Case Reports

Series A, B, C & D

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Revision Total Joint

Orthopaedic Repair

Oncology

Use of Opte*form*® to Repair Failed Total Knee Prosthesis with Osteolysis

Series A, Number 1

Harry Schmaltz, M.D.
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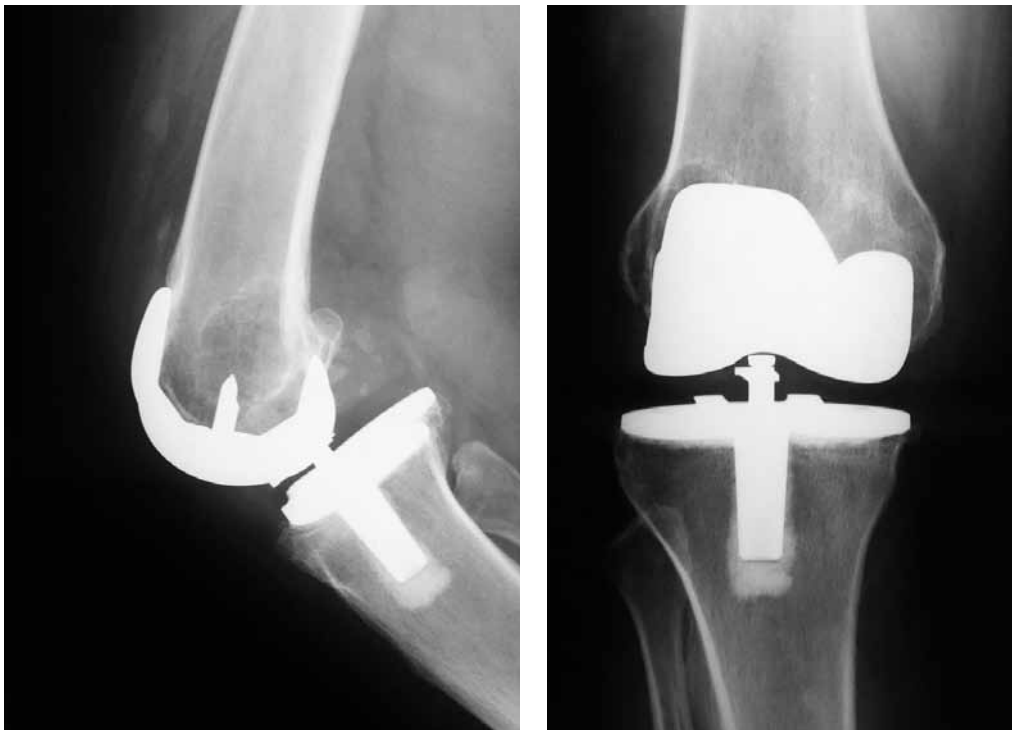
Presentation

A 58-year-old, 335 pound female with bilateral total knee arthroplasties was seen three weeks after a fall. On examination, the right knee was found to be painful with laxity in both the A/P and M/L planes. Radiographs showed a large osteolytic lesion in the lateral femoral condyle (Figure 1). The patient elected to have revision right total knee arthroplasty.

Operation

The femoral and tibial components were removed. A large osteolytic defect was found in the lateral femoral condyle and a much smaller defect in the lateral tibial plateau. Defect sizes were 4cm deep by 3cm wide and 1cm deep by 1cm wide respectively.



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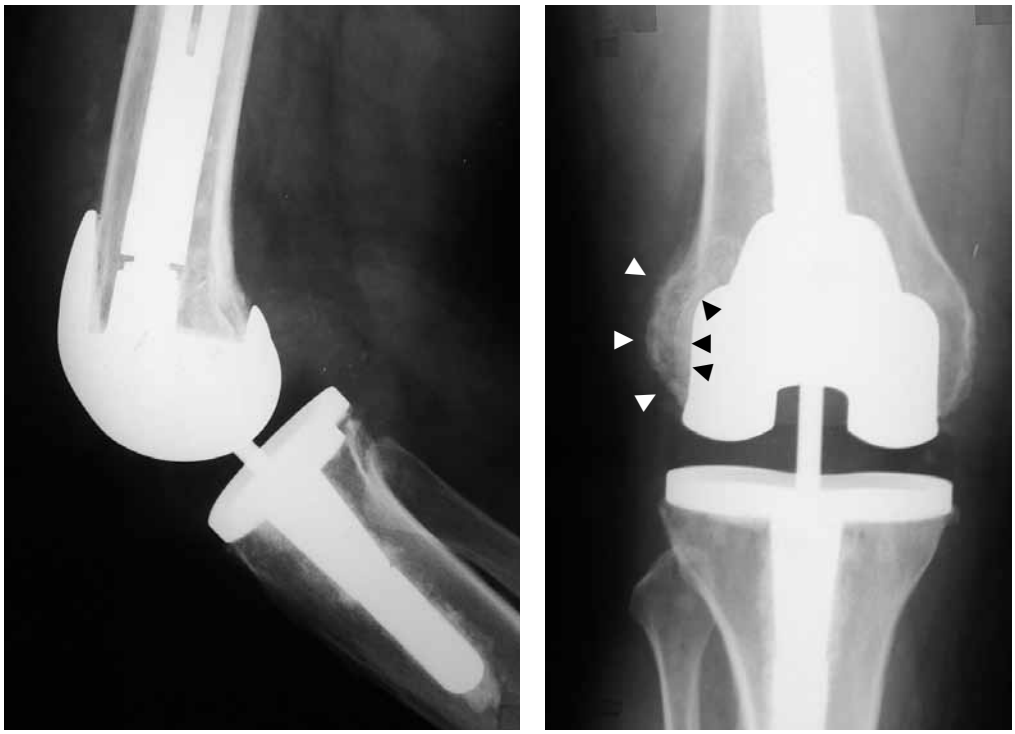

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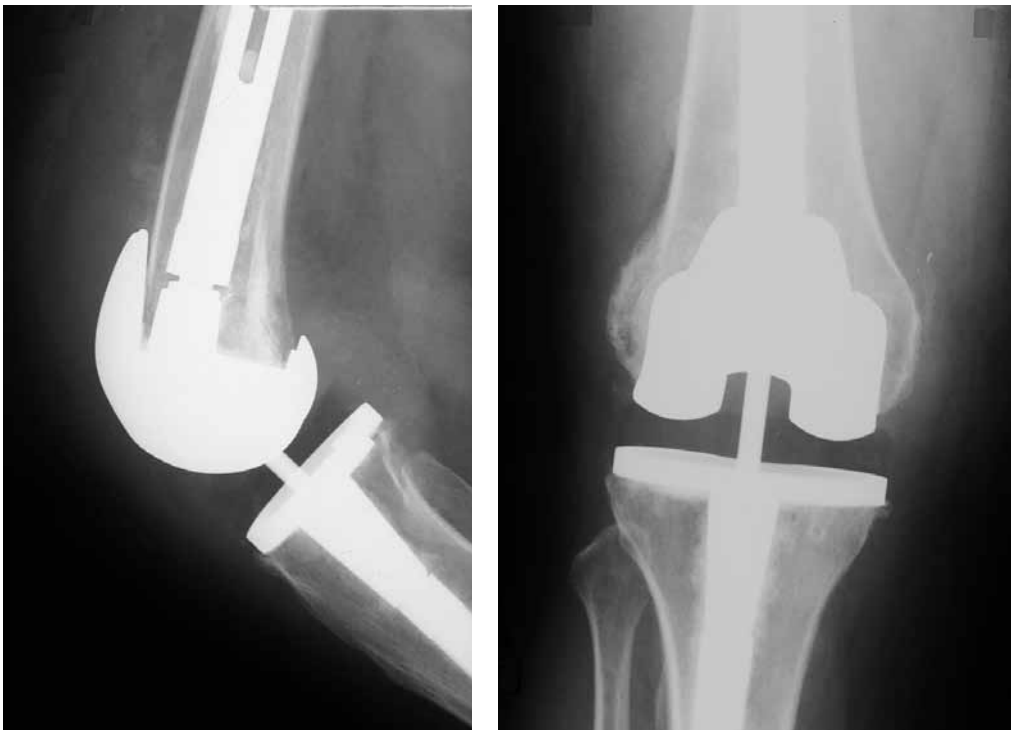
Fig.1 Pre-operative: large osteolytic defect in the lateral condyle.

Fig.2 Six weeks post-operative: Opteform® (white arrows) surrounding femoral head allograft (black arrows).



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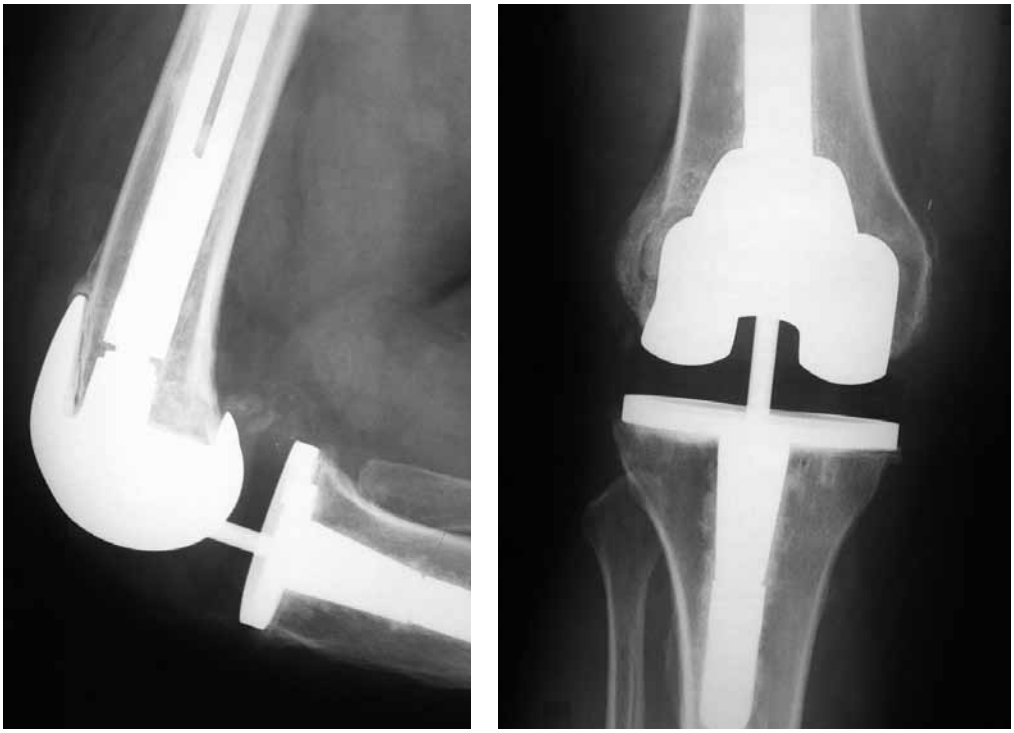

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A warmed 8cc disk of Opteform® was placed into the proximal portion of the femoral defect. A sagittally split, hemi-femoral head allograft was shaped and impacted into the defect on top of the Opteform®. A second warmed 8cc disk of Opteform® was used to fill in the remaining voids between the allograft and the host bone. The tibial defect was filled with the remainder of Opteform®. Femoral and tibial resections were made and Optetrak® total knee components were implanted to complete the revision procedure.

Post-operative Results

Radiographs taken at six weeks post-operatively (Figure 2) showed the femoral head allograft (black arrow) surrounded by Opteform® (white arrows) in the lateral femoral condyle. Three month radiographs showed consolidation of Opteform® in progress around the femoral head allograft and no migration of any component (Figure 3). Clinical examination demonstrated full extension and 110º flexion with no instability in either plane. Flexion at 1 year increased to 115º with continued stability and excellent component position. One year radiographs demonstrated graft incorporation with trabeculation traversing the Opteform® and good reconstitution of the lateral cortex (Figure 4).

Fig.3 Three months post-operative: consolidation in progress and stable components.

Fig.4 One year post-operative: trabeculation across the Opteform with good reconstitution of the lateral cortex.

Use of Opteform® to Repair Acetabular Osteolysis

Series A, Number 2

Presentation

A 53-year-old female presented with localized pain in the left hip, increased limping and decreased ability to ambulate over the last two months. She had bilateral total hip arthroplasty 13 years prior for a primary diagnosis of degenerative arthritis. In the past 10 years, the patient has had three left hip revisions and one right hip revision. Radiographs demonstrated radiolucency surrounding the socket, asymmetric wear of the polyethylene, and radiolucency along the mid-portion of the femoral component (Figure 1).

Treatment

At operation the femoral stem was well fixed. However, the acetabular component was loose and was subsequently removed. Acetabular bone was reamed to expose fresh host bone. There were bony defects in the anterior, posterior, medial and superior portions of the acetabulum. A 75mm and a 45mm disk of Opteform®, providing a total graft volume of 23cc, were warmed and pressed into the defects. A 48mm cup with a 22mm ID acetabular insert was placed. The cup fixation was supplemented with two 6.5 mm screws, applied superiorly (Figure 2). At 10 weeks postoperatively, the patient resumed full activity without external support.

