Periprothetic bone defects in infected total joint arthroplasties

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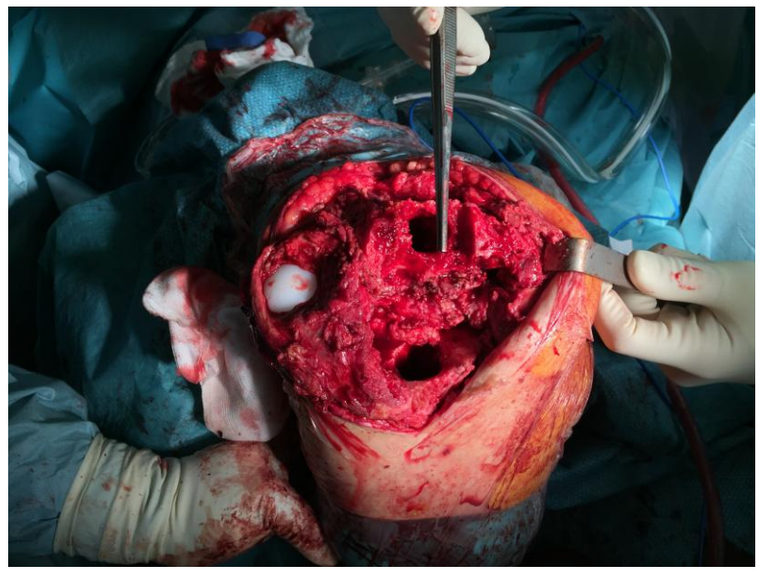


Infection

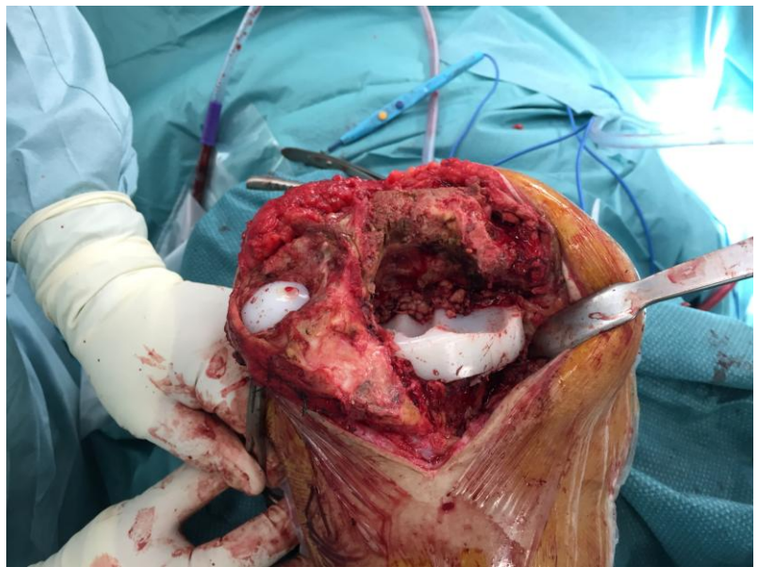
- Primary arthroplasty hip: 0,5 - 1%
- Primary knee arthroplasty: 0,5-2%
- Shoulder arthroplasty: 1%
- Elbow arthroplasty : 5,3-11%
- Ankle arthroplasty : 3,1%
- Spine fusions: 2-8%

