

Restoration® HA

Case Compendium

Simon Bridle, FRCS(Orth.)

Arthur Malkani, MD

Hugh Morris, MD

Nicholas Sotereanos, MD



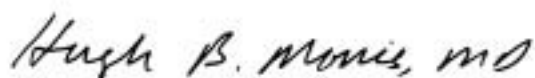
Femoral revision hip surgery has always been a difficult proposition to accomplish when trying to treat the large spectrum of significant and major defects that can occur. Revision surgeons have frequently relied on different manufacturers to cover this wide spectrum of defects.

The Restoration® HA Revision System has dramatically reduced the number of different components and different styles of components necessary to reconstruct these defects. This system allows correction of a large percentage of typical femoral revision deficiencies without having to resort to multiple systems.

The stem design, roughened surface, and a nominal thickness of 50µ PureFix™ HA coating demonstrate rapid healing and resolution of pain as well as radiographic demonstration of bone regeneration. The slight taper to the distal aspect of the fully coated stem is designed for easy insertion and may reduce risk of fracture in brittle, deficient femurs.

Throughout this compendium, note the abundance of bone regeneration, the lack of proximal stress shielding, the filling in of screw holes, and in general— the restoration of bone stock.

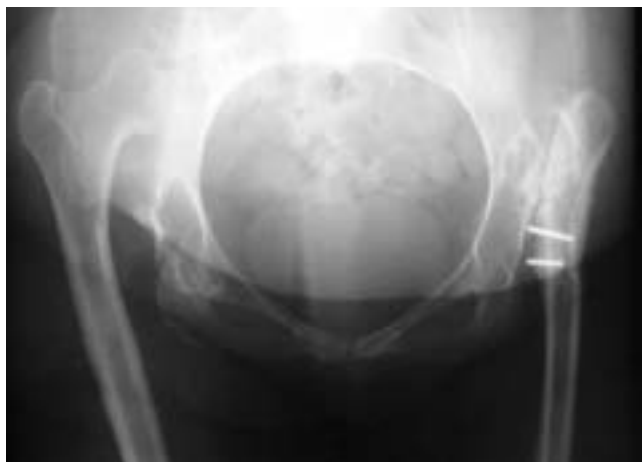
Overall, this unique revision system has increased the ability of the revision hip surgeon to handle a wide variety of defects, achieve rapid pain relief, and see gratifying radiographic results of bone healing – not only of osteotomies, but filling of bone defects at relatively early time intervals. In my clinical practice, rapid pain relief has been the most dramatic clinical hallmark of use of this stem system. The following 18 case examples illustrate the breadth of cases capably handled by this system.



Hugh B. Morris, M.D.
Jewett Orthopaedic Clinic
Winter Park, Florida

46 year old female**Preoperative**

The patient presented with bilateral CDH, back pain, and pain on the right side of the pelvis. The patient's left side had previously been treated with open reduction, a femoral osteotomy and later excision arthroplasty.

Preoperative**Treatment**

The patient was treated using a straight 155mm Restoration® HA stem with femoral shortening. Note the subtrochanteric femoral osteotomy to correct rotation, shorten the femur, and to bring the hip down and restore the normal hip center.

Postoperative

Note the healing of the osteotomy on both the AP and lateral views at 6 months. There has been no stem migration and the bone implant interface looks satisfactory.

Postoperative**6 months****6 months (lateral)**

72 year old female

Preoperative

The patient presented with a loose, subsided cemented femoral component. As can be seen in the preop film, there is significant leg length discrepancy; an additional complicating factor is the combination of long cement column and narrow femoral canal.

Treatment

The patient had a long cement column and very narrow canal that made removal difficult. To facilitate distal cement removal, a complete oblique transverse osteotomy was made, cutting the femoral shaft in half. This osteotomy was fixed utilizing the 205mm long stem Restoration® HA component, securing the oblique osteotomy which was reinforced with two femoral strut grafts.

Postoperative

The femoral shaft osteotomy is bridged and secured by the rough HA coated stem. This osteotomy can be seen on the 1 month film (arrows), and healed at 36 months.

Preoperative



1 month



36 months



case 2

Type II

73 year old male**Preoperative**

The patient presented with loosening and debonding of a cemented Charnley stem with a cement column extending greater than 60% of the femoral canal length. The acetabulum was previously revised with significant bone grafting approximately three years prior to the stem revision.

Treatment

The patient was revised with a 205mm Restoration® HA stem using an extended lateral osteotomy which was required to adequately remove the cement column. This is illustrated on the preop planning film.