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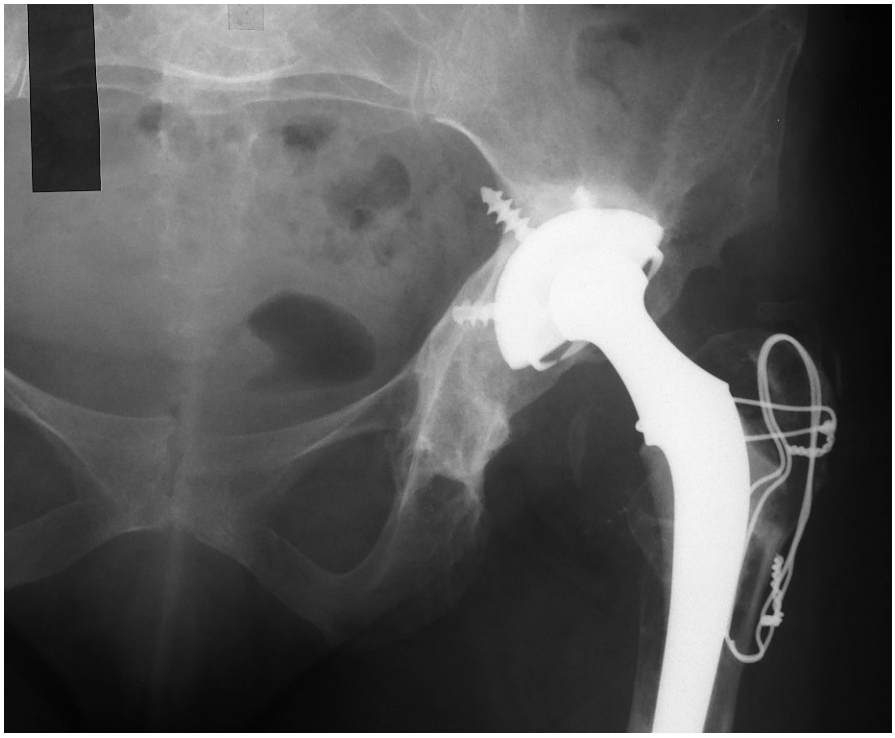

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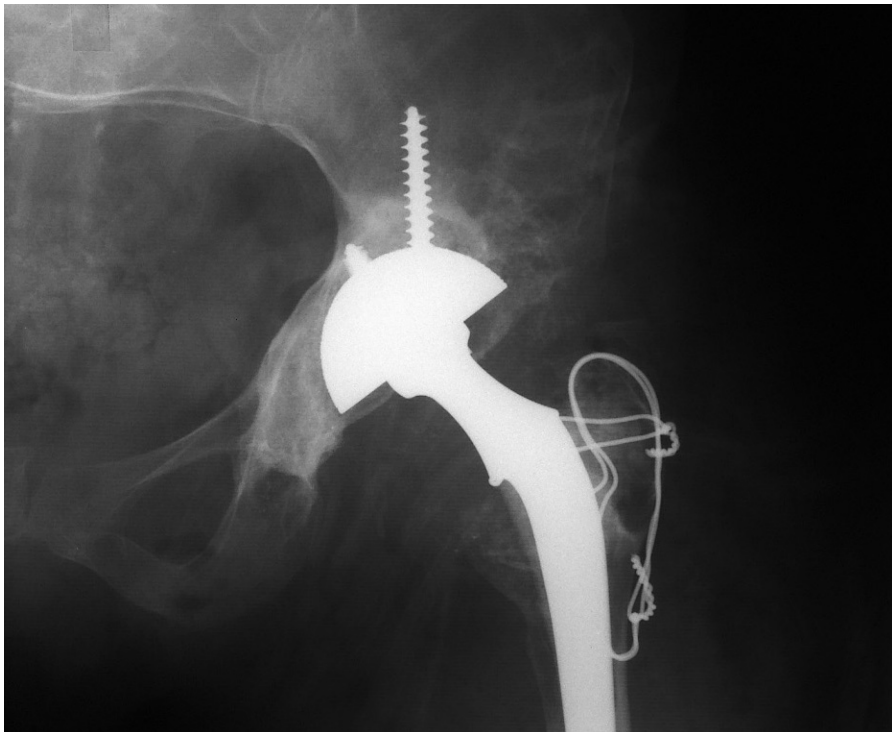
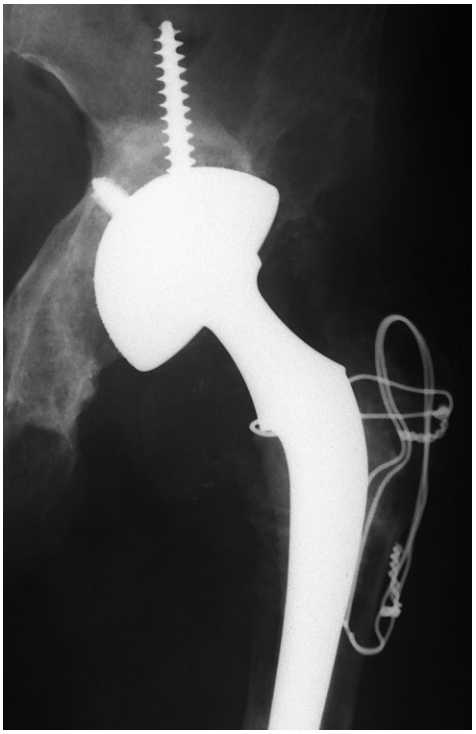


Fig 1. Preoperative: The left acetabular cup has migrated superiorly indicating looseness. Also note the radiolucency along the femur and the assymetrical polyethylene wear.

Fig 2. Immediate postoperative: new cup and implanted Opteform around the cup.



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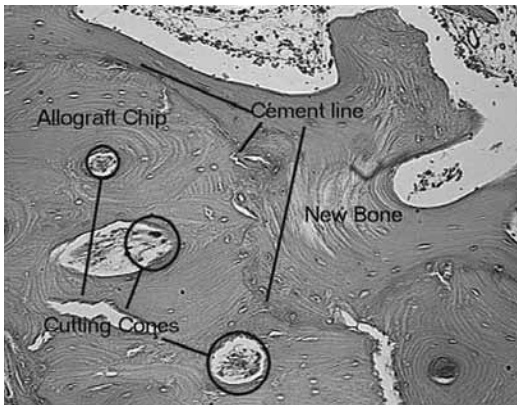

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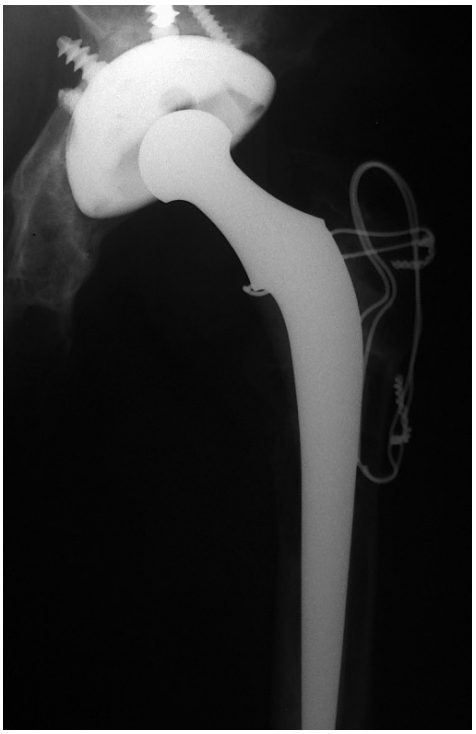

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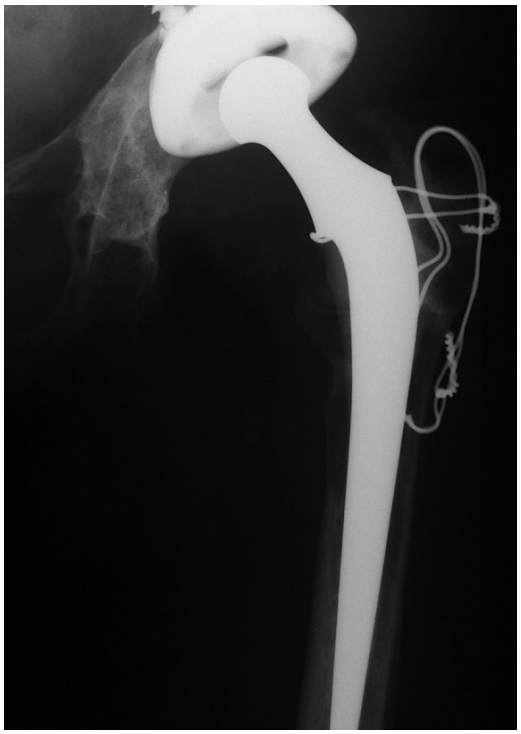

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Additional Treatment

The patient returned six months postoperatively after developing acute pain. Radiographs showed that the acetabular component had rotated into a vertical position (Figure 3). At operation the defects observed six months previously were well healed, and no additional bone graft was required during this revision. A biopsy was taken at the site of the previously placed Opteform® allograft (Figure 4). Histological analysis indicated new bone growth and remodeling throughout the Opteform®. The displaced acetabular cup was revised with a 52mm acetabular cup using four 6.5mm screws to augment the fixation.

Outcome

Four months after the most recent revision operation, the patient was walking well with one crutch. Radiographs demonstrated the prosthetic components in good position with no evidence of complications (Figures 5 & 6). The displacement of the acetabular cup was thought to be due to the inadequate fixation of the acetabular cup into healthy host bone. The use of Opteform® during the first procedure improved the bone quality at the site thus allowing for better fixation during the subsequent procedure.

Fig 3. Ten weeks postoperative: The medial edge of the acetabular cup has rotated laterally, tilting the cup vertically. Note the radiolucent gap on the medial edge indicating the cup's previous position.

Fig 4. Histological sample of the bone graft site. New bone has grown amidst the Opteform® allograft chips and is continuing to remodel as indicated by the cutting cones.

Fig 5 & 6. One month (left) and four months (right) postoperative: Note the trabeculation of the bone graft and the lack of movement of the cup.

Large Osteolytic Defect Repair Using Opte*form*® Through an Iliac Window

Series A, Number 4

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Presentation

A 73 year-old male with a right total hip arthroplasty was seen for a routine, five-year follow-up visit. Radiographic evaluation demonstrated wear in the superior aspect of the acetabular shell liner and osteolytic lesions in the superior acetabulum and greater trochanter. CT analysis revealed the acetabular lesion to measure 3x3x4.2cm (CT and Figure 1).

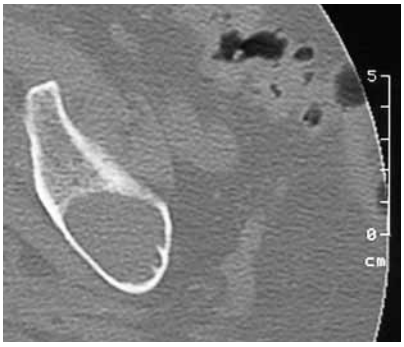
Operation

At surgery, the prosthetic femoral head and acetabular liner were removed. The acetabular shell was found to be well fixed and curettage of the superior acetabular lesion through the dome hole was attempted. Extremes of the lesion were impossible to reach through the dome hole. A 1x2cm window was made through the lateral ilium, above the level of the lesion, without disturbing the acetabular shell. Following thorough curettage, the defect was repaired with a total of 23cc of Opteform® by sequentially packing smaller volumes through the window. The cortical bone removed to make the window was tapped back into place, an apex hole eliminator placed, and a new acetabular liner was inserted. A small pituitary rongeur was used to remove osteolytic tissue around the anterior and posterior aspects of the proximal femur and the greater trochanteric area. Opteform® was used to fill these defects. A new prosthetic femoral head was placed on the femoral stem, the hip reduced, and the wound closed.

Outcome

Three weeks post-operatively, the patient was using a walker satisfactorily and advanced to a cane. Radiographic evaluation at that time revealed excellent dense graft fill of the lesion (Figure 2). At seven and one-half weeks following surgery, the patient exhibited excellent range of motion of the hip. The cane was discontinued at that time. Three months post-operatively, the patient was allowed to return to work consisting of light

CT



CT: superior view of defect

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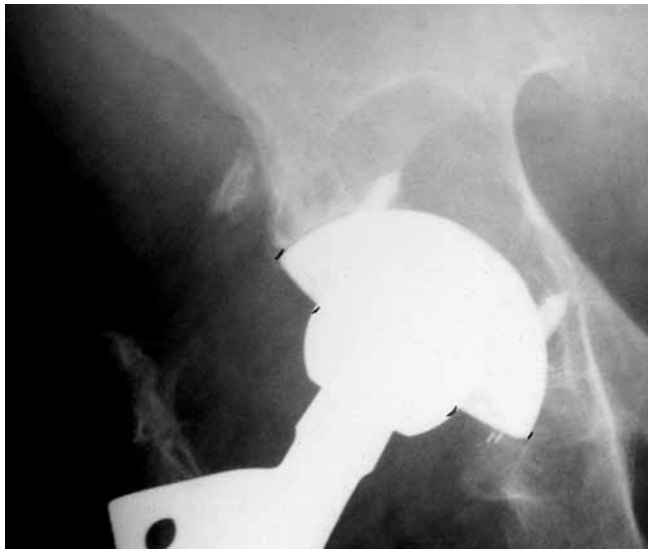

Fig 1. Pre-operative: 3x3x4.2cm osteolytic lesion in acetabulum. The cup was found to be stable intra-operatively.

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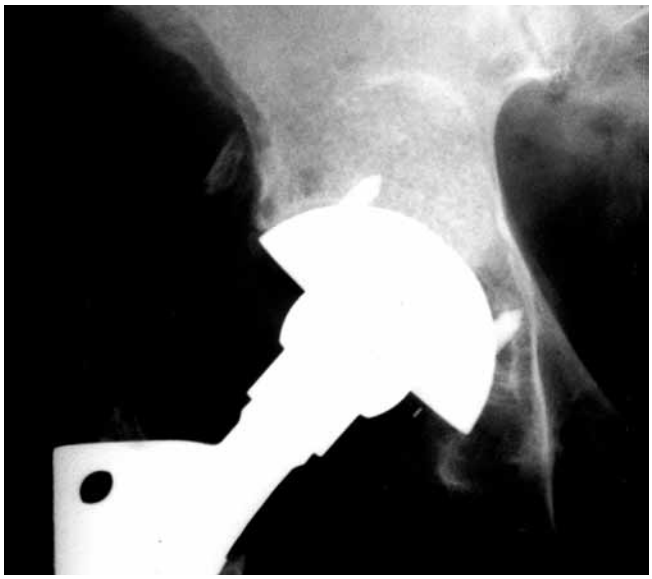

Fig 2. Three weeks post-operative: densely packed graft indicates excellent fill of the lesion. Opteform® was packed through a 1x2cm window made in the lateral ilium without disturbing the acetabular component.

janitorial duties. Early healing was present on radiographs at this time (Figure 3). Progression of trabeculation and consolidation throughout the graft was evident at six months post-operatively (Figure 4). The patient continued to perform full work duties.

