

COMBINED VASCULARIZED ILIAC AND GREATER TROCHANTER GRAFTINGS FOR RECONSTRUCTION OF THE OSTEONECROSIS FEMORAL HEAD WITH COLLAPSE: REPORTS OF THREE CASES WITH 20 YEARS FOLLOW-UP

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In this report, we present the long-term results of using combined vascularized iliac and greater trochanter graftings for reconstruction of the osteonecrosis of the femoral head (ONFH) with collapse in three patients. Necrosis over two-thirds of the femoral head and collapse were observed in these patients, with Harris hip scores (HHS) of 46, 38, and 49 points, respectively. When the patients underwent the femoral head reconstruction procedures, the ages of the patients ranged from 20 to 28 years old. The patients were followed-up for 20–24 years. X-ray examinations showed no progress of necrosis or deformity in the femoral head of patients after surgery, with the exception of bone absorption in one patient with persistence of mild pain. The HHS in the three patients were 84, 65, and 86 points at the end of follow-up, respectively. These results show that the vascularized iliac and greater trochanter graftings may be a valuable option for reconstruction of the ONFH with collapse in younger patients. ©2012 Wiley Periodicals, Inc. *Microsurgery* 00:000–000, 2012.

The osteonecrosis of the femoral head (ONFH) is a pathologic process that may lead to epiphyseal collapse and secondary osteoarthritis of the hip joint. ONFH generally affects the patients in the third to fifth decades of life. Half of the population of the patients who require surgical treatment are younger than 40 years of age.^{1,2} The aim of surgical treatment of ONFH in this group of patients is to preserve the viability of the femoral head and to prevent its collapse. The free vascularized fibula grafting has been shown as a valuable treatment option for preventing the femoral head collapse and releasing the symptoms in patients^{3–5}; however, this method is not suitable for patients with a collapsed articular surface of the femoral head.

Patients who suffer from the subchondral collapse of femoral head have a few treatment options besides the hip joint arthroplasty.^{6,7} Osteotomies and the vascularized bone grafting have been attempted for head preservation at the postcollapse stage.^{8,9} However, the reliability of these methods in the long-term follow-up has not been assessed. In the 1980s, we began to perform a technique in which the combined vascularized iliac and greater trochanter graftings were used for reconstruction of the ONFH with collapse, which showed the good short-term results.¹⁰ In this report, we present the results of a long-

term follow-up of three patients who underwent the reconstruction of ONFH with collapse from this method.

INDICATIONS AND OPERATIVE TECHNIQUE

The indications for the patients undergoing the vascularized iliac and greater trochanter graftings procedure were as followed: (1) a Ficat and Arlet stage IV of ONFH, (2) the necrotic lesion involving more than two-thirds of the femoral head with collapse confirmed by X-ray, (3) the age ranging from 20 to 30 years old, and (4) the patient suffering from a severe pain of the hip.

In surgery, the patient was placed in a supine position with the ilium elevated to 45°. A double “S”-shaped skin incision was made between the anterosuperior iliac crest and the lateral patella. The transverse and ascending branches of the lateral femoral circumflex vessel were identified beneath the rectus femoris muscle. A pedicled bone graft, approximately 4 × 2 × 2 cm³ in size, was raised from the lateral greater trochanter and a 4 × 3 cm² pedicled bone graft was raised from the anterosuperior iliac crest (Figs. 1A and 1B). An adequate amount of the autologous cancellous iliac bone was also harvested from the anterosuperior iliac crest. The capsule was then incised in a “T” shape to expose the femoral head and neck. A 6-mm diameter abrasive drill and osteotome were used to remove the necrotic bone (Fig. 1C). The previously raised pedicled iliac bone graft was transferred and fixed at the femoral head-neck junction. The previously raised pedicled great trochanter bone graft was transferred and fixed at the upper portion of the remnant femoral head using a size 8 catgut (Fig. 1D). The wound was then closed in layers.