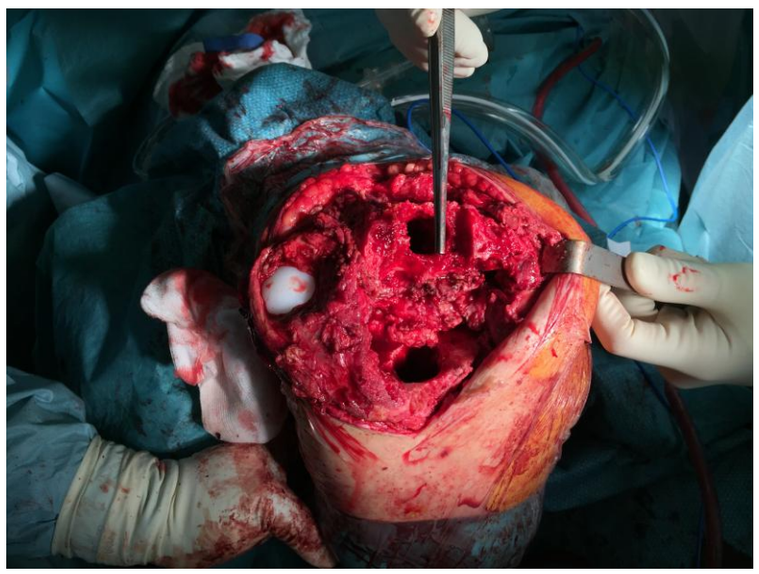
Challenge

- Management of
- 1. Infection
- 2. Bone loss

Management of infection

- Soft tissue debridement
- Excision of infected bone
- Removal of infected prosthesis
- Antibiotics IV
- Bone cement with antibiotics (two stage)





Management of infection

<u>One stage procedure:</u>

Direct exchange of implant

Known germ

Minor bone loss

Bacterial identification (aspiration)

No sinus tracts

Systemic antibiotics 40 +/- 2,4 days

Oral antibiotics51 +/- 27 days

Management of infection

<u>Two stage procedure</u>

- Second procedure , cement removal, 6 weeks after antibiotherapy completion

- Oral antibiotics 53+/-32.2 days

One vs Two stage procedure results

The reported success rates vary from 85% to 95% with better outcomes for a two-stage surgery comparatively to a one-stage surgery

Danger for reinfection with diff germ

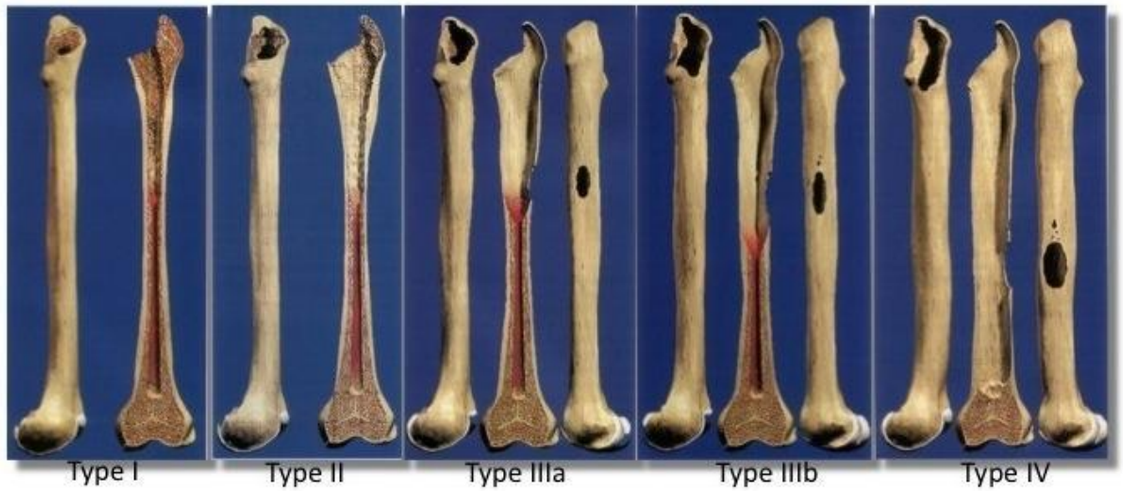
Elson 96.5% vs 87.6%

Elson R. Exchange arthroplasty for infection. Perspectives from the United Kingdom. Orthop Clin North Am 1993;24:761—7.

Garvin et al. 94.4% vs 89.9%

Garvin K, Fitzgerald RH, Salvati, Brause BD, Nercessian OA, Wallrichs SL, et al. Reconstruction of the infected total hip and knee arthroplasty with gentamycin-impregnated Palacos bone cement. Instr Course Lect 1993;42:293—302.