Discussion

Severe osteolysis behind stable uncemented acetabular components can occur in the absence of clinical symptoms. Although this patient had only minimal discomfort at five years' follow-up, radiographs showed an extensive osteolytic lesion behind the acetabular component and polyethylene wear denoted by femoral head eccentricity relative to the liner. One treatment option is complete acetabular component revision, which provides optimum exposure for lesion debridement, subsequent reaming and grafting of the lesion. Some have proposed that complete debridement is essential to stop the osteolytic process[1]. Removal of a rigidly fixed acetabular component, however, often results in loss of good ingrown bone or, in some cases, damage to other pelvic structures. Maloney, et al[2] found that effective debridement to stop the osteolytic process can be accomplished without component removal. In the present case, the lesion was found to be irregularly shaped. Subdividing volumes of Opteform® from the warm disk and sequential packing allowed for complete and effective filling of the void. Intra-operative and post-operative radiographs show the packing density and complete fill associated with the "window" technique using this allograft. This method of treating osteolytic defects in the presence of a stable, uncemented acetabular component avoids shell removal and replacement. Additionally, this allograft provides the surgeon with a functionally and clinically effective alternative to traditional graft treatments.

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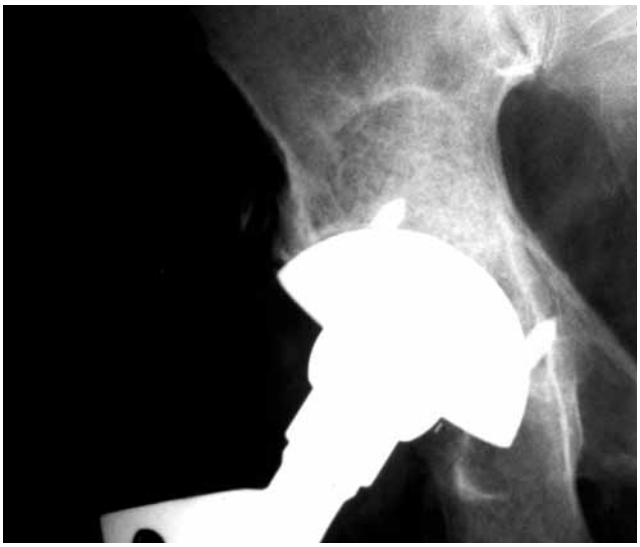

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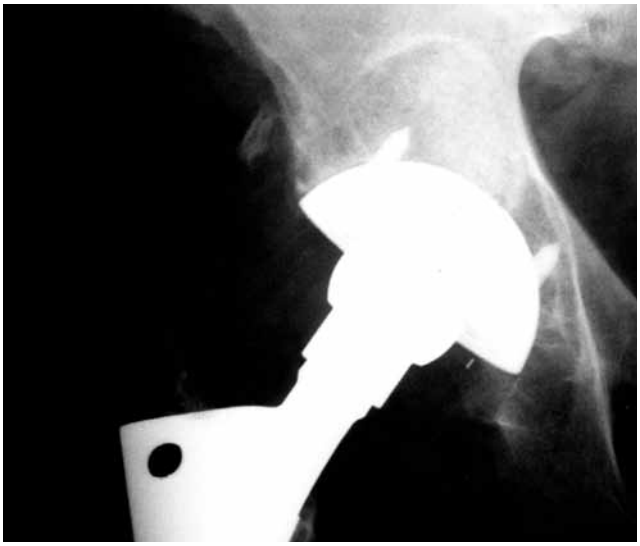

Fig 3. Three months post-operative: early healing evident by consolidation in the superior-lateral area of the lesion. Patient returned to work with full weightbearing.

Fig 4. Six months post-operative: further consolidation and trabeculation of the defect repaired with Opteform®.

References

1. **Maloney WJ, Peter P, Engh CA, Chandler H.** Severe osteolysis of the pelvis in association with acetabular replacement without cement. *J Bone Joint Surg.* 1993; 75-A:1627-35.

2. **Maloney WJ, Herwurm P, Paprosky W, Rubash HE, Engh CA.** Treatment of pelvic osteolysis associated with a stable acetabular component inserted without cement as part of a total hip replacement. *J Bone Joint Surg.* 1997; 79-A:1628-1635.

Repair of Acetabular Fracture and Osteolysis with Opte*form*®— Two Year Follow-Up

Series A, Number 5

Wayne Moody, MD FACS
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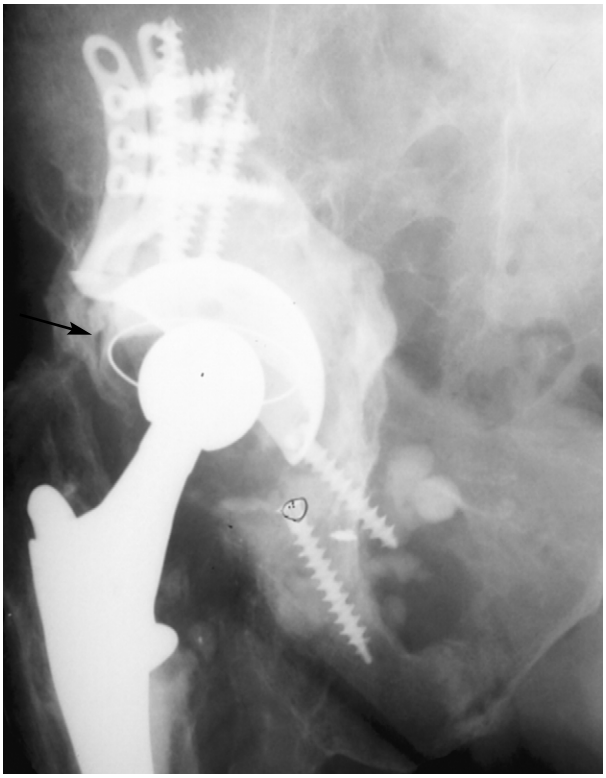
Portland, MA

Presentation

A 71 year old male underwent revision right total hip arthroplasty in 1997, secondary to aseptic loosening. The patient did well until a fall in March 2001. Subsequent to the fall, he was having significant right groin and anterior thigh pain and was found to have a fracture of his acetabular cage and loosening of the prosthesis (Figure 1). The patient elected to undergo another revision.

Operation

Upon inspection of his acetabulum, the fractured portion of the cup was evident and the fractured fragments and cup were removed without difficulty. There was considerable osteolytic debris and necrotic bone in the central aspect of the acetabulum. After debridement, a large acetabular defect—approximately 62 mm in diameter—was present. Other defects included a segmental loss of bone superiorly and a pelvic dissociation secondary to a fracture of the posterior wall extending through the medial wall. One 14cc and three 21cc disks of Opteform were warmed and packed into the acetabular defects using a 62mm trial shell. The remainder of the Opteform was placed in the uncontained superior rim defect. The reconstruction ring that had previously been shaped was inserted and anchored using multiple screws. This resulted in a stable construct that stabilized the pelvic dissociation. A 58mm all-polyethylene cup was then cemented in place in 45-50 degrees of abduction and 15 degrees forward flexion. A new 32mm femoral head was then inserted and the hip was reduced following copious Neosporin irrigation. Range of motion was tested and the hip wasfound to be stable at 90 degrees of hip flexion, 30 degrees of adduction and 40 degrees internal rotation.



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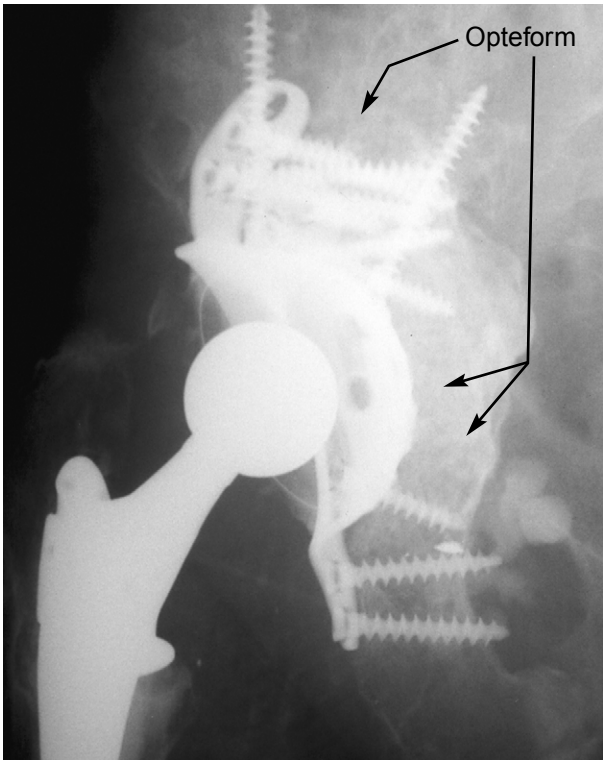

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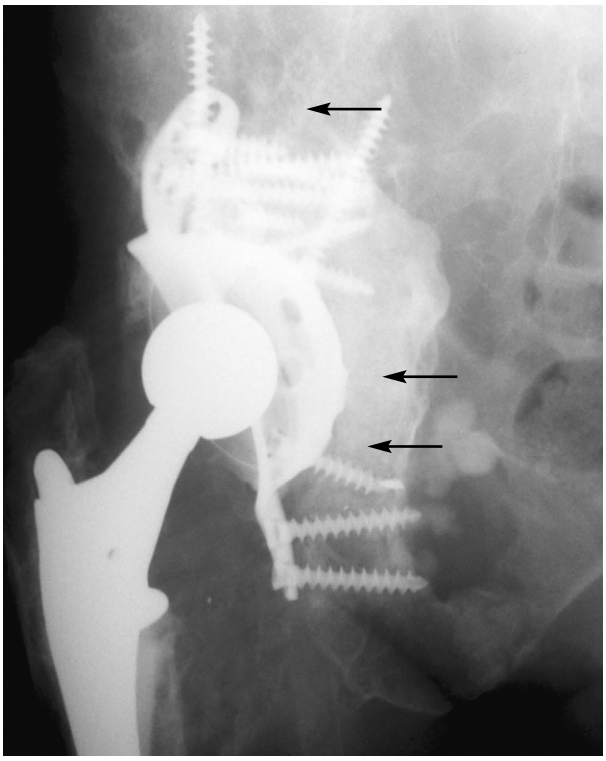
Fig 1. Preoperative radiograph revealing fracture of cup.

Fig 2. Initial postoperative radiograph revealing stippled appearance of Opteform® graft.



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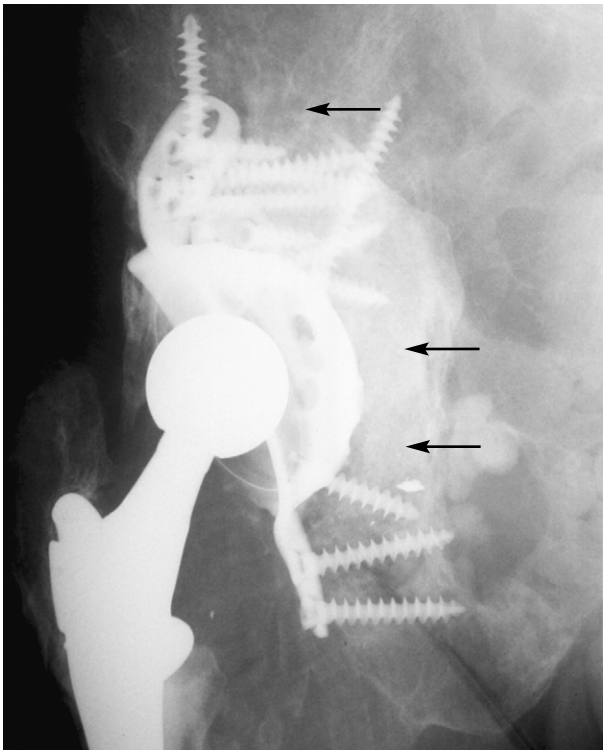

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Results

Initial postoperative radiographs show a large amount of Opteform graft material with a stippled appearance (Figure 2). After five months of touch down weight bearing restriction, radiographs showed evidence of consolidation of the graft and the patient was allowed to progress to full weight bearing (Figure 3). At the two year follow-up, the patient was pain-free and radiographs demonstrate further evidence of graft consolidation with no evidence of graft resorption, radiolucency or cup migration (Figure 4).

Fig 3. Five month postoperative radiograph shows evidence of consolidation of Opteform® graft.

Fig 4. Two year postoperative radiograph shows further consolidation with stable acetabular prosthesis.

Acetabular Reconstruction with Opte*form*® and Reconstruction Ring

Series A, Number 6

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Presentation

A 79 year-old male presented with severe hip pain and inability to ambulate 10 years after primary total hip arthroplasty. Upon examination, the patient was unable to rise from his wheelchair without maximum assistance and had severe pain with hip range of motion. Radiographs revealed a dislodged acetabular component with severe osteolysis in Zones I, II and III. The femoral component also showed evidence of loosening with radiolucency in Zones VI and VII and a large osteolytic cyst in the greater trochanter (Figure 1). The patient was scheduled for revision total hip arthroplasty.