All of patients followed a strict rehabilitation and training program, and had bed rest with a light skin trac-

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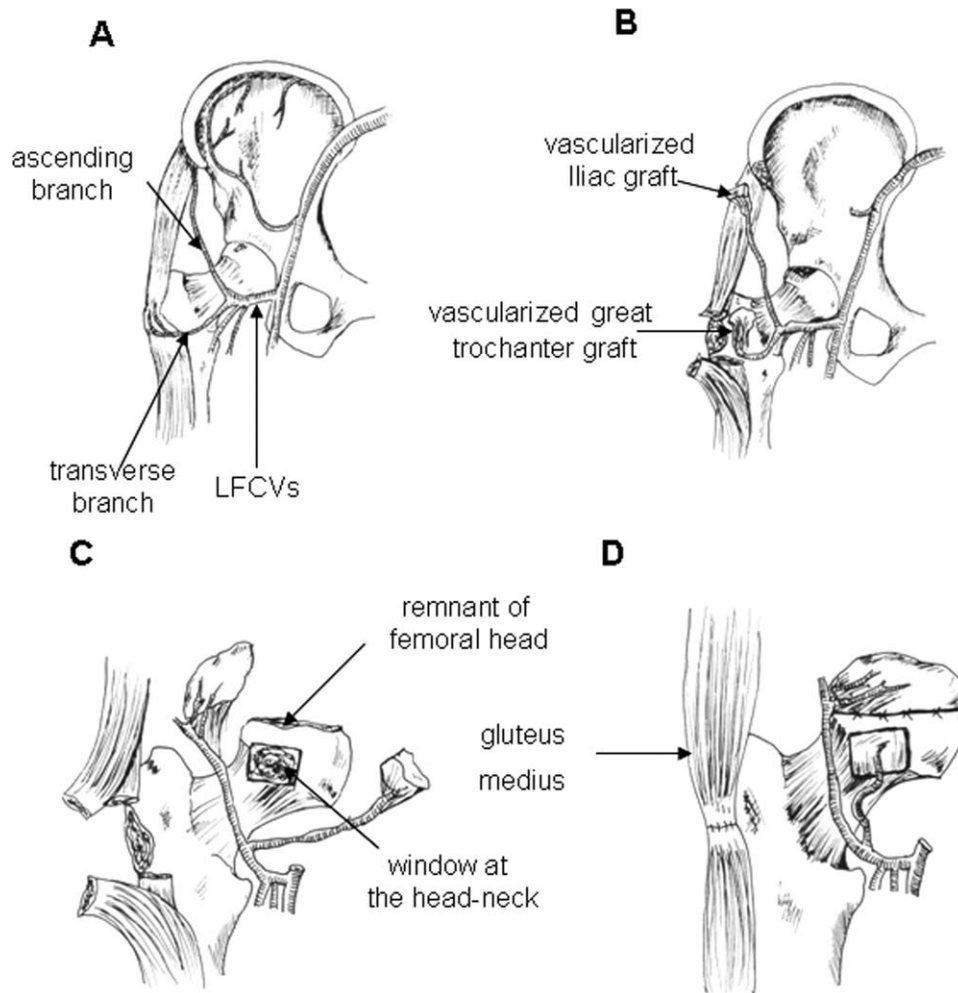


Figure 1. (A) The transverse and ascending branches of the lateral femoral circumflex vessel (LFCVs), (B) vascularized iliac and great trochanter graft, (C) necrotic bony tissue was curetted from femoral head and the head-neck junction, and (D) grafts inset.

tion for the first 6 weeks to prevent additional collapse and reduce the compression between the acetabulum and the femoral head. Weight-bearing with two crutches was allowed during the second 6 weeks. In the third 6 weeks, the patients were instructed to practice weight-bearing with a maximum of 30% of the body weight. The full weight-bearing was allowed at 6 months after surgery. The first follow-up was 3 months after surgery, at 6 months, and then yearly thereafter.

