How to deal with a loss of bone stock

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Introduction

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- Bone deficiency represents a common theme in revision total knee arthroplasty.
- The etiology of bone deficiency may be
  - aseptic loosening,
  - osteolysis,
  - stress shielding,
  - septic loosening,
  - or iatrogenic resulting from implant removal

Pre op classification

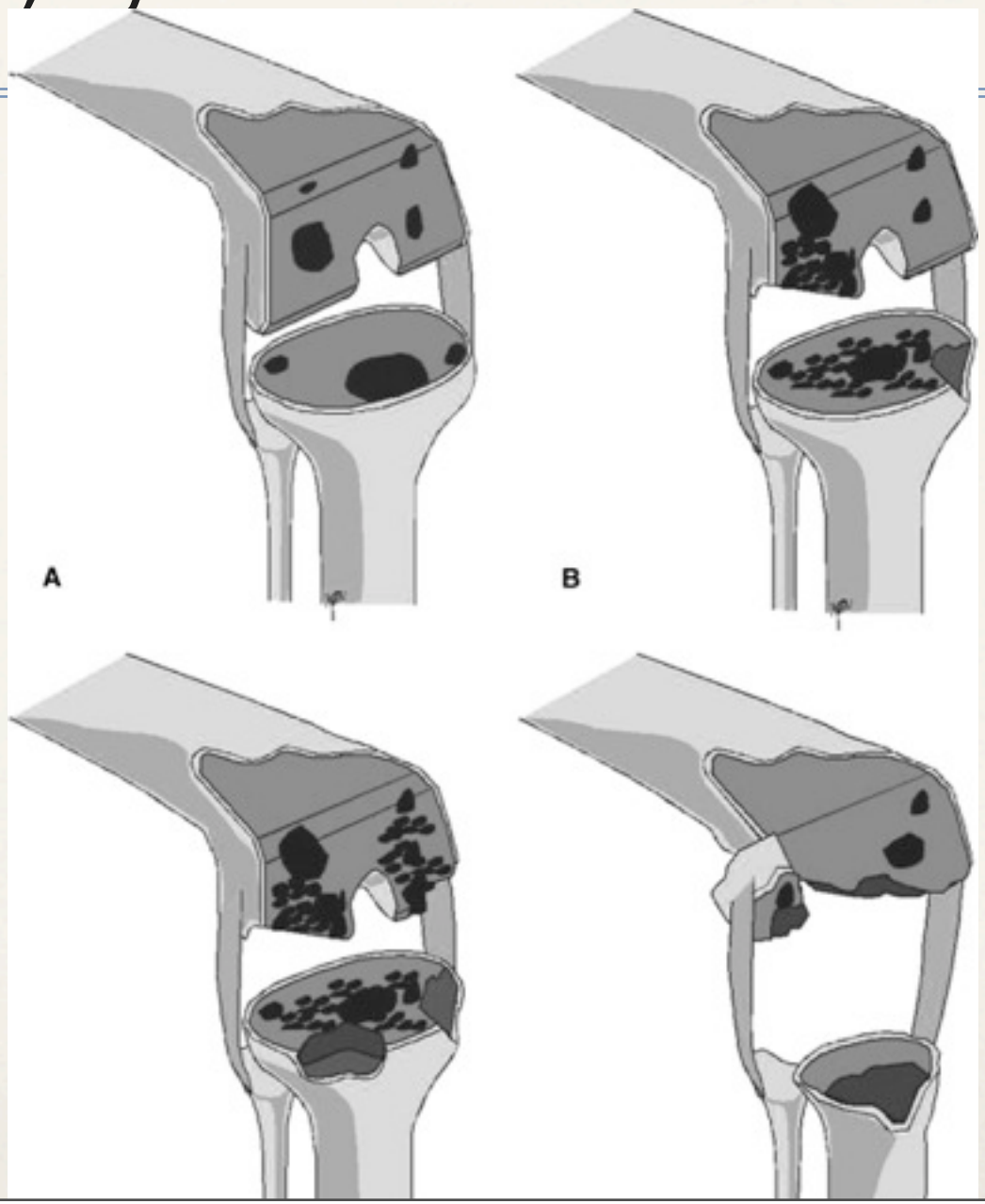
- Anderson Orthopaedic Research Institute (AORI) system of Engh and Ammeen

Table 1

Anderson Orthopaedic Research Institute Classification of Bone Defects

Type	Severity of Bone Deficiency Encountered
1	Minor femoral or tibial defects with intact metaphyseal bone, not compromising the stability of a revision component
2	Damaged metaphyseal bone. Loss of cancellous metaphyseal femoral bone requiring reconstruction (cement fill, prosthetic augment, or bone graft) to provide stability of the revision component.
	A: Defects in one femoral or one tibial condyle
	B: Defects in both femoral or both tibial condyles
3	Deficient metaphyseal segment compromising a major portion of either femoral condyles or tibial plateau, occasionally associated with collateral or patellar ligament detachment.