Operation

Following a posterolateral approach, the disassociated acetabular component was exposed and easily removed with a Kocher clamp. A large amount of synovial debris and granulomatous material was debrided and the acetabulum was packed off to address the femur. Marked osteolysis of both the lesser and greater trochanters was noted and an extended trochanteric osteotomy was utilized to remove the femoral component. Further inspection of the acetabulum revealed a large segmental posterior wall defect as well as large cavitary lesions superiorly, anteriorly and into the ischium (a Gross Type IIB or AAOS Type III lesion). The acetabulum was completely debrided, cleaned and prepared to accept a 62mm outside diameter reconstruction ring. Prior to inserting the ring, two 22 cc and one 15 cc Opteform® disks were warmed and impacted into the defects. The ring was then inserted and stabilized with several screws.

The ring was supported superiorly on host bone. A 55mm outside diameter polyethylene liner was then cemented into the ring in approximately 15 degrees forward flexion and 45 degrees of abduction. The femur was then prepared to accept a size 4, 210mm long AuraR calcar replacement stem. The

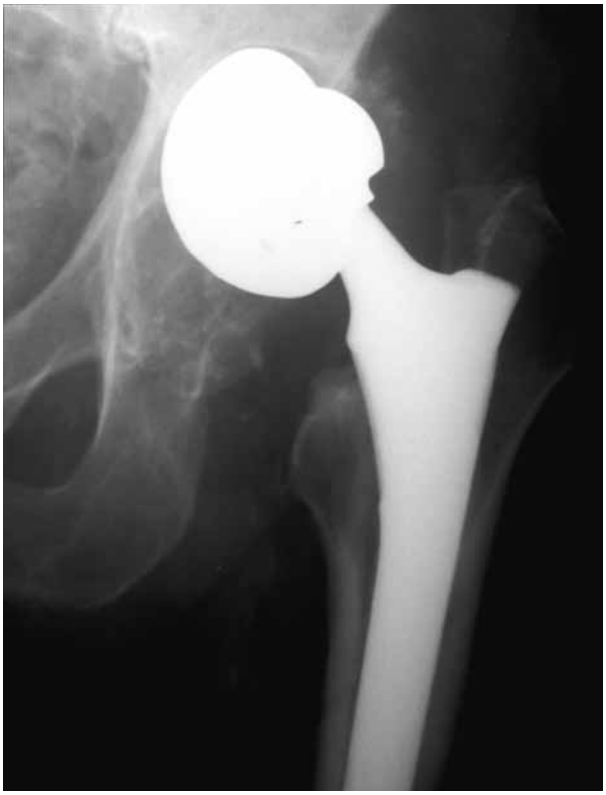

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Fig 1. Preoperative radiograph revealed a dislodged acetabular component and a large osteolytic defect.

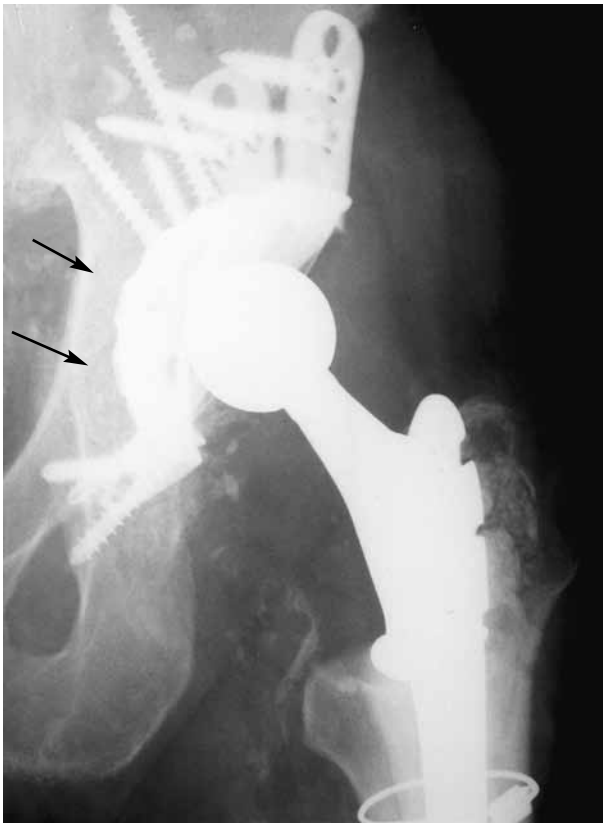

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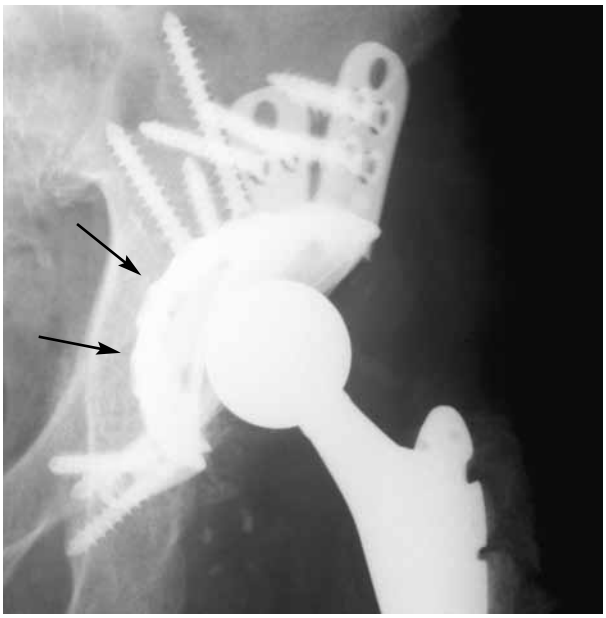
Fig 2. Three week follow-up: the components are in good position. The reconstruction ring is well fixed with a large amount of Opteform® graft superiorly and medially.



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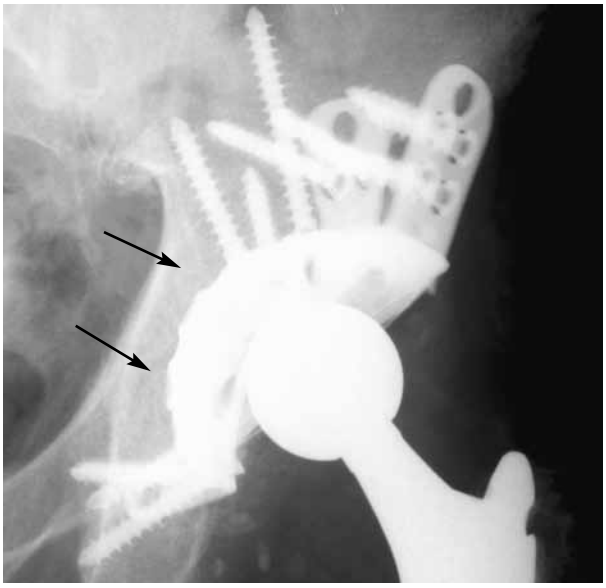

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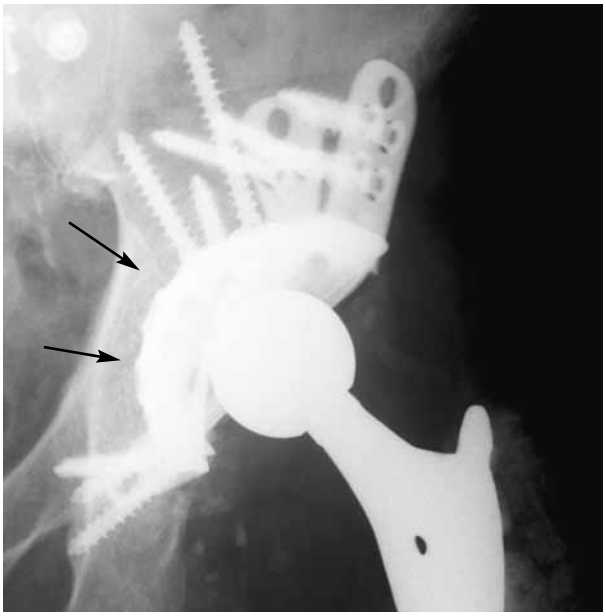

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trochanteric osteotomy was repaired with two 1.6mm cables and the Aura stem was cemented into place. A 32mm +5 head provided excellent stability and range of motion.

Results

Initial postoperative evaluation revealed stable hip components with a large amount of Opteform® graft material behind the reconstruction ring. The patient was having only mild hip discomfort and was ambulating with the assistance of a walker, maintaining touchdown weight bearing and abduction precautions (Figure 2). At three-month follow-up, radiographs revealed stable components with continued stippled appearance of the Opteform® graft. The patient was increased to partial weight bearing (50-60 lbs. maximum). (Figure 3) By his six-month follow-up appointment, the patient had progressed to full weight bearing, although still utilizing a walker. He had no hip pain and improving abductor strength. Radiographs revealed evidence of consolidation of the Opteform® graft with a confluent appearance and minimal stippling (Figure 4). At his one-year evaluation, the patient was ambulating six blocks with the assistance of a cane and had only some mild symptoms of trochanteric bursitis. His HHS improved from a preoperative 21.225 to 93.425 at one year. Radiographs showed consolidation of the Opteform® graft without any evidence of graft resorption or reconstruction ring migration (Figure 5).

Bone grafting with Opteform promoted rapid healing of this osteoporotic fracture allowing early removal of the external fixator. This patient was able to avoid complications, such as muscle atrophy and stiffness, which may accompany long-term immobilization with an external fixator.

Fig 3. Three month follow-up: the Opteform® graft maintains a stippled appearance, without any evidence of graft resorption.

Fig 4. Six month follow-up: radiographs show evidence of Opteform® graft consolidation with less stippling and more confluent appearance.

Fig 5. One year follow-up: the Opteform® graft appears consolidated. The reconstruction ring is stable without evidence of migration or radiolucency. There is no evidence of graft resorption.

Use of Opte*form*® in Acetabular Reconstruction and Osteolytic Defect Repair

Series A, Number 7

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Presentation

A 68 year-old female complaining of right hip pain was seen 15 years after primary total hip arthroplasty for osteoarthritis. Physical examination demonstrated significant pain and decreased range of motion of her right hip. Radiographs revealed significant polyethylene wear with medial and superior migration of the acetabular component as well as a large osteolytic defect in Zone III. The femoral component showed evidence of some calcar rounding in Zone VII, but generally appeared well fixed (Figure 1). The patient was scheduled for revision total hip arthroplasty.

Operation

The patient underwent revision of the acetabular component through a posterolateral approach. Intraoperative cultures were negative. The femoral stem was felt to be stable and in good position and was retracted anteriorly. The acetabular component was mobile and easily removed with a Kocher clamp. A large fibrous membrane was debrided and, although the medial wall was intact, several large defects were noted. The acetabulum was sequentially reamed from 48mm to 58mm. A 58mm AcuMatch trial cup fit well despite a large contained superior defect and a large posterior segmental defect (which represented less than one-third of the cup circumference). Additional cavitary defects were noted in the medial wall, the ischium and pubis. One 75mm and one 90mm Opteform® disks were warmed and finger-packed into all cavitary defects. A hemispherical trial shell was then used to further impact the graft. A 58mm AcuMatch shell was inserted and three dome screws were utilized to enhance

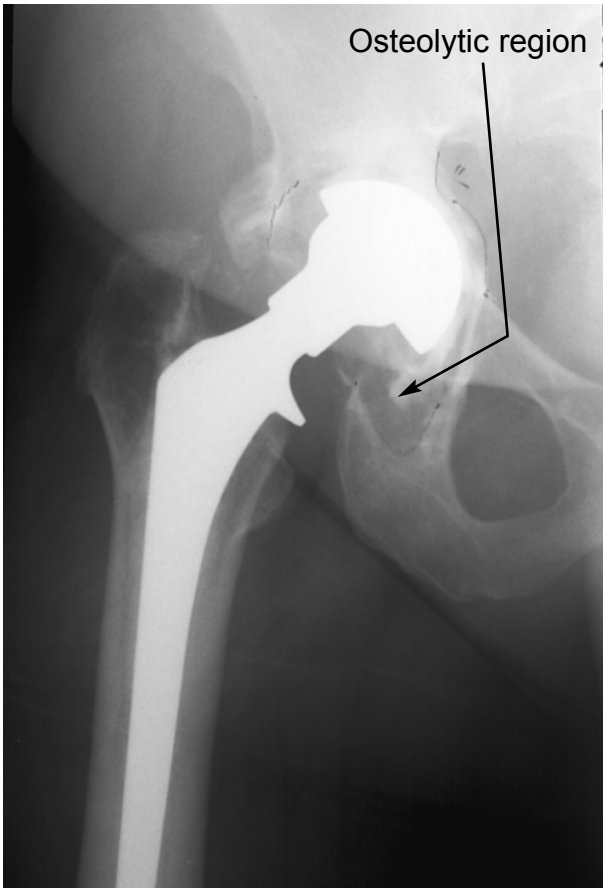

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Fig 1. Preoperative radiograph reveals loose acetabular component with cup migration and large osteolytic cyst in Zone III.

