

(CASE REPORT)



Acetabular revision using ReadiGraft® BLX Putty and cortical/cancellous bone chips

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Magna Scientia Advanced Research and Reviews, 2021, 02(02), 037-045

Publication history: Received on 01 April 2021; revised on 14 May 2021; accepted on 17 May 2021.

Article DOI: <https://doi.org/10.30574/msarr.2021.2.2.0040>

Abstract

Acetabular bone loss presents a challenge to the revision total hip arthroplasty surgeon. It is described a technique of stressing the acetabular bone intra-operatively to access for pelvic discontinuity and the use of allograft to fill the bone gap. Three radiographic criteria are assessed on the AP radiograph for pre-operative classification according to the Paprosky system. This paper describes the pre-operative assessment, the acetabular defect classification and the surgery to achieve a successful outcome.

Keywords: Acetabular bone loss; acetabular deficiency; allograft; ReadiGraft®.

1. Introduction

Dependent on the cause, pain or functional failure in the hip may be resolved by acetabular revision [1-2]. Previously placed implants may have become loosened due to lack of bone ingrowth in uncemented hips or lack of cement interdigitation [3-5]. Implant-wear can lead to debris which subsequently can incites an osteoclastic cascade resulting in osteolysis and possible loosening of the components [6]. Patients may also be predisposed to hip instability due to cognitive deficits [7], neuropathic joints [8], and hyperflexibility [9], which are often symptoms of disorders such as Charcot arthropathy or Ehlers-Danlos syndrome. Finally, infections in the hip joints caused by nearby infections or a compromised immune system can also compromise the integrity of the joint resulting in the need for acetabular revision [10].

With these factors in mind the goal of reconstruction are as follows: [11-13].

- Restore hip mechanism;
- Reestablish osseous coverage of the new acetabular component; and
- Rigid fixation of:
Acetabular component and Graft.

Demineralized Bone Matrices (DBM) are one option for the treatment of large acetabular defects to restore bone and enhance fixation of the socket. Bone void fillers, such as allograft bone chips, can be used as a graft extender, eliminate donor-site morbidity, and overcome restricted availability and donor-site comorbidity associated with autografts One such DBM, ReadiGraft® BLX Putty*, may be used in acetabular revisions. ReadiGraft® BLX Putty is a demineralized bone matrix (DBM) used in orthopedic and spine procedures. This graft is biocompatible, osteoconductive, and osteoinductive. ReadiGraft® BLX Putty is moldable, allowing it to conform to the surgical site, and resists migration under irrigation [16]. if desired, ReadiGraft® BLX Putty can be combined with Bone Marrow Aspirate (BMA), which will

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provide an osteogenic component. Furthermore, ReadiGraft® cortical/cancellous bone chips can be used as a graft extender to aid in healing.

2. Paprosky acetabular revision classification

The following acetabular revision cases follow the Paprosky classification which is based on the amount of hip center migration and the integrity of four acetabular supporting structures as evaluated on preoperative anteroposterior radiographs of the pelvis [17-18]. Paprosky classification is based on:

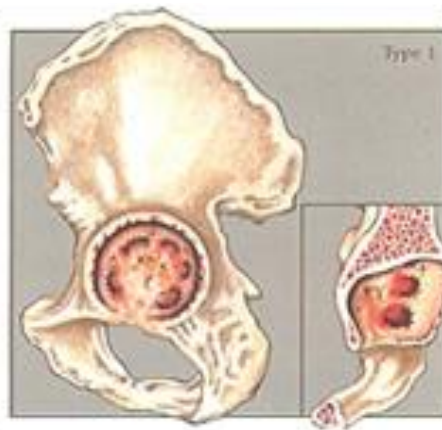
- Severity of bone loss.
- Ability to obtain cementless fixation for a given bone loss pattern.

Key of this classification is ability of the remaining lost bone to provide initial stability of the hemispherical cementless acetabular component until ingrowth.

3. Surgical technique

- All patients under epidural anesthesia.
- Anterolateral approach.
- Lateral positioning with axillary roll and positioners to hold pelvis in stable position.
- Interval is between tensor fascia lata and gluteus medius.
- The anterior 1/3 of the gluteus medius is taken down to allow greater mobility of the femur and increase vision of the acetabulum.
- Reamers were used for acetabular reconstruction and debris removed.
- Liners were trialed to determine the proper size.