Management of bone loss



- Bone loss classification by Paprowsky
- Hip
- Femur

Type	Description	Treatment option
I	Minimal metaphyseal cancellous bone loss Intact diaphysis	Cementless or cemented primary stems with common length and geometry Proximally fixed stem (usually modular)
II	More extensive cancellous bone loss including the whole metaphysis down to the level of the lesser trochanter	Calcar replacement stem if medial cortex of the femoral neck is compromised Cementless stems with distal (diaphyseal)
IIIA	Extensive metaphyseal and diaphyseal bone loss of the femur; More than 4 cm of diaphyseal bone are available for distal fixation of cementless stem	Extensively porous coated stems Modular stems fluted distally and porous coated proximally
IIIB	Available diaphyseal bone is less than 4 cm in length	Extensively porous-coated stems Impaction grafting + cemented stem Modular cementless tapered fluted stem
IV	Widened diaphysis that provides no support for cementless fixation	Impaction grafting + cemented stem Allograft prosthetic composite Tumor megaprosthesis

Treatment of bone loss - femur Paprowsky Classification

- Type I : Cemented of cementless primary stems
- Type II: Modular stem, Calcar replacement with porous coating. 96% in situ after 11 ,5 years Emerson et al JBJS 2003
- Type IIIa: Cementless stem with distal fixation
- Type IIIB:

Extensively porous coated stem, 4.1% aseptic loosening after 14,2 years Weeden J Arthroplasty 2002

Impaction grafting 98% survival after 10 years Lamberton et al J Arthroplasty 2011

Modular cementless tapered fluted stem

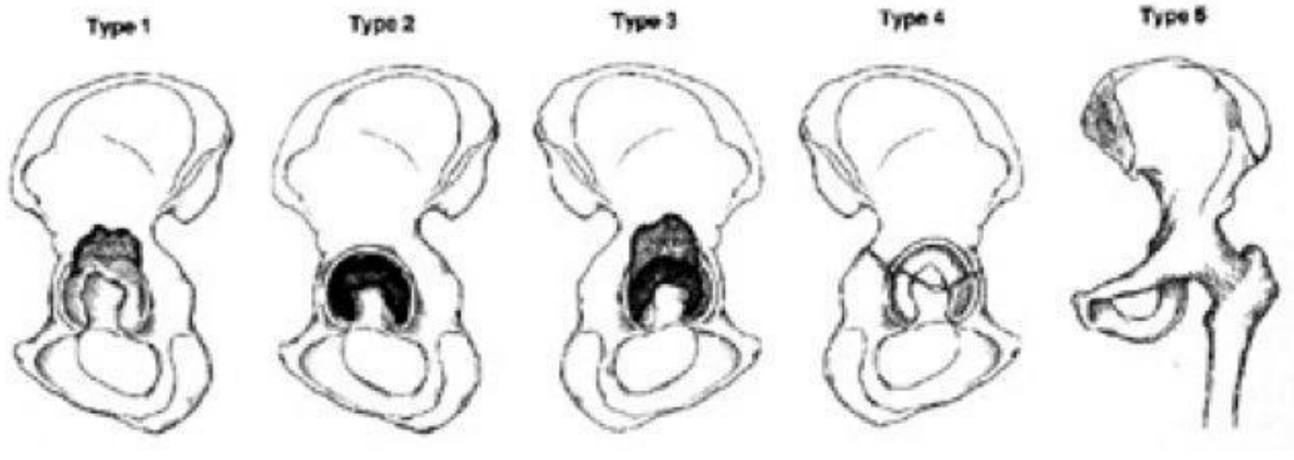
- Type IV:

Allograft prosthetic composite Survival 64-86 % at ten years. Blackley et al JBJS 2001

Proximal femoral replacement survival 81 % at 11 years Parvizi et al CORR 2004

Type	Description
I	Minimal metaphyseal cancellous bone loss Intact diaphysis
II	More extensive cancellous bone loss including the whole metaphysis down to the level of the lesser trochanter
III A	Extensive metaphyseal and diaphyseal bone loss of the femur; More than 4 cm of diaphyseal bone are available for distal fixation of cementless stem
III B	Available diaphyseal bone is less than 4 cm in length
IV	Widened diaphysis that provides no support for cementless fixation