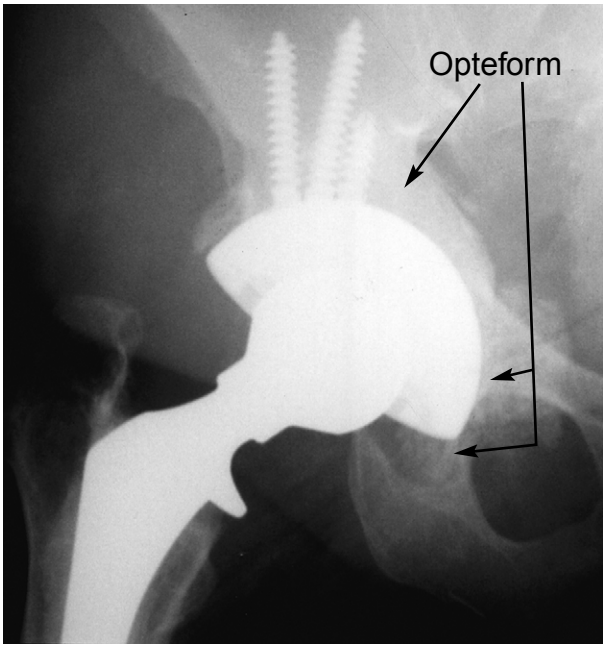

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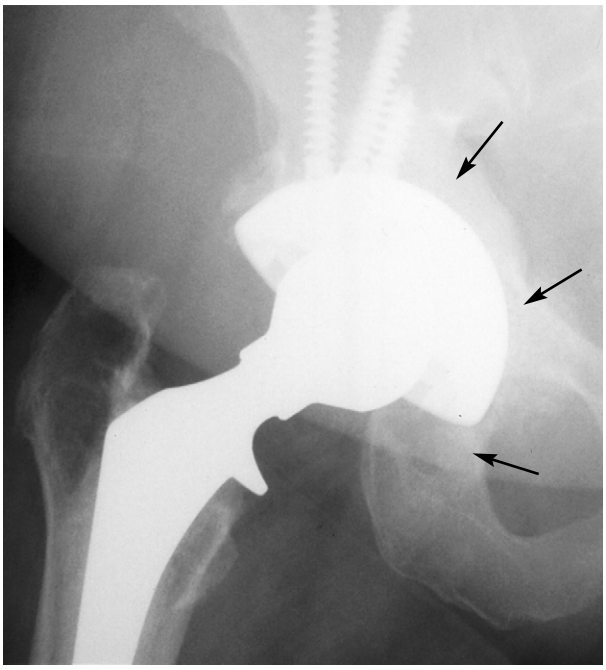
Fig 2. Two week follow-up: radiographs reveal large amount of Opteform® graft superiorly, in the ischium and pubis and along the medial wall. The graft material has a stippled appearance.



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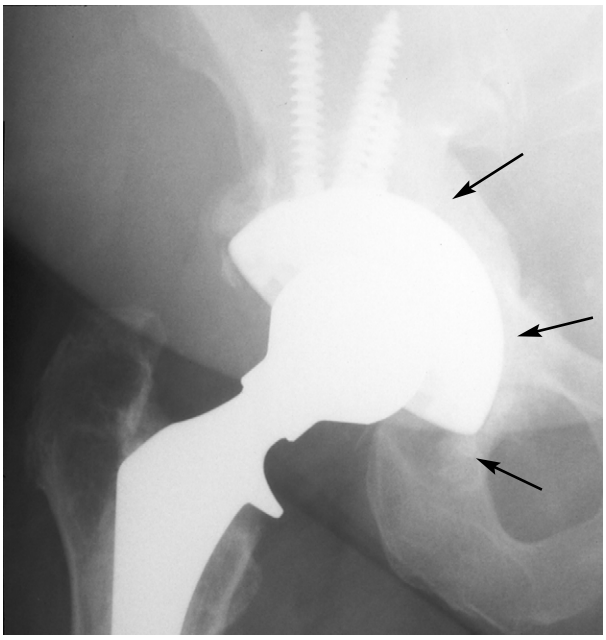

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fixation. The three screws were anchored to the solid host bone. A new 32mm head was selected to avoid prosthetic impingement. The construct was stable, eliminating the need for femoral stem revision.

Results

Postoperative radiographs at the time of staple removal revealed a large amount of Opteform® graft material with a stippled appearance (Figure 2). The patient returned for an 8-week follow-up appointment ambulating with a cane and with only mild hip discomfort. Radiographs revealed a less stippled, more confluent appearance to the Opteform® graft material (Figure 3). At 6-month follow-up, the patient was doing very well with only some minor lateral hip discomfort and a HHS of 93.725 (improved from 58.375 preoperatively). Six month radiographs showed consolidation of the Opteform® graft and no evidence of graft resorption, cup migration or radiolucency (Figure 4).

Fig 3. Eight week follow-up: radiographs show more confluent appearance of graft although some stippling is apparent.

Fig 4. Six month follow-up: radiographs show a confluent, consolidated Opteform® graft with no evidence of cup migration or graft resorption.

Shoulder Fusion Performed Using Opte*form*® Following Failed Shoulder Arthroplasty

Series B, Number 1

RICHARD TAVERNETTI, MD, FACS
Orthopedic Surgery Associates
San Francisco, CA

Presentation

A 59 year-old female was seen six months following a revision right shoulder arthroplasty and three months following rotator cuff repair and capsular shift. Despite having had these procedures, the patient continued to exhibit instability and moderate to severe pain with any active motion of the shoulder. It was decided that a shoulder fusion would provide the best long-term solution for her chronic symptoms.

Operation

At surgery, an incision was made along the scapular spine and the shoulder joint exposed posteriorly. Following soft tissue debridement, osteotomes were used to remove the cemented humeral stem. The proximal humerus was curetted and bone grafted with 30cc of cancellous allograft chips. On the glenoid side, the polyethylene implant was resected and fresh bleeding bone exposed. Soft tissue on the underside of the acromion was also removed and bone curetted down to a bleeding cancellous bed. The lesser tubercle, greater tubercle and rotator cuff were absent. The humeral shaft was placed in contact with the acromion and glenoid. The lateral acromion was osteotomized and bent down to the humerus. A 14-hole reconstruction plate was bent so that it would fix the humerus in a functional position. Prior to fixing the construct with screws, 15cc of Opte*form*® was placed between the humerus and glenoid. An additional plate was placed posteriorly from the scapular spine to the humerus and fixed with screws. All remaining spaces under the acromion and around the glenoid area were packed with an additional 20cc of Opte*form*®. Final check revealed excellent stability of the fixed shoulder joint. The wound was closed and the patient placed in a shoulder immobilizer for recovery. At discharge, she was instructed in the use of a pillow splint.

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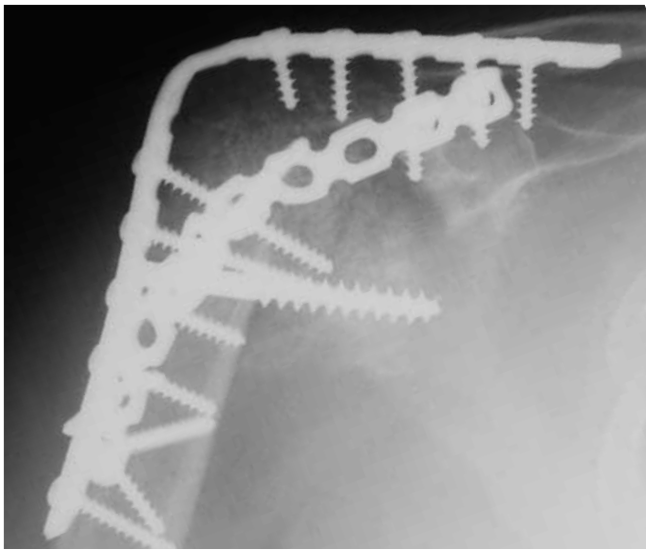

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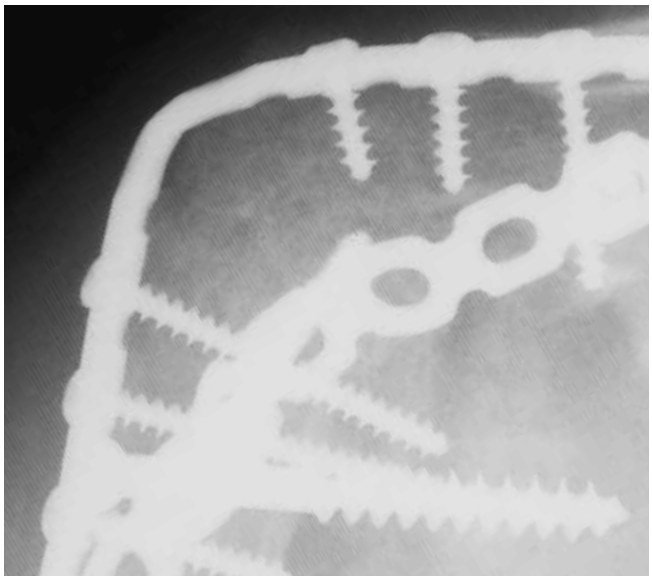

Fig 1. Six weeks post-operative: Opteform® bone graft fills the space resulting from bone loss.

Fig 2. Three months post-operative: early healing is evident.

Outcome

The six weeks post-operative radiograph shows the extent of the graft between the glenoid and acromion superiorly and between the glenoid and humerus inferiorly (Figure 1). When the patient's shoulder was moved passively through a range of motion three months after surgery, the scapula and humerus moved as a single unit without pain or crepitance. The area of Opte*form*® bone graft showed progressive signs of union at three months and all hardware was stable (Figure 2). Six months after surgery, further consolidation of the graft and mature bone patterns was present (Figure 3). Pain was greatly diminished from pre-operative levels. One year after surgery, internal rotation was 45º, abduction 45º, extension 20º and forward flexion 60º, with full function of the elbow, wrist and hand. The radiograph showed solid fusion (Figure 4).

Summary

Successful arthrodesis is demonstrated by minimal pain, stability, good function, and bony union on radiograph. In the absence of the humeral head, achieving successful arthrodesis is difficult. Bone contact between the glenoid and the humerus is limited, increasing the chance for pseudarthrosis. In the present case, using Opte*form*® bone graft, the shoulder was successfully fused with good functional result.

3)

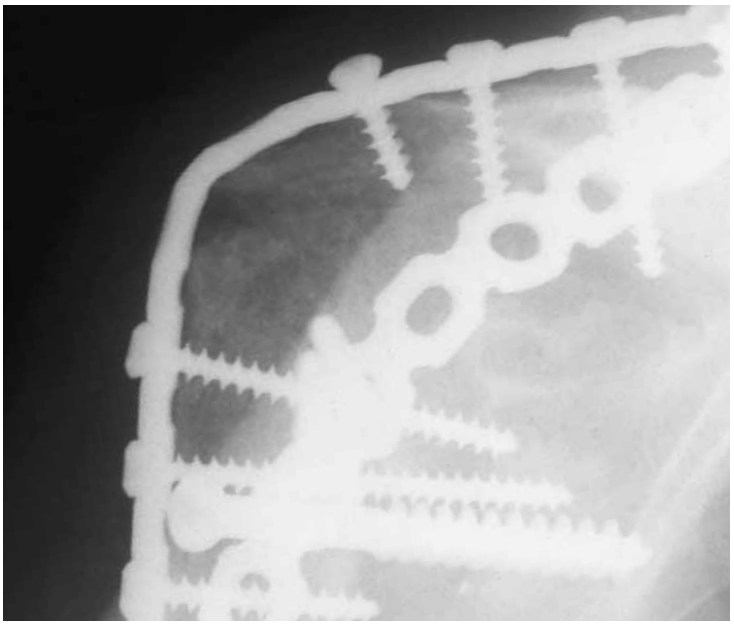

Fig 3. Six months post-operative: mature bone patterns appear.

4)

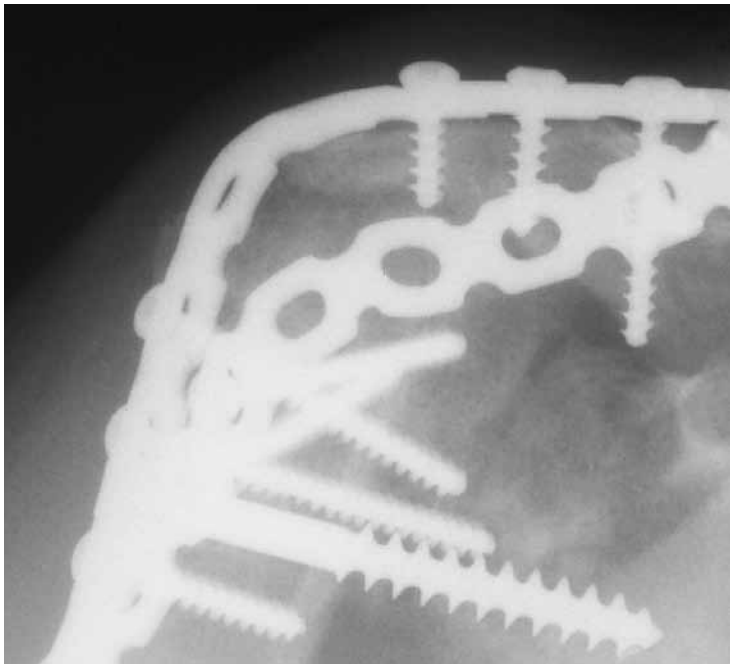

Fig 4. One year post-operative: bony fusion.

Use of Opte*form*® in Anterior Cruciate Ligament Reconstruction

Series C, Number 2

MARK W. HOLLMANN, M.D.
Florida Orthopaedic Associates
DeLand, Florida

Background

The purpose of this case study was to evaluate the progress of bone reconstruction after backfilling the resection sites with Opteform® bone allograft. This procedure is performed to help prevent anterior knee pain following anterior cruciate ligament reconstruction.

Patient Population

Forty-two consecutive patients were followed with surgical dates spanning 18 months: 11 females, 31 males; age 26 +/- 9.4 (range 14-51).