CASE REPORTS

Case 1

A 28-year-old male suffered from pain at the right hip for 6 years with the history of alcohol abuse (≥ 8 mL daily alcohol intake). The motion of the right hip was found to be limited in all of directions in the physical examination. The X-ray examination revealed the osteosclerotic changes in the femoral head with collapse along with reduced joint

space (Fig. 2A). The ONFH was diagnosed with a Ficat and Arlet stage IV. The Harris hip scores (HHS) was measured at 46 points. The patient underwent the procedure of combined vascularized iliac and great trochanter graftings for the femoral head reconstruction in October 1986 (Fig. 2B). The patient had an uneventful postoperative course. The postoperative X-ray showed no progression of the necrosis or deformity (Fig. 2C). At the early postoperative period, the patient still complained of moderate pain at the right hip. At the 24th year postoperatively, the patient was pain free and able to resume his previous work (Fig. 2D). An X-ray at the last visit showed that the femoral head had relatively kept integral contour and normal joint space of hip. There was no sign of osteosclerotic changes, and the HHS was measured at 84 points.

Case 2

A 20-year-old was referred for pain and restriction of motion of the bilateral hip joints. The patient had a his-

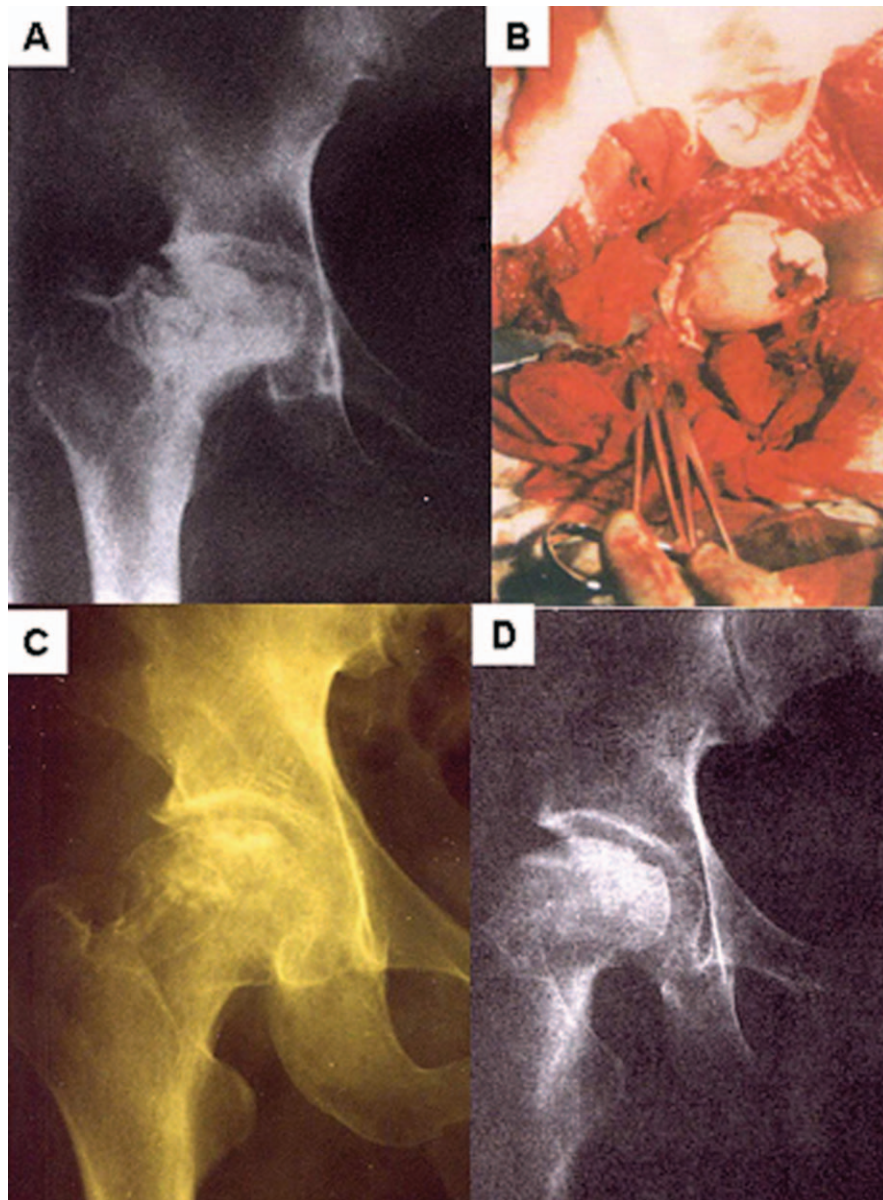