3.1. Case 1: Paprosky type 1



Paprosly type 1

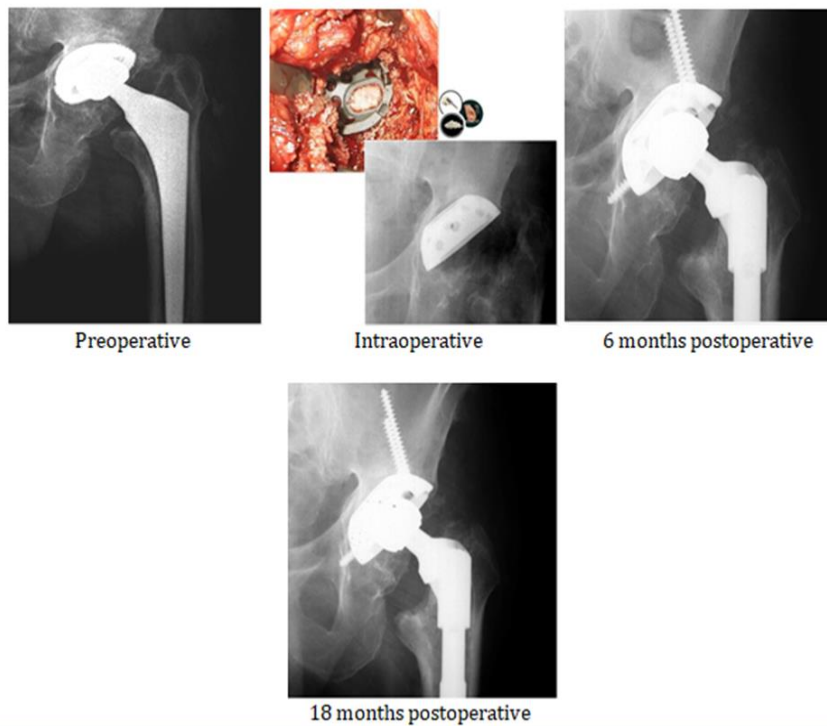
3.1.1. Case description/anamnesis

- 72-year-old, male.
- Left acetabular cup mobilization 8 years postoperative.
- Defect has minimal focal bone loss with maintenance of the hemispheric shape of the acetabulum. The supporting structures, including the acetabular walls and columns, are all intact and with no hip center (component) migration.

3.1.2. Treatment

- Old cup was removed.
- 5cc ReadiGraft BLX® Putty was mixed with 15cc of cortical/cancellous chips to fill the acetabular bone void.

- Elliptical cup with screws implanted.
- Uncemented stem replaced after canal reaming.

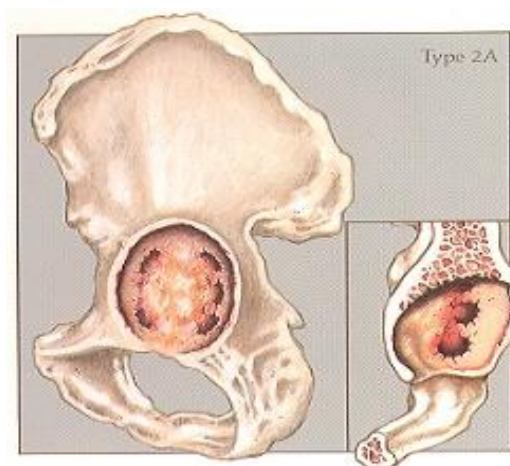


Paprosky type 1: surgery

3.1.3. Outcomes

Postoperative course was uneventful and at 6 months postoperative the cup was completely integrated in the bone.