Treatment

A bone - patellar tendon - bone autograft was removed from the patient leaving bone voids in the distal patella and tibial tubercle. An arthroscopic anterior cruciate ligament reconstruction was performed. After securing the graft in place with absorbable fixation, a 2.1cc disk of Opteform was used in the voided spaces. A tourniquet was utilized in all cases with the average time of 40 minutes (range 36 minutes to 44 minutes).

Outcomes

Patients regained full function and presented few complications. There were no cases of patella fracture. No patients had symptoms of anterior knee pain after three months. Post-operative pain was determined by number of weeks on prescription pain medication. Post-operative function was determined by number of weeks of physical therapy.

Single Case Follow-Up

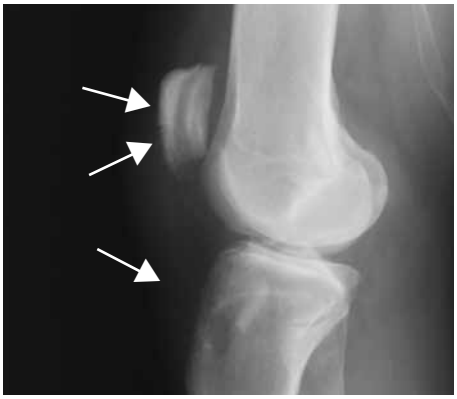

Fig 1. One month post-operative: osseous tissue has begun to take over the space, which is noticeably filled with Opteform allograft.

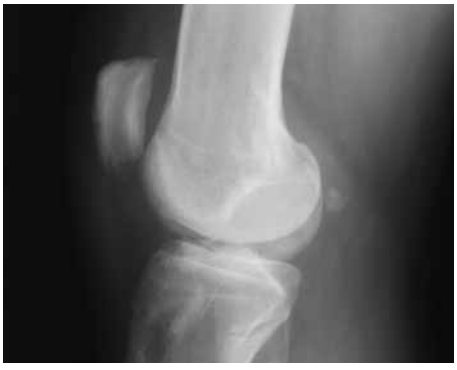

Fig. 2 Three month post-operative: trabecular formation has taken over the void.

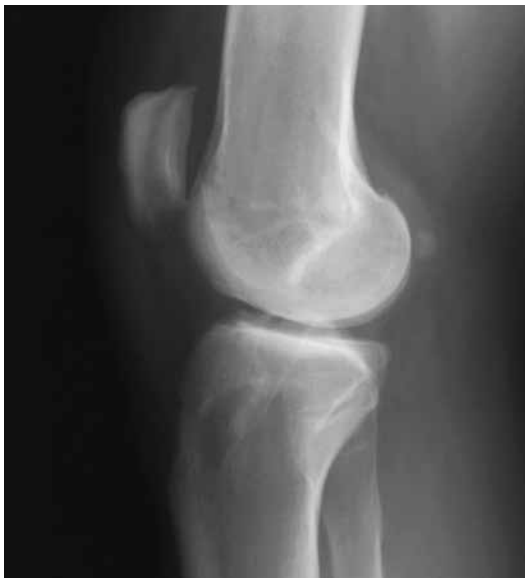

Fig. 3 Six month post-operative: trabeculation across Opteform with good reconstitution.

Time on post-op pain medication was 1.60 +/-1.25 weeks (range 1 to 8 weeks) with only 11.9 percent (5 of 42) of patients on medication for longer than two weeks and 69 percent needing it for one week or less. Time on post-op physical therapy was 5.86 +/- 2.30 weeks (range 2-12 weeks) with only 9.5 percent needing more than eight weeks and 64 percent needing six weeks or fewer.

Discussion

Anterior knee pain following ACL reconstruction has long been a concern with bone - patellar tendon - bone autografts. Filling the void with a bone allograft may eliminate or diminish anterior knee pain, reduce post-operative patella fractures, decrease rehabilitation time, and increase prospects for bone restoration.

Repair of Distal Radius Fracture Using Opte*form*®

Series A, Number 3

MARK A. PETTY, M.D.
The Orthopaedic Center
Gainesville, FL

Presentation

A 70-year-old female complained of pain in the right wrist following a fall at work onto her outstretched hand. Radiographs showed a comminuted and dorsally angulated fracture of her right distal radius. A nondisplaced transverse fracture through the ulnar styloid was also present (Figure 1).

Treatment

The fracture was treated with open reduction and external fixation. A small incision was made on the dorsum of the wrist, and the fracture site was exposed. Two large dorsal bone fragments were elevated, resulting in a gap between the proximal and distal fragments. A 2.1cc disk of Opteform® was warmed and formed to the defect in the fracture site (Figure 2).

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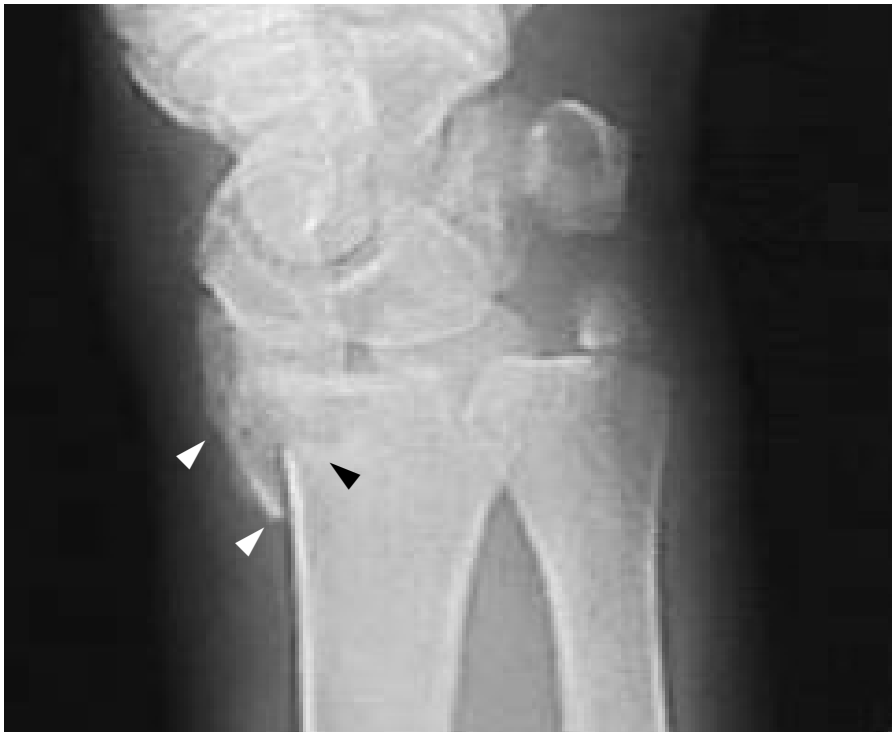

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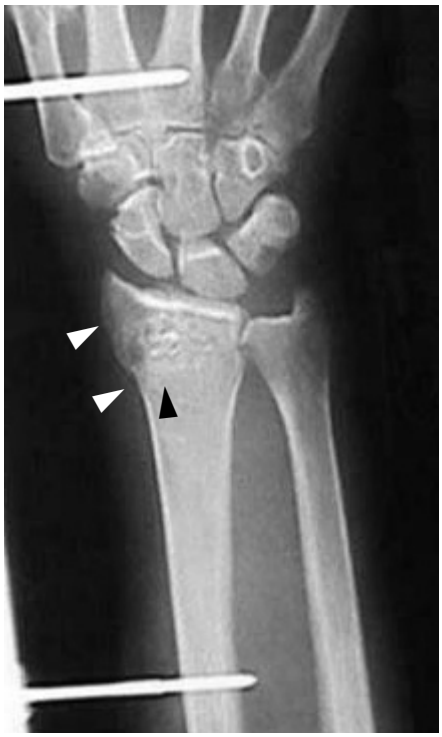


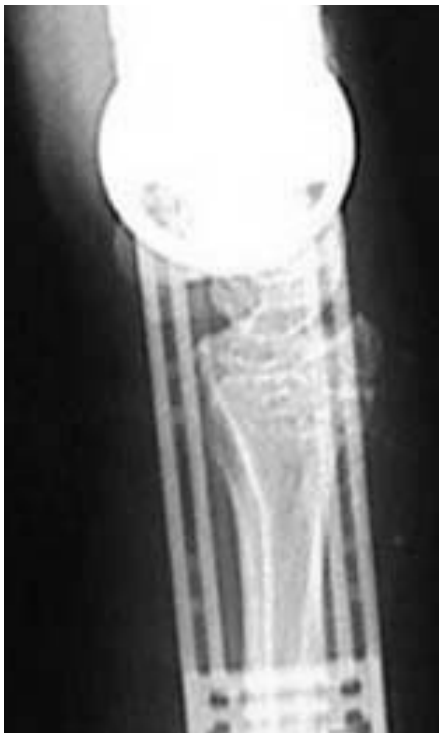
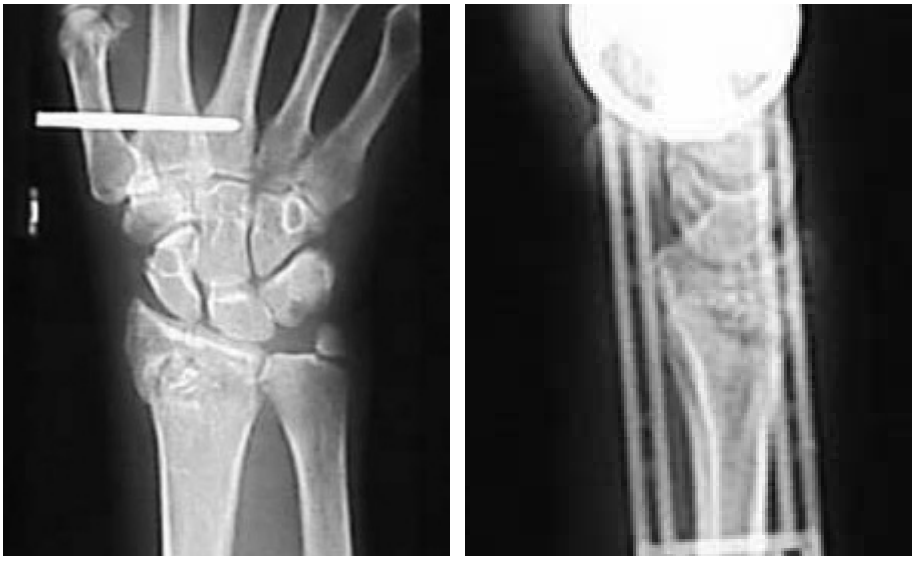


Fig 1. Pre-operative: comminuted fracture of the distal radius.

Fig 2. One week post-operative: showing reduction, external fixator and the location of the Opteform® allograft.



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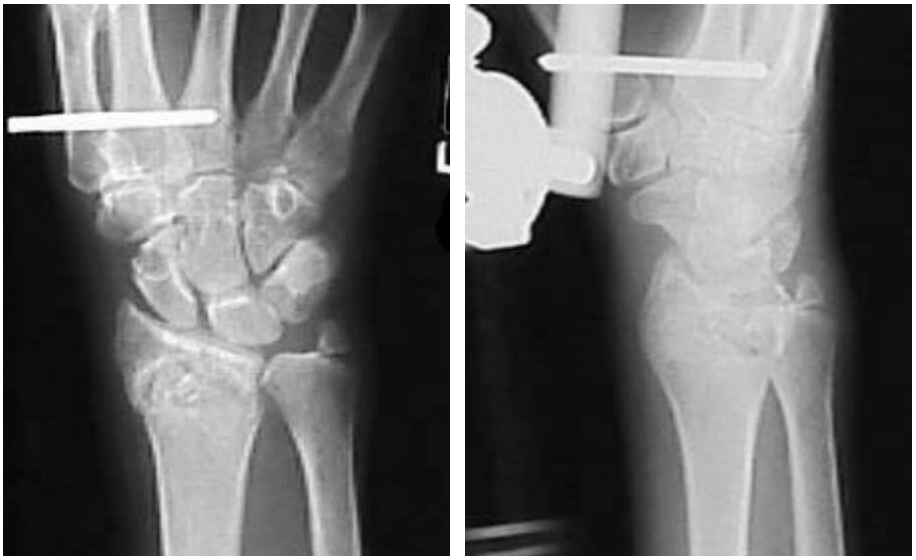

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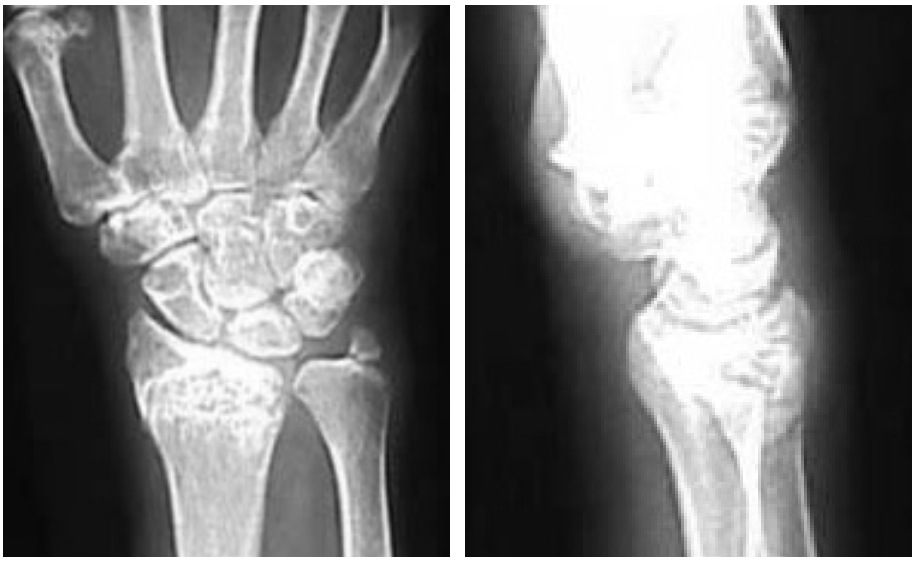

5)

Outcome

Four weeks after the reduction, position of the fracture fragments remained satisfactory (Figure 3). Six weeks post reduction, the external fixator was removed (Figure 4). The 10 week follow-up radiograph showed the fracture healed in good position. The patient had full range of motion in the fingers and no longer experienced any significant pain (Figure 5).