Figure 2. Case 1. (A) Preoperative X-ray, (B) removal of necrotic tissues, and (C,D) results of X-rays showing no collapse of the reconstructed femoral head at 2nd and 24th postoperative year. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

tory of receiving a steroid therapy for lupus erythematosus 6 months before the onset of the symptom. The diagnosis of ONFH was made based on the X-ray showing the osteonecrosis of the left femoral head with collapse and narrowed joint space (Fig. 3A). The ONFH was graded as a Ficat and Arlet stage IV. The combined vascularized iliac and great trochanter graftings for FH reconstruction were performed on the left hip, which had worse symptoms with the HHS of 38 in January 1989 (Fig. 3B). The postoperative course was uneventful with the pain released. Twenty-one years after the surgery, the patient reported a mild pain in the left hip as well as a

limited range of motion with 90° of hip flexion; however, the symptom could be controlled by pain pills. Nevertheless, the patient was able to return to her previous job. The X-ray revealed some degree of collapse of the femoral head with loss of hip joint space and slight osteosclerotic change of the acetabulum at the last visit (Figs. 3C and 3D). The HHS was at 65 points during the last visit.

Case 3

A 25-year-old male, with a history of 2 years of steroid treatment for necrotizing glomerulonephritis, had severe pain in the right hip for 3 months. The range of