- Anderson Orthopaedic Research Institute (AORI) system



Pre op classification

Table 2

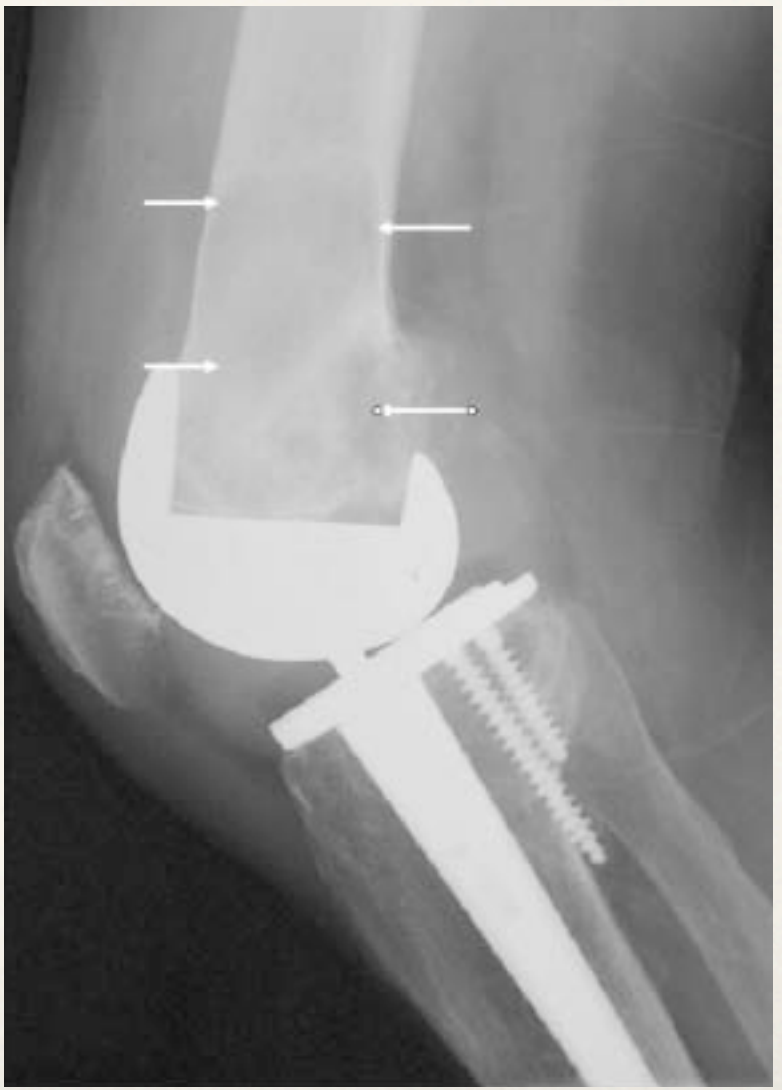
Bone Loss Classification of Clatworthy and Gross[2]

Type	Severity of Bone Deficiency Encountered
I	Contained with metaphyseal bone intact, in which restoration of the joint line can be accomplished without bone grafting or augmentation
II	Contained with damaged metaphyseal bone and requiring bone grafting, cement fill, or augments to restore the joint line
III	Noncontained, noncircumferential defects requiring a partial distal femur, partial proximal tibia, or femoral head graft
IV	Noncontained, circumferential defects requiring a segmental distal femoral or proximal tibial graft

Type I

Type II

Type III



Treatment

- Implant constraint: posterior-stabilized, varus-valgus-constrained, rotating hinge
- Stem configuration: straight versus tapered, standard, or long-stemmed
- Stem fixation cement versus press-fit
- Method of bone-defect repair cement, augments, bone graft

Treatment

defect type	defect size	Treatment options
Contained	< 5 mm 5-10 mm > 10 mm	PMMA fill Reinforced PMMA morcellized allograft or porous metal

Treatment

defect type	Fig. 1A Ddefect size	Treatment options
Non Contained	< 5 mm 5-10 mm < 50% > 10 mm > 50% > 15 mm	PMMA fill Reinforced PMMA TKA modular system Structural allogragt megaprosthesis

Iatrogenic bone loss after removal of the femoral component

Results for allografts

	Number of patients (knees)	Average followup (years)	Reop secondary to infection (%)	Reop secondary to allograft complication (%)	Reop secondary to nonallograft complication (%	Radiographic nonunion not requiring revision (%)	Complications not requiring reoperation (%)
Backstein	65	7.5	7.1	11.4	4.3	6	18.6
Clatworthy	58	5.4	4.9	11.5	3.3	0	NA
Ghavazy	50	8.1	8	11.5	3.8	0	NA
Engh	28	4.3	10	6.7	6.7	0	NA
Bauman	30	4.2	0	0	2.9	0	NA

Conclusion

- Prosthetic augments will address the vast majority of defects
- The use of allograft is primarily indicated in the setting of major bone loss in revision knee arthroplasty,
- The use of autograft is appropriate in the management of small defects in primary arthroplasty.
- Bone cement can be used for small defects if the stability of the implant is not compromised by the defect.