3.2. Case 2: Paprosky type 2a



Paprosky type 2a

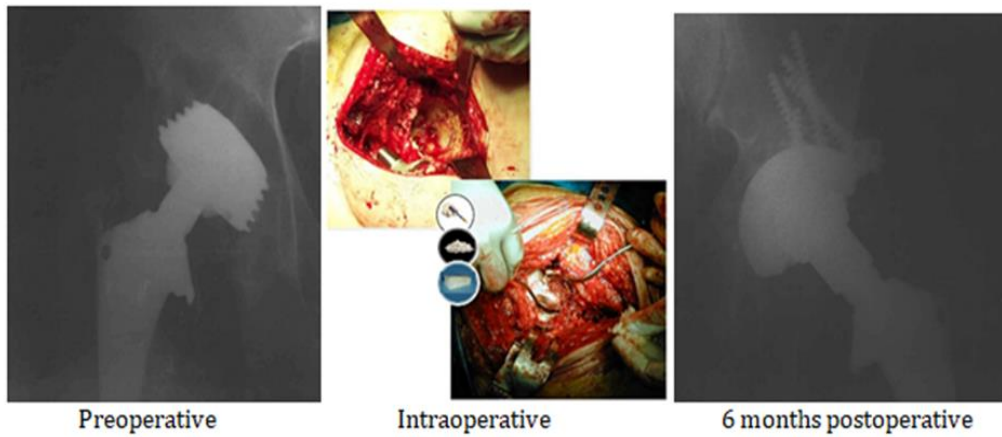
3.2.1. Case description/anamnesis

- 71-year-old, female
- Left acetabular cup mobilization 8 years postoperative.

- Defects are characterized by global cavitation of the acetabulum with direct superior hip center migration, sufficiently intact superior dome and teardrop prevent concomitant lateral or medial displacement, respectively. Anterior column (Kohler line) and ischium (posterior column) intact.

3.2.2. Treatment

- Old cup was removed. Acetabulum preparation using successively larger reamers.
- 5cc REDIgraft® BLX Putty was mixed with 15cc of cortical/cancellous chips and ilium strip to fill the acetabular bone void.
- Cup and screws implanted.
- Uncemented stem replaced after canal reaming.

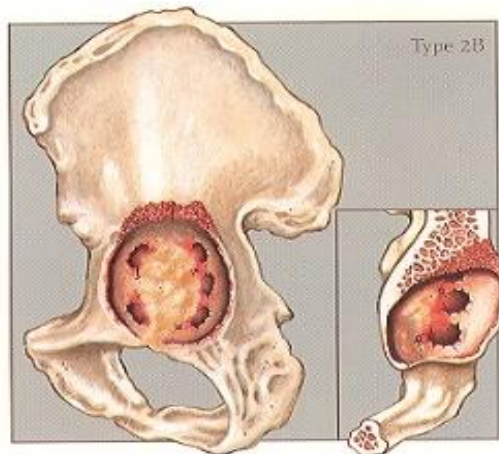


Paprosky type 2a: surgery

3.2.3. Outcomes

Postoperative course was uneventful and at 6 months postoperative the cup was completely integrated in the bone.

3.3. Case 3: Paprosky type 2b



Paprosky type 2b

3.3.1. Case description/anamnesis

- 78-year-old male
- Right acetabular cup mobilization 10 years postoperative.

- Defects are characterized by a deficient superior dome, allowing for superior and lateral component migration owing to the lack of a lateral stabilizing buttress, normally provided by the lateral margin of the superior dome.

3.3.2. Treatment

- Old cup was removed.
- 15cc ReadiGraft® BLX Putty was mixed with 45cc of cortical/cancellous chips to fill the acetabular bone void.
- Cage, screws, and cemented cup were replaced.

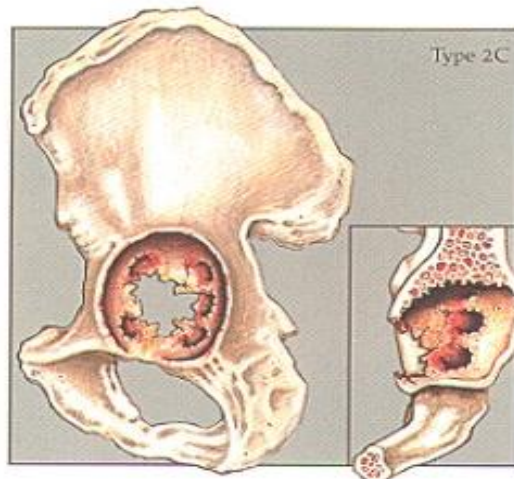


Paprosky type 2b: surgery

3.3.3. Outcomes

Postoperative course was uneventful and the hip was completely restored at 10 months postoperative.