Postoperative

Six months postop the distal aspect of the osteotomy appears to be healed. At 36 months followup there is no remnant of the extended lateral trochanteric osteotomy with full healing. There are no lucencies in any area about the femoral stem and the patient has a pain free 36 month result*. His modified Harris Hip Score is 91. The only deductions are due to his back and other problems – none due to the revised hip. This represents another example of the ability of the femoral shaft to heal osteotomies, screw holes, or other defects which are adjacent to the HA coated device.

*Individual results and pain reduction varies in each patient

Preoperative**1 month****6 months****36 months**

80 year old male

Preoperative

The patient presented with failed fixation of a low intertrochanteric fracture performed elsewhere and is now wheelchair bound with pain due to a 9 month nonunion.

Treatment

The patient was reconstructed with a 155mm Restoration® HA stem bypassing all femoral screw holes.

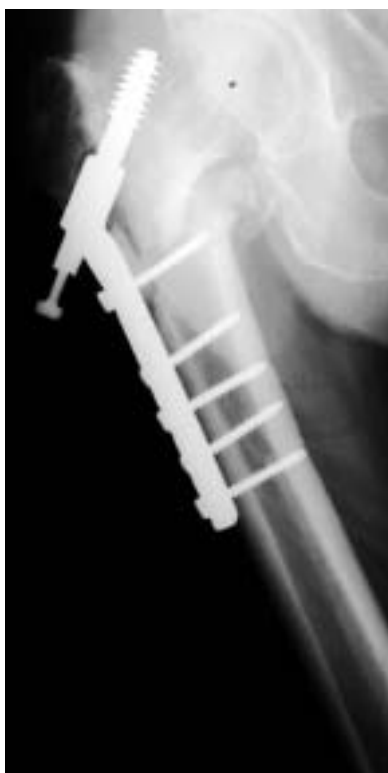
Postoperative

The patient is pain free and has no limitation in regard to right hip at 24 months postop. The Restoration® HA stem was chosen due to the deficient femoral metaphysis. This revision stem allowed full restoration of leg length in the face of significant bone loss and preop shortening.

case 4

Type II

Preoperative



24 months



24 months (lateral)



36 year old female**Preoperative**

The patient presented with an infected hip subsequent to open reduction and internal fixation of a femoral shaft fracture.

Treatment

The implants were removed and the infection treated. After successful treatment of the infection, the hip was revised using a 205mm Restoration® HA stem.

Postoperative

At 7 month follow-up there is precise fit and complete incorporation of the HA stem in the femur. There is no subsidence of the stem and no signs of re-infection. The patient has regained function. At the latest follow-up, the patient has some pain caused by trochanteric bursitis, but this does not appear to be related to the implants.

Preoperative**7 months****7 months (lateral)**

47 year old male

Preoperative

The patient presented with an aseptically loosened femoral stem following a right bipolar cementless hip arthroplasty. There are large lytic defects especially evident on the lateral preop film.

Treatment

Removal of the cementless implant required an osteotomy. The femur was revised with a 205mm Restoration® HA stem, bypassing the large proximal lytic defects. The proximal femur was stabilized using cerclage wires and strut allograft.

Postoperative

Good proximal and distal fit was achieved. At 9 months, the patient has some weakness in the adductor group but no hip related pain. The patient is fully mobile and does not require walking support. New bone formation in the medial osteolytic defect can be seen by comparing the 5 and 9 month films. The patient's postop function is positive.

case 6

Type II

Preoperative



Preoperative (lateral)



5 months



9 months



83 year old female**Preoperative**

The patient presented 12 years following cemented THA. There has been massive subsidence of the stem. The metaphysis is very thin and the medullary canal is very wide, especially apparent on the lateral view.

Treatment

The patient was revised using a 205mm Restoration® HA stem to bypass the deficient region at the tip of the old stem. An 18mm distal diameter stem was used to fix the stem distally. It was also possible to achieve good proximal fill to allow load transfer proximally.

Postoperative

The film at 12 months shows a well-integrated stem, with no migration and no stress shielding. The stem design facilitates good fixation, even in a wide osteoporotic femur.

Preoperative**Preoperative (lateral)****Postoperative****12 months**

68 year old female

Preoperative

The patient presented with severe rheumatoid arthritis 8 years following cementless hip replacement. Both components are loose and there is a huge acetabular defect and a very wide medullary canal.

Treatment

The stem was revised using a 155mm Restoration® HA stem, 18mm distal diameter. The postoperative film shows acceptable distal (although not optimal) fit. The proximal geometry allowed good proximal fill, adding to the stem's stability and allowing proximal load transfer.