Bone grafting with Opteform® promoted rapid healing of this osteoporotic fracture allowing early removal of the external fixator. This patient was able to avoid complications, such as muscle atrophy and stiffness, which may accompany long-term immobilization with an external fixator.

Fig 3. Four weeks post-operative: excellent maintenance of the fracture reduction.

Fig 4. Six weeks post-operative: the external fixator and transfixing pins were removed at this time.

Fig 5. Ten weeks post-operative: well-healed distal radius fracture.

Use of Opte*form*® to Repair Enchondroma Defect in the Hand

Series C, Number 1

Morgan P. Lorio M.D.
Opelousas General Hospital
Opelousas, Louisiana

Presentation
A 15-year-old, right hand dominant female was seen in the emergency room with a painful pathologic fracture to her right ring metacarpal. The patient's medical history was remarkable for having undergone giant cell tumor resection on her left middle finger four months prior.

Examination
ER X-rays (Figure 1) demonstrate enchondroma on the fourth metacarpal with intramedullary calcification, expansion and thinning of the diaphyseal cortex. MRI images (Figure 2) were obtained and exhibit 7 x 15 mm slightly heterogeneous long T1 – long T2 single lesion in the mid to distal diaphyseal region of the fourth metacarpal. Bone imaging studies (Figure 3) reveal focal uptake in the right fourth metacarpal consistent with an osseous neoplasm.

Operation
A small incision was made along the radial border of the right ring and carried down through the skin and subcutaneous tissue. A burr was utilized to create an elliptical window over the dorsum of the cortex allowing for placement of multiple curets with subcutaneous curettage of the lesion. The wound was copiously irrigated and 2.1 cc of Opteform® allograft was warmed and packed into the defect. Following further irrigation, the soft tissue was closed and an ulna gutter splint applied to protect the hand.

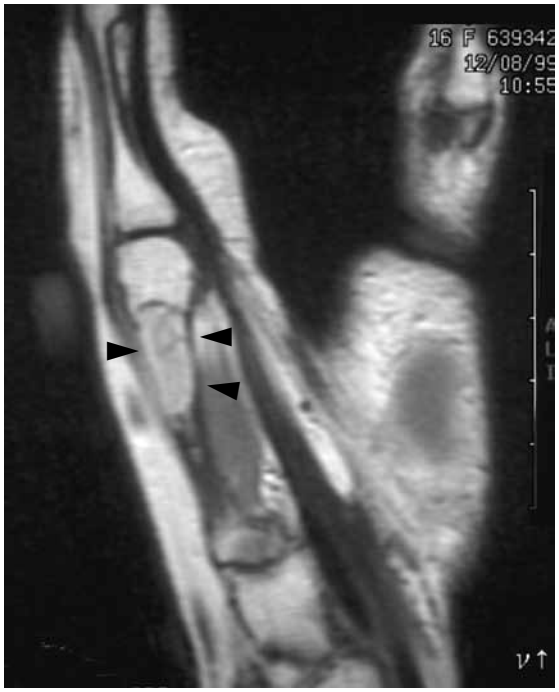

Figure 1.

Figure 1. MRI sagittal view demonstrates the extent of the lesion.

Figure 2. Bone scan indicates area of solitary focus of increased uptake consistent with osseous defect.

Figure 3. Pre-operative X-ray showing large osseous defect, pathologic fracture, thin cortices with widened diaphysis and metaphysis of right ring metacarpal.

Figure 2.

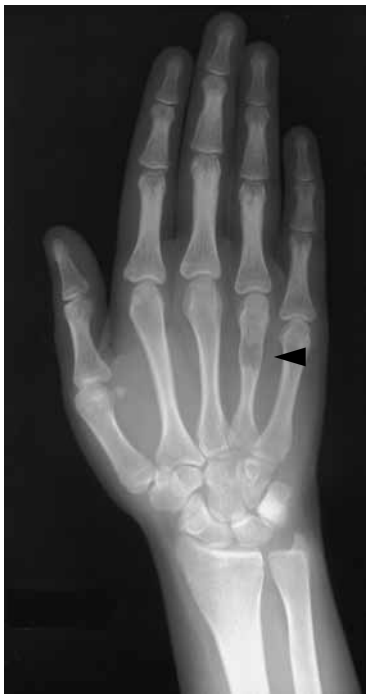

Figure 3.

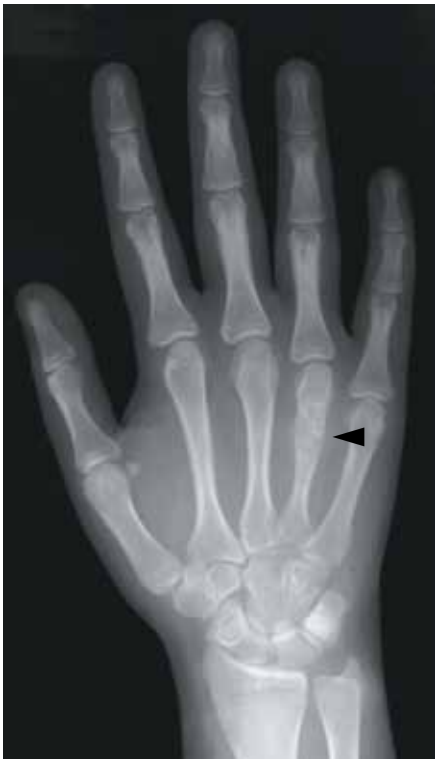

Figure 4.

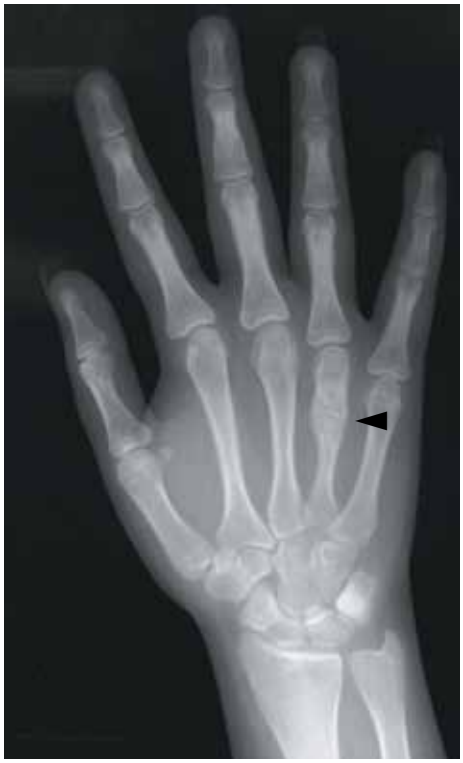

Figure 5.

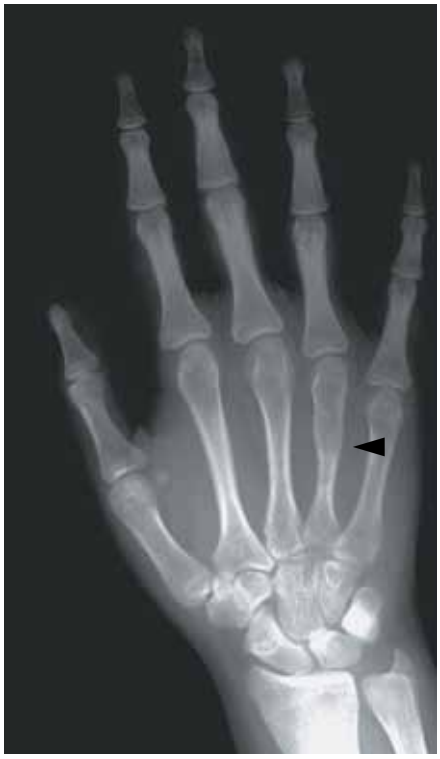

Figure 6.

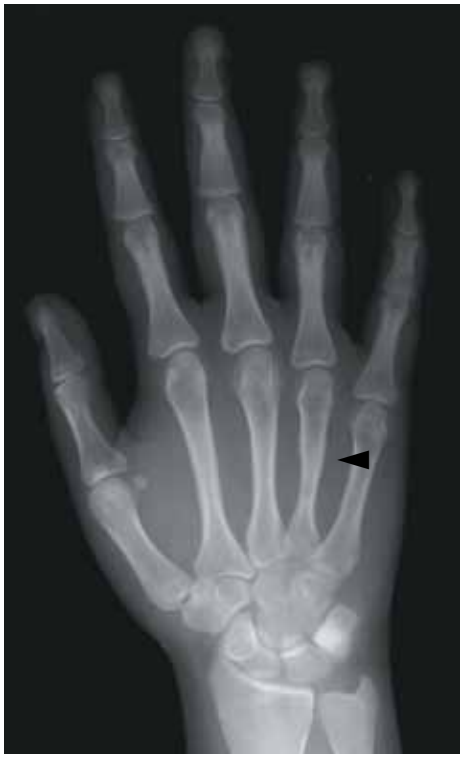

Figure 7.

Post-Operative Results

The patient regained full range of motion in her fingers, and reported no pain at six weeks. The six month follow-up radiograph demonstrates a well-healed metacarpal (Figure 6) without tumor recurrence.

Bone grafting with Opteform promoted rapid and robust osteoinductive and osteoconductive healing and avoided bone site morbidity associated with autograft harvest. Opteform, exhibited excellent handling characteristics when packing/filling the tubular bone defect. Moreover, the consistency of this product promoted graft containment.

Figure 4. Two weeks post-operative (palmer view) x-ray shows cortical cancellous chips clearly visible in defect and providing internal scaffolding support for outer cortex. Good callus consistent with early fracture healing.

Figure 5. Six weeks post-operative (palmer view) x-ray demonstrates Opteform incorporating with good callus response.

Figure 6. Six months post-operative (palmer view) x-ray reveals complete incorporation of Opteform, only subtle evidence of prior treatment and no indication of tumor recurrence.

Figure 7. One year post-operative (palmer view) x-ray exhibits complete incorporation of Opteform with no indication of tumor return.

Posttraumatic Grafting of a Radial Cyst Using Opte*form*®

Series D, Number 1

MR. MICHAEL UGLOW FRCS (Tr & Ortho)
Southampton University Hospital, UK
Consultant Orthopaedic Surgeon

PRESENTATION

A 5-year-old girl presented to our department with a pathological fracture through a radial bone cyst. Six months previously she had sustained fractures to the right radius and ulna at the junction of the middle and distal thirds. The arm was treated in a cast where loss of position occurred during follow-up, but due to the patient's age, the deformity was accepted.

The pathological fracture through the bone cyst healed, but the cyst increased in size and the cortex became progressively thinner. The risk of further pathological fracture was considered to be high and the lesion was therefore treated with curettage and grafting.

OPERATION

The operation consisted of a standard Henry approach to the radius and separation of the very thick periosteal layer. A window was fashioned in the cortex and a fluid filled cyst was identified with a fibrous and friable lining. Curettage was performed and material sent for frozen section and histology. The results were consistent with an aneurysmal bone cyst.

The entire fibrous membrane was removed and the defect packed with 5ml Opteform® premixed with the patient's blood. Good filling of the defect was achieved. The osteoperiosteal flap was replaced, and postoperatively the patient was treated in a cast for four weeks.

POSTOPERATIVE RESULTS

The patient regained forearm function within a few weeks of the cast removal and has had no functional or neurological deficit. Follow-up 10 months from surgery shows excellent incorporation of the graft and progressive remodeling of the radius.

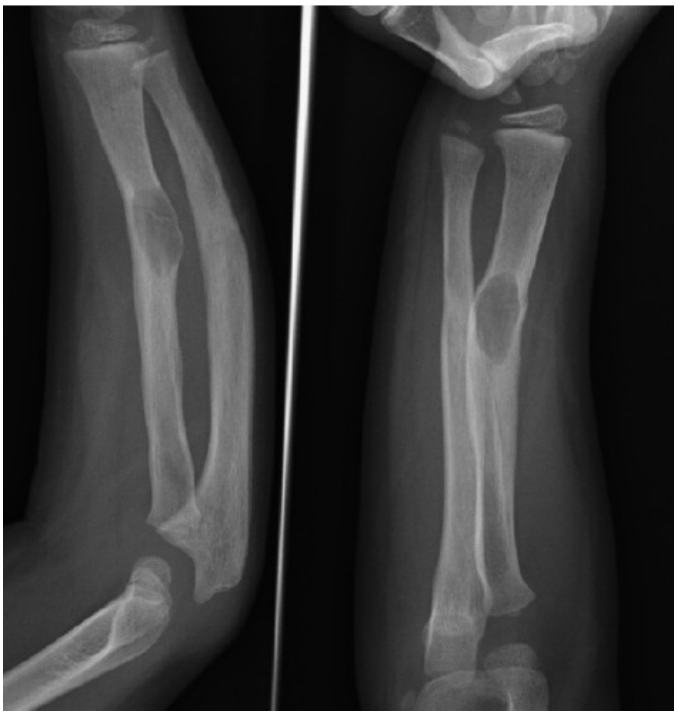

Figure 1: Radial bone cyst seen in a 5-year-old girl. The pathological fracture can be clearly seen.