3.4. Case 4: Paprosky type 2c



Paprosky type 2c

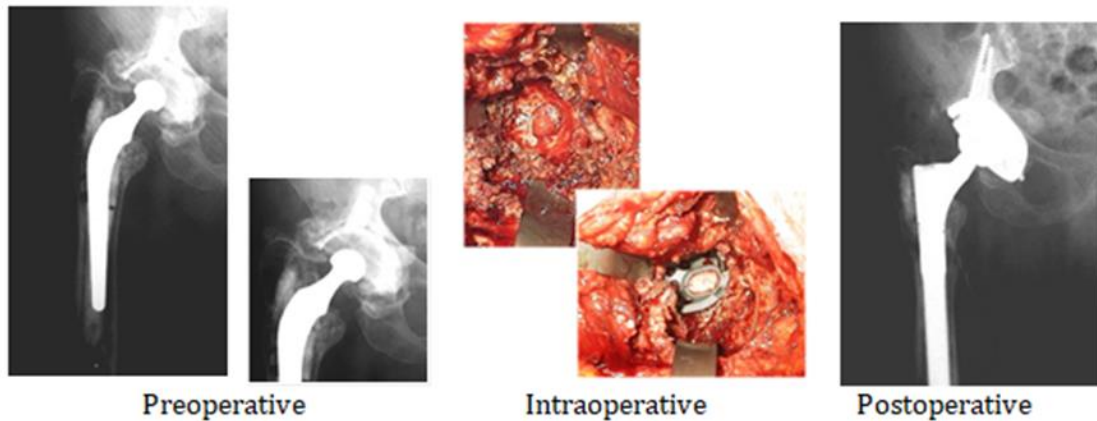
3.4.1. Case description/anamnesis

- 80-year-old male
- Right acetabular cup mobilization 18 years postoperative.
- Defects were characterized by a deficient medial wall (tear drop) causing direct medial migration of hip center. The superior dome is intact, presenting vertical displacement.

3.4.2. Treatment

- Old cup was removed.
- 15cc ReadiGraft® BLX Putty was mixed with 45cc of cortical/cancellous chips to fill the bone void.
- Elliptical cup and screws implant.

- Uncemented stem replaced after canal reaming.

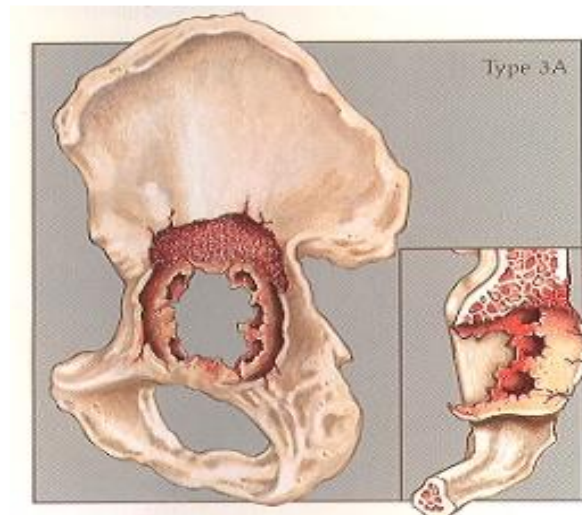


Paprosky type 2c: surgery

3.4.3. Outcomes

Postoperative course was uneventful at 8 months post-operative.

