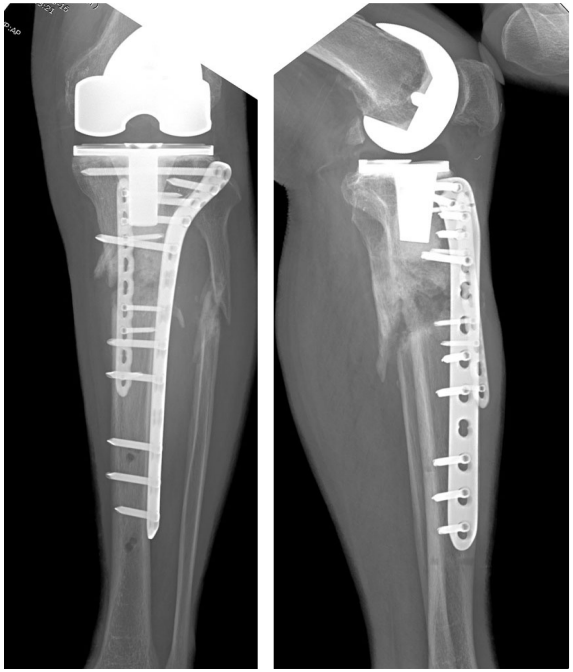


Limited numbers of screws

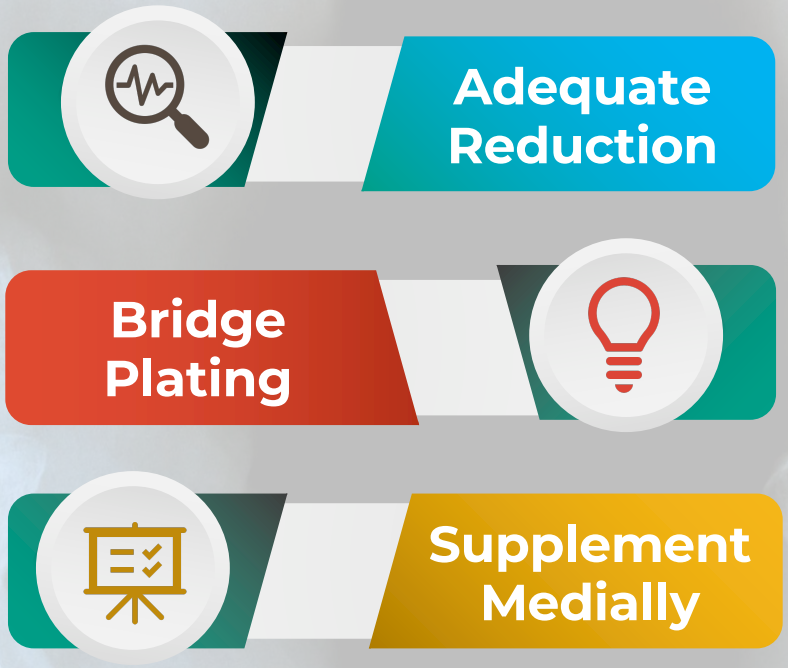
Short working length

CASE 4

FU 6 months



CONCLUSION



CONCLUSION

Cases which don't need OR may be done by MIPO

Adequate Reduction

Bridge Plating

Supplement Medially

CONCLUSION

Adequate Reduction

Bridge Plating — Should be employed to achieve Relative stability

Supplement Medially

CONCLUSION

Adequate Reduction

Bridge Plating

In comminution / short segment we should

Supplement Medially

SUMMARY

Tibial periprosthetic fractures

- Rarely occured
- Too small proximal fragment / poor bone quality
- Loose implants
- Revision usually required

Thank You For Your Attention

AAHKS American Association of Hip and Knee Surgeons · APA Asia Pacific Arthroplasty Society · AAOS American Academy of Orthopaedic Surgeons · Arthroplasty Society in Asia · ICJR · European Knee Society