Postoperative

The film at 12 months shows no migration and good integration. Good proximal fit was achieved allowing proximal load transfer – there does appear to be improvement in the proximal bone. This case is an example of how stem design and coating allow good fixation and proximal bone densification even in the presence of extremely poor bone stock.

case 8

Type II

Preoperative



Postoperative



12 months



37 year old male**Preoperative**

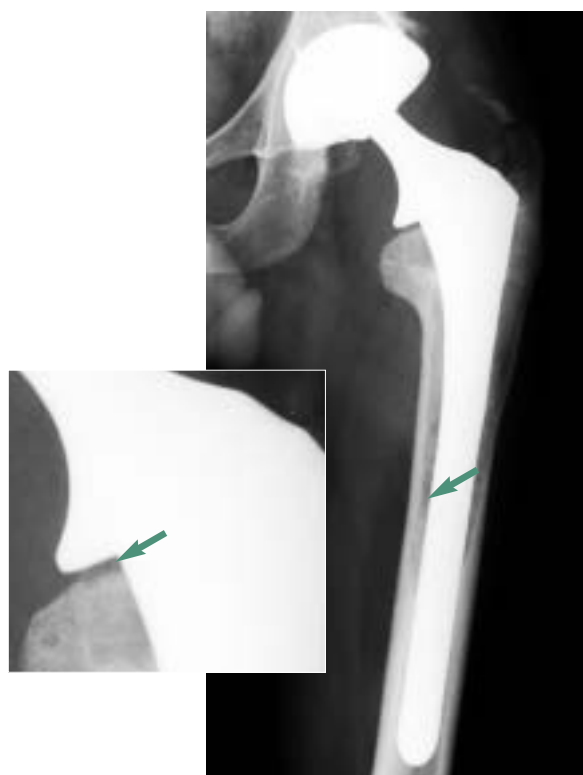
As an owner-proprietor of a machine tool service company, this patient was losing his business due to his inability to get in and out of his step van and make service calls. The patient presented with an extremely loose titanium cementless stem. Note the thin cortical walls and complete loss of all cancellous bone in the proximal metaphysis of the femur and large lytic defects medially and superiorly in the acetabulum.

Treatment

The femur was reconstructed with a 205mm Restoration® HA stem; a fully HA coated, roughened acetabular component with peripheral screw holes was used. The acetabular cysts were grafted as were the femoral shaft defects.

Postoperative

Note early consolidation of femoral compacted cancellous graft at 3 months and complete incorporation at 15 months. Note complete filling in of the 3mm gap below the stem collar on the inset views at each follow-up. The patient has a Harris Hip Score of 100, is fully functional, and has restored his full business.

1 month**3 months**

Preoperative



15 months



26 months



64 year old male**Preoperative**

The patient presented with loosening of components on both sides and was at risk for periprosthetic femur fracture on the left. He had previous cementless hip arthroplasties six and eight years ago. He suffered severe disabling pain that prevented him from pursuing his avocation of ballroom dancing and work as a police academy instructor.

Preoperative**Treatment**

The left hip was revised with a 56mm HA revision acetabulum and size 10 x 205 length by 14mm diameter Restoration® long stem with “restoration” impaction grafting of the proximal femur. The patient elected to wait for 3 years before proceeding to revise the opposite side. Revision on the right side was accomplished with a 60mm HA revision acetabulum and size 10 x 205 length x 14mm diameter Restoration® long stem. This also underwent proximal femoral impaction “restoration” impaction grafting but of less significant defects.

Postoperative

Both sides show very positive results with distal spot welds, incorporation of cementless “restoration” impaction grafting and an absolute absence of proximal stress shielding despite the distal spot welds. Modified Harris hip score is 88 for both left and right hips, at long term follow up. The patient was able to resume his avocation of ballroom dancing and work as a police academy instructor.

Postoperative



Left Hip: 6 weeks



Right Hip: 8 weeks



Left Hip: 3 1/2 years



Right Hip: 7 years



44 year old male

Preoperative

The patient received primary cemented THA in 1984 for AVN. By 1995, the primary stem had failed causing proximal bone loss. Impaction grafting was performed to reconstitute bone stock and revise the failed primary THA. The impaction grafting stem failed; however, the morselized cancellous bone graft incorporated, facilitating revision.

Treatment

The failed impaction grafting stem was revised to a 205mm Restoration® HA component. No complications occurred.