3.5. Case 5: Paprosky type 3a



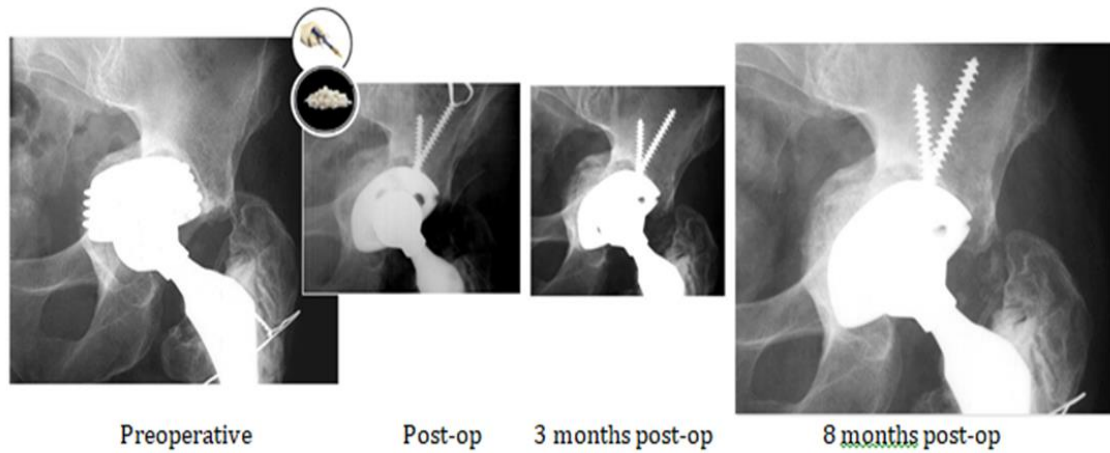
Paprosky type 3a

3.5.1. Case description/anamnesis

- 68-year-old male
- Left acetabular cup mobilization 8 years postoperative.
- Defects were characterized by moderate-to-severe destruction of the acetabular walls and posterior column, rendering these structures non-supportive. The hip center migrates super-lateral (up-and-down deformity)

3.5.2. Treatment

- Old cup was removed.
- 20cc ReadiGraft® BLX Putty was mixed with 60cc of cortical/cancellous chips to fill the bone void.
- Cup and screws and cemented cup replaced.

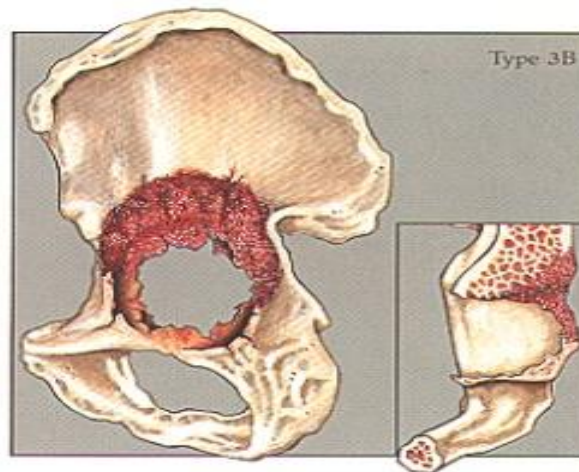


Paprosky type 3a: surgery

3.5.3. Outcomes

Postoperative course was uneventful and at 8 months postoperative the cup was completely integrated in the bone.

3.6. Case 6: Paprosky type 3b



Paprosky 3b type

3.6.1. Case description/anamnesis

- 82-year-old, female
- Left acetabular cup mobilization 10 years postoperative.
- Defects are most severe and characterized by destruction of all acetabular supporting structure including both walls and both columns ("up-and-in" deformity).

3.6.2. Treatment

- Old cup was removed. Acetabulum preparation using successively larger reamers.
- 15cc ReadiGraft® BLX Putty was mixed up with 45cc of cortical/cancellous and ilium strip to fill the acetabular bone void.
- Cage and screws and cemented cup replaced.



Paprosky 3b: surgery

3.6.3. Outcomes

Postoperative course was uneventful and at 9 months postoperative the hip was restored.

4. Conclusion

The Paprosky classification system is valid and shows good reliability when combined with standardized definition of landmarks and structured analysis. While many different graft types are available for orthopedic procedures, there are numerous advantages of allografts.

However, allograft processing varies by manufacturer, and resulting product intended for orthopedic applications may differ in sterilization assurance, osteoinductive potential, and proven clinical performance.

One allograft option, referred to here as "ReadyGraft", is provided sterile to a SAL of 10^{-6} and with an extensive history of published studies to support clinical efficacy, makes this type of graft a valid option for the practitioner to consider.

Compliance with ethical standards

Acknowledgments

The Authors acknowledge LifeNetHealth for providing the allografts for the acetabular revisions described.

Disclosure of conflict of interest

There is no actual or potential conflict of interest in relation to this paper.

Statement of informed consent

Patients' informed consent obtained.

**ReadiGraft® (BLX Putty) and ReadiGraft® (cortical/cancellous) are registered by LifeNet Health, Virginia Beach, USA*

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