Management of bone loss



- Classification by Paprowski
- Acetabulum

Type	Defect
Type 1	Completely Supportive Rim without Bone Loss or Migration
Type 2	Distorted Hemisphere with Anterior and Posterior Columns Intact and Supportive • Migration less than 2 cm superomedially or laterally • Minimal Ischial Lysis • Minimal Teardrop Lysis 2A Defect with Superomedial Migration 2B Defect with Superolateral Migration 2C Defect with Straight Medial Migration only
Type 3	• Superior Migration greater than 2 cm • Severe Medial and Ischial Lysis • Marked Bone Loss of Supportive Acetabular Rim
	3A • Köhler's Line Intact • 30% to 60% of the Component Contact with Support Allograft 3B • Köhler's Line Loss • More than 60% of the Component Contact with Support Allograft

Treatment of bone loss - acetabulum Paprowsky Classification

- Acetabular component: Reconstruction cage, bilobed components, triflanged components
- Type 1: Bone graft
- Type 2a. NO bone graft , cancellous screws
- Type 2b. Cancellous screws or reconstruction plate
- Type 2c. Medial cancellous allograft. Hemispherical cup
- Type 3a. Large hemispherical cup
- Type 3b. No discontinuity. Cancellous allograft with cage, trabecular metal with augments , custom implant - triflange
- Type 3b acute discontinuity . Compression. Plate with cage and allograft. Internal plate with trabecular metal
- Type 3b Chronic discontinuity. Distraction. Acetabular transplant. Trabecular metal with augments. Triflange implant

- Paprowsky et al CORR 2005

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Treatment of bone loss knee

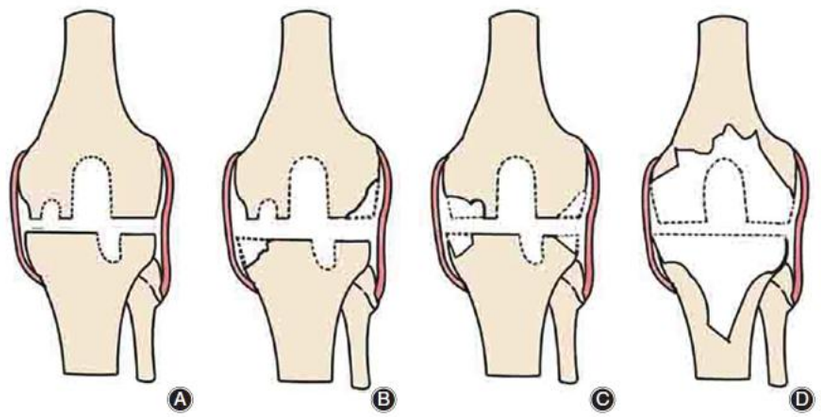
- Type 1: Cementation, autologous , allogenic bone grafting

- Type 2: Modular metal augmentation, structural bone allograft

- Type 2a, 2b, 3: Porous tantalum metaphyseal cones, Megaprothese

TABLE 1 The Anderson Orthopedic Research Institute classification of bone defects in revision of total knee arthroplasty[15–17]

Type	Severity of bone defects in tibia (T) and femur (F)
Type 1 (T1 and F1)	Minor bone defect without compromising the stability of a revision component, normal development of the posterior condyles
Type 2A (T2A and F2A)	Metaphyseal bone damage and cancellous bone loss in one femoral condyle/tibial plateau, reduced development of the posterior condyles, requiring reconstruction to maintain implant stability
Type 2B (T2B and F2B)	Metaphyseal bone damage and cancellous bone loss in one or both femoral condyle/tibial plateau, reduced development of the posterior condyles, requiring reconstruction to maintain implant stability
Type 3 (T3 and F3)	Significant cancellous metaphyseal bone loss compromising the ligamentous instability of a major portion of the tibial or femoral condyle, association with patellar tendon detachment



Conclusion

- Challenging
- Treatment of infection and bone loss
- Many treatment options adapted to the severity of bone loss

Thank you for your attention