Postoperative

At 24 months, the bone stock has been maintained and the patient continues to have positive results. This difficult situation – implanting a stem into a previously grafted femur – is a good example of how the stem geometry contributes to a stable construct with no subsidence.

Primary THA (1984)



Failed primary THA (1995)



Failed first revision (1996)



Second revision 24 months



case 11

Type
III

56 year old female

Preoperative

The patient was post two or more revisions of the right hip performed elsewhere, most recent being a cemented long stem Charnley device. Note the extreme thinning of the proximal lateral cortex on the AP view and bulbous wear debris defect at the tip of the long stem cement column on both AP and lateral views (inset). The patient complained of distal shaft pain and was at high risk for a distal shaft fracture.

Treatment

The patient was revised with a bowed 255mm Restoration® HA long stem device and onlay allograft strut to reinforce the distal lytic defect. Note compression of the relief slots in the distal stem tip on the 3 month lateral view.

Postoperative

The patient has positive postop function and is pain free without limp.

Preoperative



3 months



3 months (lateral)



6 months



12 months



case 12

Type
III

85 year old male

Preoperative

The patient presented with severely failed bilateral hip replacements. On the left hip there is severe destruction of the medial cortex, almost complete destruction of the midportion of the lateral cortex, as well as malunion with severe angular bowing. Compare AP and lateral (far page) views of the right hip and note the stem protruding through the posterior cortex with loss of a significant portion of the proximal posterior femur.

Preoperative



Treatment - Left Hip

The left hip was reconstructed with a 205mm Restoration® HA long stem and a fully HA coated, roughened acetabular component with peripheral screw holes. This included osteotomy of the malunion of the proximal femur and augmentation with multiple strut allografts.

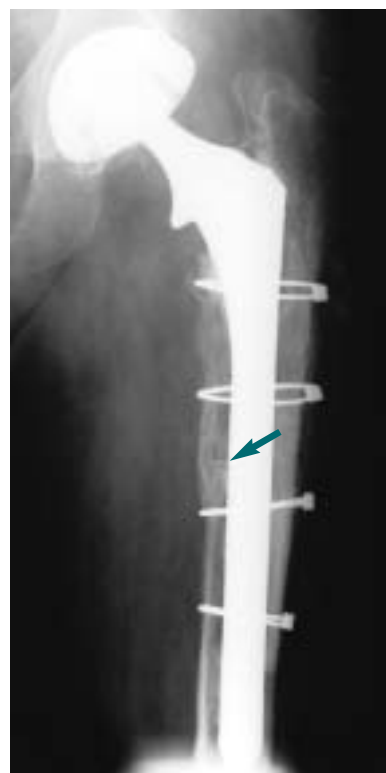
Postoperative - Left Hip

Note the rapid bone healing of the opening wedge osteotomy of the medial femur on the early film at 8 weeks and nearly complete healing and incorporation of the allograft on the 20 month film.

8 weeks



20 months



Preoperative



3 months



Treatment - Right Hip

The right hip was reconstructed with a 205mm Restoration® HA long stem with bone grafting of the large proximal posterior femoral defect. A fully HA coated, roughened acetabular component with peripheral screw holes was used.

Postoperative - Right Hip

Note early reconstitution of the proximal posterolateral femur on both AP and lateral views on the 3 month film.



3 months (lateral)

Postoperative 20 months (left hip), 3 months (right hip)



Postoperative

The patient is pain free bilaterally and has been converted from wheelchair bound to fully ambulatory and independent status. This patient shows an example of a femoral shaft osteotomy healing while bridged by a Restoration® HA long stem device demonstrating significant bone healing, even in an elderly patient.

57 year old male

Preoperative

This patient with a failed multiple revised right hip underwent attempted revision of peri-prosthetic fracture of a grossly loose revision stem in 1994. The entire medial cortex was not strong enough to support any available stem.

Treatment

The femur was reconstructed with onlay strut allograft and bone grafting with plans for a later staged revision. The patient was lost to follow-up for two years, and returned in 1996, 24 months post allograft strut with healing of his proximal femur evident on film. The femur was reconstructed with a 205mm calcar replacement Restoration® HA stem.

Postoperative

At 39 months, the patient is pain free and walks without aid. A comparison of the preop and postop films shows how leg length has been equalized in this very difficult case. Comparing the 5 month film to the 39 month film, bone densification can be seen between the two most distal cerclage cables. There is good radiographic restoration of bone and healing of allograft. This case continues to be a positive example of use of the calcar replacement stem.