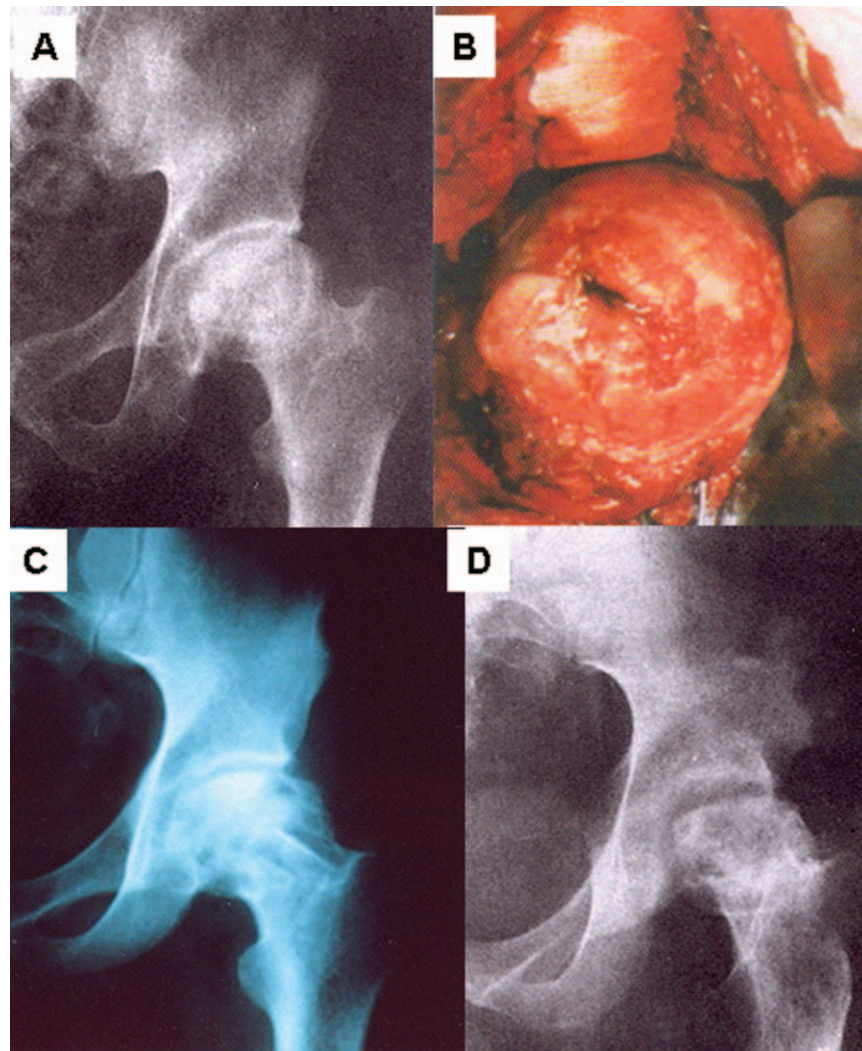


Figure 3. Case 2. (A) Preoperative X-ray, (B) removal of necrotic tissues, (C) X-ray at 4th postoperative year, and (D) at 21st postoperative year, X-ray showed hip osteoarthritis and osteosclerotic changes. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

motion of the hip was restricted in all directions. The diagnosis of ONFH was made based on the X-ray showing osteonecrosis of the femoral head that was also found to be collapsed with narrowed joint space (Fig. 4A). The ONFH was graded as a Ficat and Arlet stage IV. The HHS was at 49 points. The patient underwent the combined vascularized iliac and great trochanter graftings for the femoral head reconstruction in October 1990 (Fig. 4B). The symptoms were released after surgery. In a 20-year follow-up, the patient was able to return to his previous job with only a slight pain at the hip. An X-ray showed no progression of the necrosis (Fig. 4C). During the last visit, the X-ray showed that the contour of the femoral head and the joint space were relatively restored with no osteosclerotic changes. A CT scan showed that the iliac and greater trochanter graftings had been fully

incorporated in the femoral head (Fig. 4D). The HHS was measured at 86 points during the last visit.

DISCUSSION

The total hip arthroplasty (THA) remains the most frequently performed procedure for the ONFH of Ficat and Arlet stage IV. However, even with improvements in THA design and techniques, the hip joint replacement is not indicated for the young patients or those with very active lifestyles.^{11,12} Therefore, the initial goal of ONFH treatment in the young generation should preserve of the femoral head.^{13,14}

The treatment of ONFH with the vascularized iliac bone grafting and the vascularized greater trochanter bone grafting, respectively, showed promising results.^{15,16}