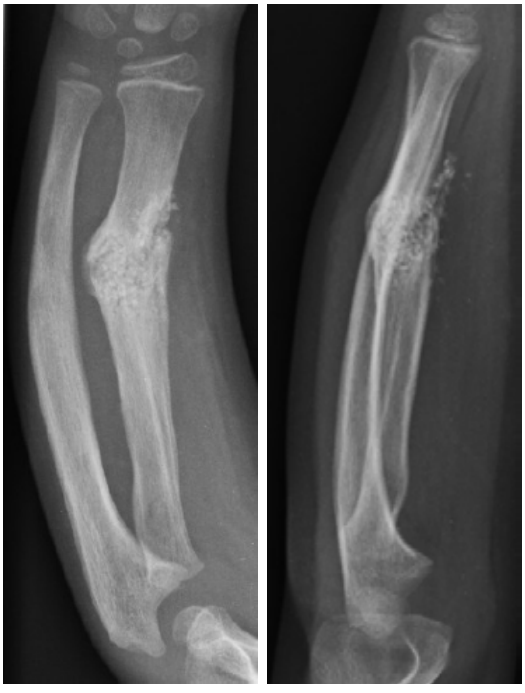

Figure 2: Postoperative radiograph showing excellent packing of the defect with Opteform.

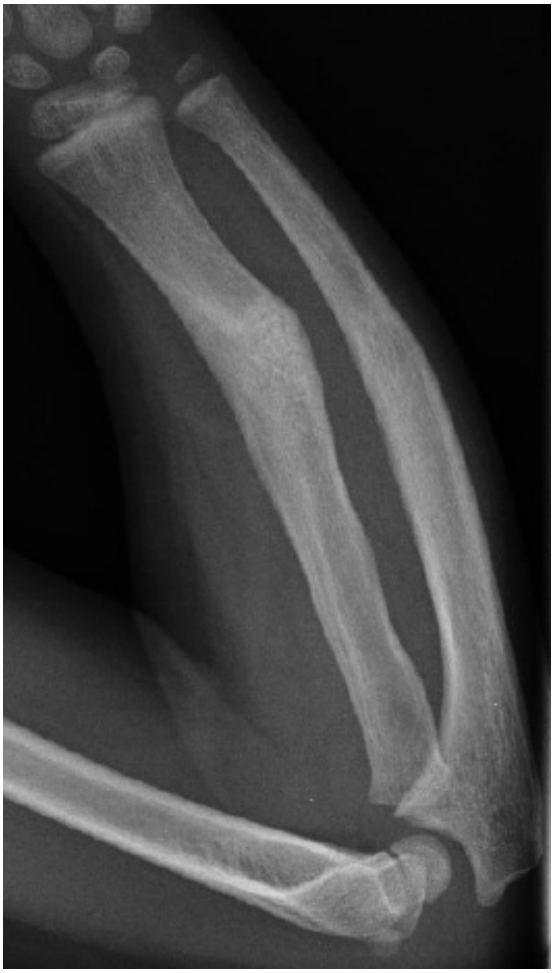

Figure 3: Complete healing is seen at eight weeks postoperatively.

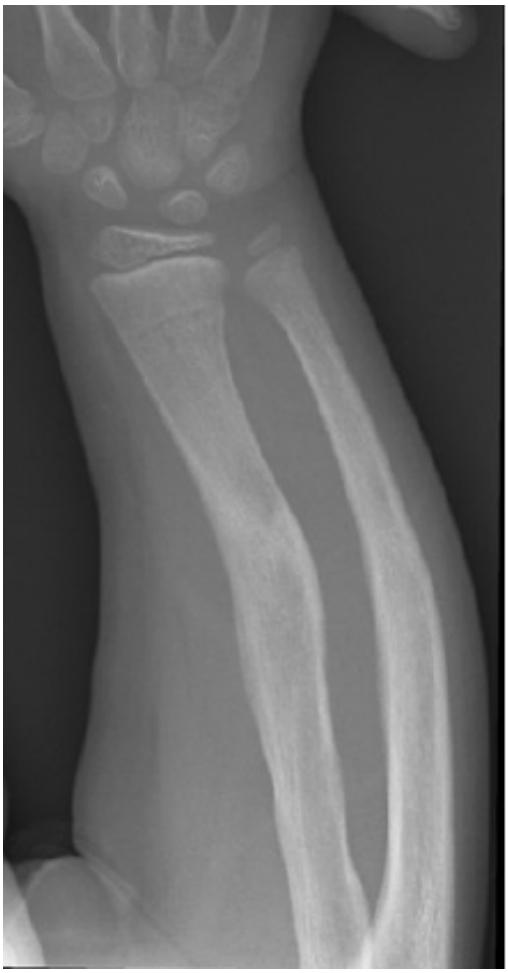

Figure 4: 10 months after grafting and there is excellent development with continued remodeling of the radius.

Using Opte*form*® to Graft an ABC in the Proximal Humerus

Series D, Number 2

MR. MICHAEL UGLOW FRCS (Tr & Ortho)
Southampton University Hospital, UK
Consultant Orthopaedic Surgeon

PRESENTATION

A 7-year-old boy presented with a pathological fracture through a proximal humeral bone cyst. The fracture united without difficulty but the lesion progressed during follow-up and developed the radiographic appearances of an aneurysmal bone cyst. Definitive treatment of the lesion was required but there was a delay due to the coincidental diagnosis of a benign brain tumour that required neurosurgery.

OPERATION

Due to continued progression, at the age of 9 years and 6 months the lesion was treated by open curettage and bone grafting. Through a large osteoperiosteal window the cyst was decompressed and the lining carefully resected to ensure total clearance of the cyst lining macroscopically. 30ml of Opteform® was mixed with the patient's blood and the defect was then packed with the graft. The firm texture is ideal to ensure that the defect remains soundly filled with bone graft. The window was then replaced and secured with sutures and deltoid closed over it. The limb was supported with a broad arm sling postoperatively.

POSTOPERATIVE COURSE

The boy regained use of his arm within a few weeks. Follow-up radiographs have shown excellent incorporation and remodeling of the graft with medullarisation occurring by nearly the second anniversary.

DISCUSSION

Opteform has been shown to be a very effective substitute for use in large bone defects in children. The alternative of taking bone from the iliac crest does not guarantee that sufficient volume of bone will be available and confers considerable morbidity to this sensitive group of patients. Opteform has been shown to have excellent osteoinductive and osteoconductive properties and its use avoids the morbidity of iliac bone grafting. The firm texture of Opteform, once it is mixed with blood, provides the surgeon with a convenient way of packing a large defect with graft material.

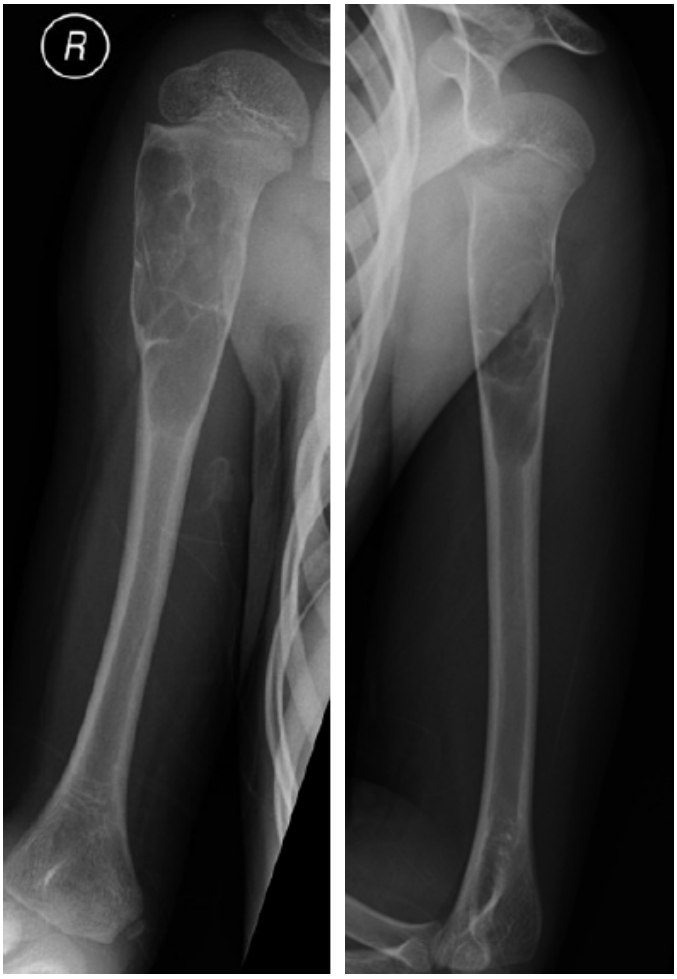

Figure 1: An aneurysmal bone cyst of the proximal humerus in a 9-year-old boy.

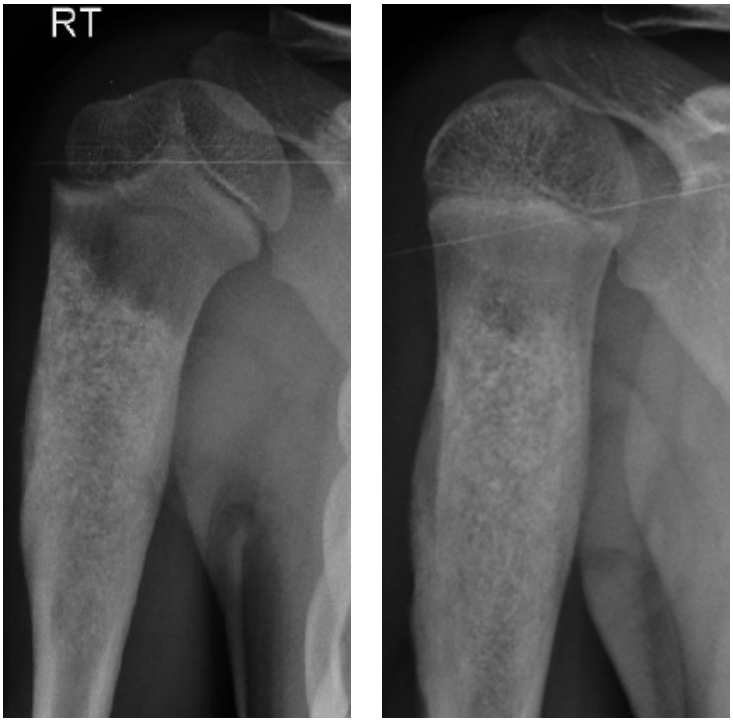

Figure 2: Postoperative radiograph showing excellent impaction of the Opteform graft in the defect and healing by four months.

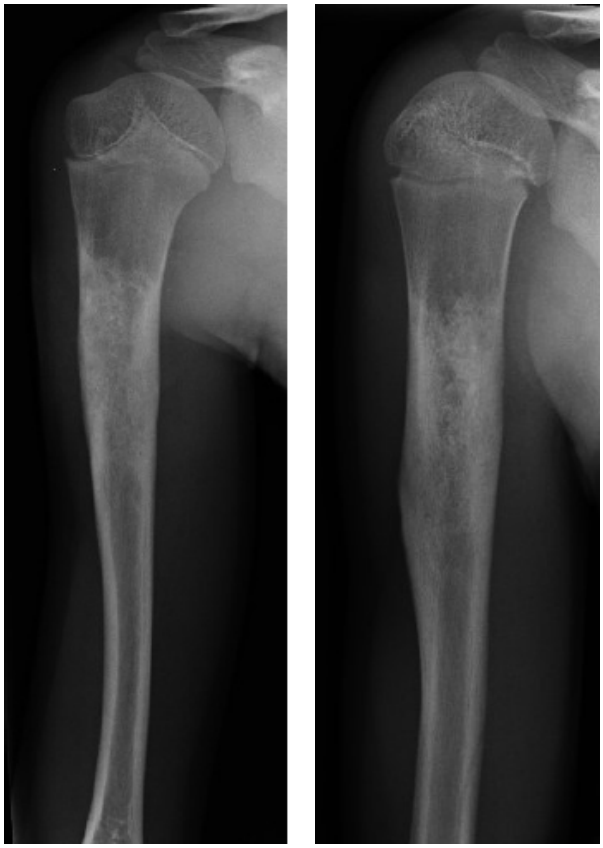

Figure 3: Remodeling is progressing well six months after surgery.

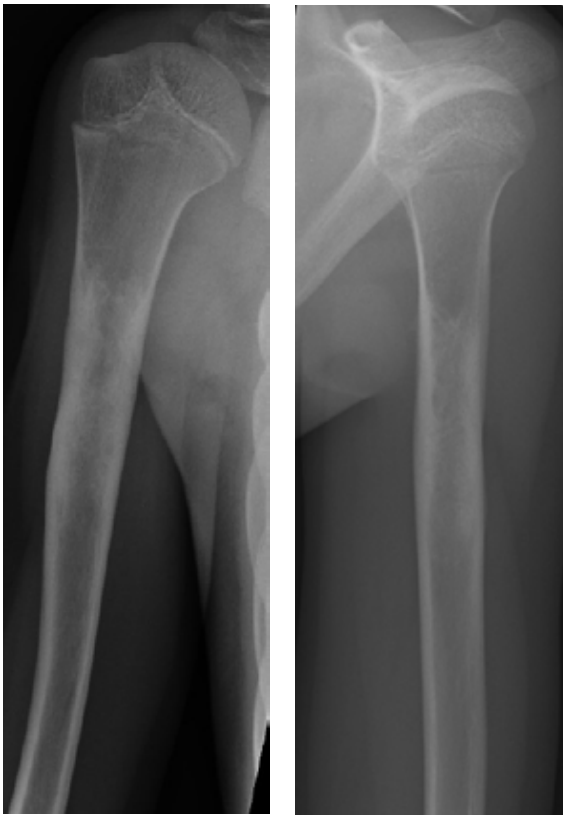

Figure 4: Medullarisation of the humerus is clearly seen with no signs of recurrence at nearly two years following surgery.

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