Preoperative



5 months



39 months



case 14

Type
III

74 year old male

Preoperative

The patient presented with severely failed bilateral acetabular and femoral components. There is significant varus bowing of both femurs. On the left, there is a very thin lateral femoral cortex; on the right, an extensive cement column extends well past the stem tip below the midshaft of the femur.

Treatment

Original templating called for performing a transverse femoral osteotomy to correct the bowing of the left femur near the apex of the defect. Intraoperatively, it was found that a 155mm length Restoration® HA stem could be utilized and the osteotomy avoided. The lateral defect was packed with bone graft. The right hip was revised several months after the left side utilizing a Secur-Fit™ Plus HA femoral stem.

Postoperative

Note the incorporation, remodeling, and bone regeneration in the lateral defect, which is apparent on the postop and 18 month films (arrows).

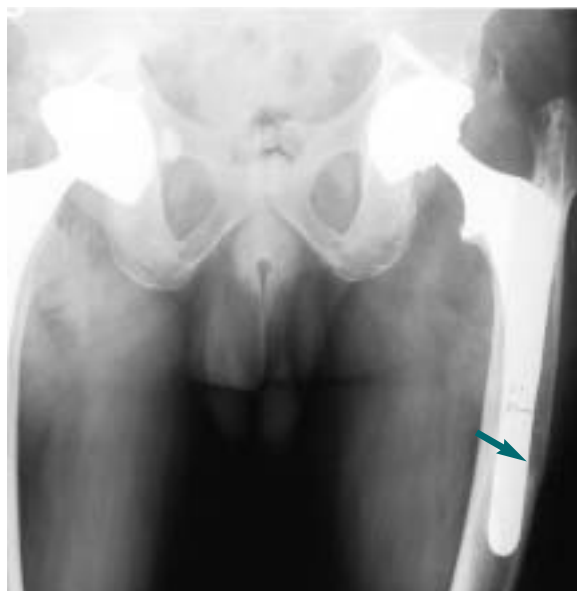
Preoperative



Postoperative



18 months



87 year old male

Preoperative

The patient presented with failed/fractured metallic implant for open reduction and internal fixation of a multi-part subtrochanteric femur fracture. The fracture is a nonunion with fatigue failure of the metallic implant.

Treatment

The patient was revised with a 205mm Restoration® HA stem to bypass all screw holes. The subtroch nonunion was taken down, realigned, and rigidly fixed with use of the HA coated device with good fit and fill in the proximal femur.

Preoperative

Compare the 3 – 4cm defect in the proximal lateral femoral cortex visible on the 1 month film with the 38 month film (top arrow). There is reconstitution of lateral femoral cortex and complete union of the subtroch region. Note the complete filling in of all distal screw holes (bottom arrow). The patient is pain free with no limitation to his left hip.

Preoperative



1 month



38 months



case 16

Type
III

72 year old male

Preoperative

The patient presented 16 years following cemented Muller hip replacement. He was awaiting revision for stem loosening when he sustained a fracture through a lytic defect that can be seen on the preoperative film.

Treatment

The patient was revised using a 205mm Restoration® HA implant which achieved good distal fit, as shown on the 3 month film.

Postoperative

On the 3 month film, it can be noted that the fracture is already uniting and the defect is filling in. AP and lateral films show the fracture solidly healed, plentiful new bone formation and good integration of the stem with no migration. There is no evidence of stress shielding – in fact, if anything the proximal bone has increased density.

Preoperative



3 months



24 months



24 months (lateral)



Restoration® HA

Case Compendium

stryker®

Joint Replacements

Trauma, Extremities & Deformities

Craniomaxillofacial

Spine

Biologics

Surgical Products

Neuro & ENT

Interventional Pain

Navigation

Endoscopy

Communications

Imaging

Patient Handling Equipment

EMS Equipment

The information presented in this brochure is intended to demonstrate the breadth of Stryker product offerings. Always refer to the package insert, product label and/or user instructions before using any Stryker product. Surgeons must always rely on their own clinical judgment when deciding which treatments and procedures to use with patients. Products may not be available in all markets. Product availability is subject to the regulatory or medical practices that govern individual markets. Please contact your Stryker representative if you have questions about the availability of Stryker products in your area.

The marks bearing the symbol ™ are trademarks of Stryker.
The marks bearing the symbol ® are registered trademarks of Stryker.

Literature Number: **LSA30** Rev. 1
MS/GS 500 01/06

Copyright © 2005 Stryker
Printed in USA

stryker®

325 Corporate Drive
Mahwah, NJ 07430
t: 201 831 5000

www.stryker.com