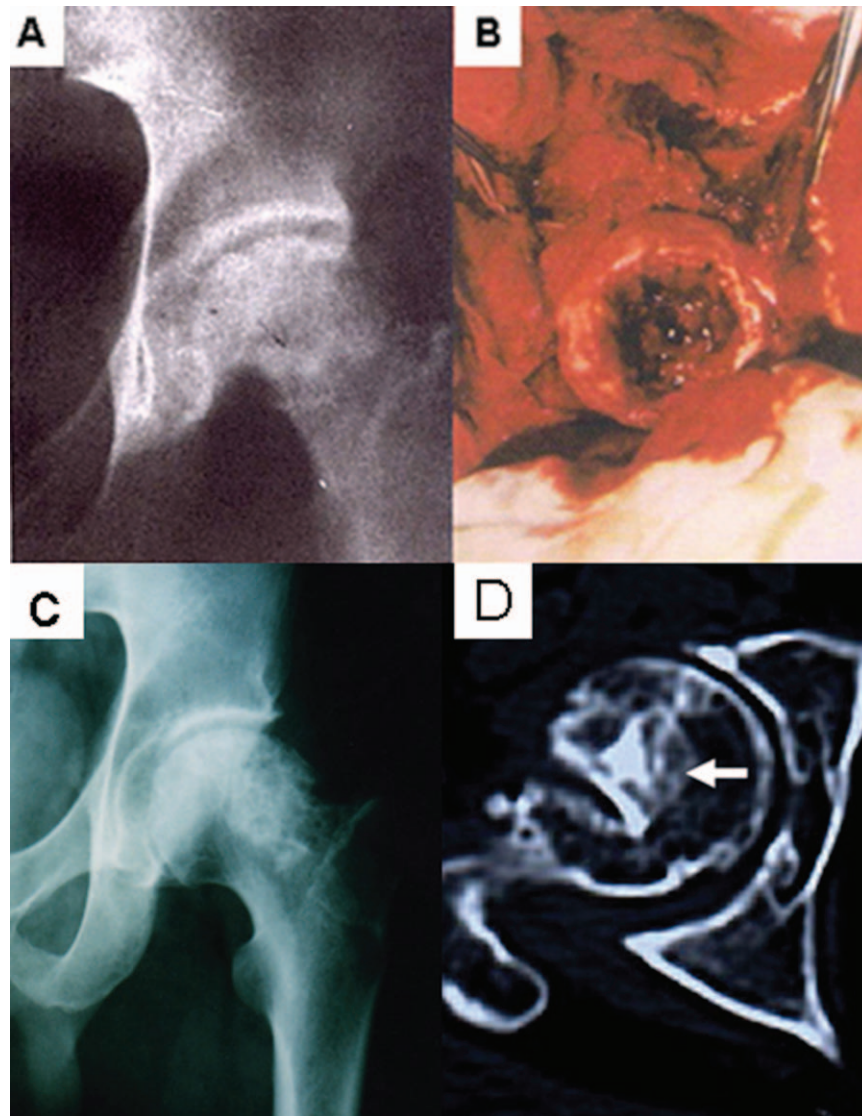


Figure 4. Case 3. (A) Preoperative X-ray, (B) removal of necrotic tissues, (C) an X-ray showing no progression of necrosis at 20th postoperative year, and (D) a CT scan showing that the iliac and greater trochanter grafts were fully incorporated in the host area. [Color figure can be viewed in the online issue, which is available at wileyonlinelibrary.com.]

This combined vascularized iliac and greater trochanter graftings were designed for reconstruction of the ONFH with collapse, which could revascularize the cancellous bone in the femoral head and provide an articular surface for the femoral head.¹⁰ This procedure was indicated for the ONFH with a Ficat and Arlet stage IV in young patients. An extension of the necrotic lesion to more than two-thirds of the femoral head was more suitable for this reconstruction of the femoral head.

From our experience, this procedure is believed to have several advantages including restoration of the contour of femoral head, removal of the necrotic or poorly vascularized bony tissue, and replacement of the necrotic bony tissue with the vascularized healthy cancellous

bone, which may temporarily delay or prevent progress of necrosis. However, several limitations must be kept in mind while considering this procedure. The patients would need a long period of bed rest with a light skin traction to minimize the risk of femoral head collapse after surgery. Unfortunately, the quantitative volumetric measurements were not used to determine the lesion size via MRI or digital image analysis in these patients.

This procedure may damage the remaining femoral head blood supply. However, this procedure would probably not cause more damage the femoral head since necrosis in the femoral head usually located around the incised capsular and round ligament. Moreover, this procedure could provide additional blood supply to the

femoral head through two vascularized grafts. Previously, we discussed the chondroid change of the greater trochanter in a case of the femoral head reconstruction with a vascularized greater trochanter bone grafting.¹⁷ The biopsy showed that the collagen fibers experienced hyaline degeneration, and the chondroid metaplastic cells were evident in the soft tissue in histology. After transferring to the femoral head with collapse, the graft compensated not only for the rough surface of the greater trochanter, but also for the dense connective tissue that may eventually turn to chondroid metaplasia due to diminished joint fluid and active motion of the joint.

In summary, the use of combined vascularized iliac and greater trochanter bone graftings may be an alternative option for reconstruction of ONFH with collapse. More cases will need to be collected to prove the value of this procedure.

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