

En bloc Extraction Technique in Total Hip Arthroplasty for Avascular Necrosis Treated with Non-vascular Fibular Autografts

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Abstract

Performing a total hip arthroplasty (THA) in the presence of a previous fibular graft can be technically challenging and may be associated with complications. We describe a novel method of “en bloc extraction” of the fibular graft during THA to facilitate complete removal of the graft and adequate femoral preparation. This en bloc extraction technique is safe and effective for complete removal of fibular graft during THA performed in patients with non-vascularized fibula grafting for avascular necrosis.

Keywords: Avascular necrosis, fibular graft, total hip arthroplasty, hip, conversion arthroplasty.

Introduction

Avascular necrosis (AVN) of the femoral head is a major indication for total hip arthroplasty (THA) in young patients [1]. The treatment options for AVN femoral head in young patients include core decompression [2, 3], core decompression with non-vascularized bone grafts [4, 5], or free vascularized fibular graft [6, 7, 8, 9], stem cell injection [10], muscle pedicle bone graft [11], electrical stimulation [12, 13], hyperbaric oxygen therapy [14], and peritrochanteric osteotomies [15]. Non-vascularized or vascular fibular allografting with core decompression is indicated in the early stages (Ficat Stage I and II) of AVN of femoral head [2, 3, 4, 5, 6, 7, 8, 9]. The technique of fibular grafting with core decompression helps reduce intraosseous hypertension, excision of sequestrum which facilitates

revascularization, filling of decompression channel with an osteoconductive material, and adding mechanical support to weak femoral head bone. Despite initial good results of this “joint-sparing” technique, up to 11% of patients with Ficat Stage II AVN, and 29% of patients with Ficat Stage IV AVN may get converted to THA at the end of 5 years [1618].

Performing a THA, especially femoral canal preparation, in the presence of a previous fibular graft can be technically challenging and may be associated with complications [19]. These include the need to use a high-speed burr to remove fibular cortical bone from the femoral neck and facilitate lateralization the femoral stem [19, 20], increased risk of intraoperative fracture during femoral canal broaching due to increased hoop stresses in the proximal femur secondary

to incomplete removal of the fibular graft [19], poor cementing of the femoral component due to improper removal of the fibular graft, significantly greater operative time [19], excessive blood loss and post-operative hematoma formation with vascularized fibular grafts [19], and increased risk of deep infection [19]. Furthermore, the presence of residual lateral cortical fibular bone may increase the risk of varus placement and improper sizing of femoral component resulting in compromised stability, osteointegration, and early loosening of the implant.

Hence, the senior author devised a novel method of “en bloc extraction” of the fibular graft during THA to facilitate complete removal of the graft. Hence, this case series describes this en bloc extraction technique and post-operative outcomes in patients who underwent THA for AVN treated with non-vascular fibular autografts where this technique was used.

Surgical Technique

The THA was performed under spinal anesthesia in the lateral decubitus position using a posterior approach.

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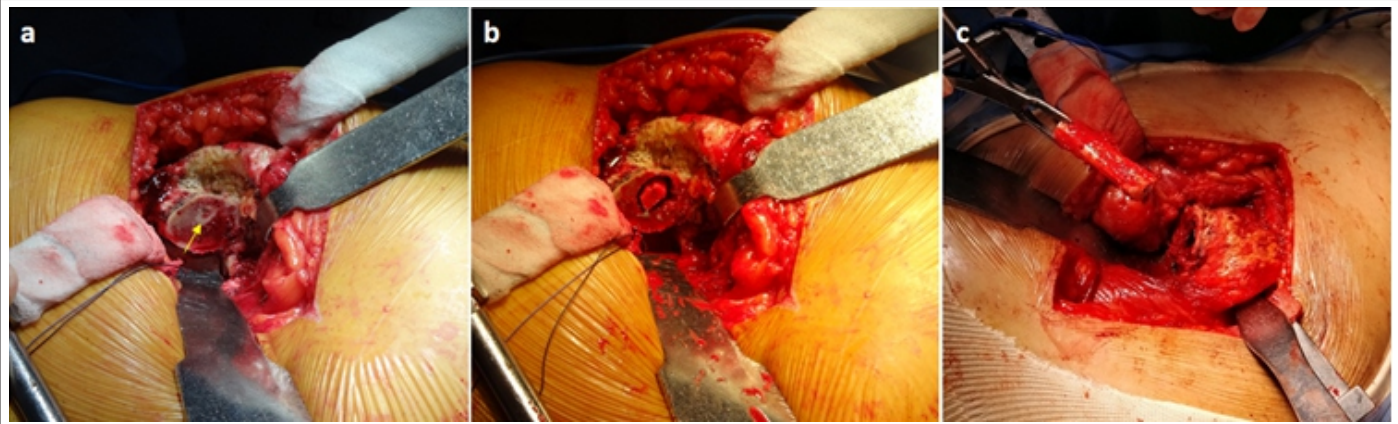


Figure 1: Intraoperative photograph of fibular graft en bloc extraction. (a) Fibular graft seen after neck osteotomy (arrow). (b) Gap created around the fibula graft using fine gouges. (c) En bloc extraction of fibular graft.

After hip dislocation, the neck was osteotomized at the appropriate level using a neck cutting guide, exposing the fibular graft within the femoral neck (Fig. 1a). The fibular graft was well incorporated in the femoral neck in all hips with cancellous bone growth all around the graft fibula (Fig. 1a). Fine gouges were used to create a gap around the fibula graft (Fig. 1b). The fine gouge was used flush to the fibular graft cortex and gradually advanced to reach the lateral cortex of femur. As a final step, the fibular graft was disengaged from the lateral cortex. En bloc extraction of the fibular graft was done once it was loosened all around till the lateral cortex (Fig. 1c). The THA procedure and implantation of the femoral component were performed as usual after the extraction of the fibular graft (Fig. 2). In the rare situation, where the fibular graft was solidly fused with the lateral cortex



Figure 2: Pre- and post-operative hip X-ray in a 52-year-old male patient where the left total hip arthroplasty was performed after en bloc extraction of fibular graft.

and could not be disengaged through the neck, a window was created on the lateral cortex of the femur. The position of the lateral window was identified by passing a guidewire through canal of fibula graft for its precise location. This window was blocked with small piece of fibula (Fig. 3) to avoid a stress riser and prevent periprosthetic fracture.

En bloc extraction of the fibular graft was performed in seven hips (six patients) who underwent THA following non-vascularized fibula grafting for AVN at our center. In six hips, fibular graft was extracted en bloc without difficulty and in one hip, a lateral window had to be created to achieve complete removal of the graft. There was no excessive bleeding, post-operative hematoma formation, or increased need for blood



Figure 3: Pre- and post-operative hip X-ray in a 53-year-old male patient where the right total hip arthroplasty was performed after en bloc extraction of fibular graft. A lateral window had to be created which was blocked with small piece of fibula to avoid stress riser (arrow).

transfusion in any of the patients since all had a non-vascularized fibular graft. An additional 15–20 min of operative time was recorded for en bloc extraction of graft in each hip. Out of seven hips, one stem was in mild degree of varus due to technical error rather than fibular obstruction.

Discussion

En bloc extraction of the fibular graft using the technique described above was a safe and effective procedure during THA performed in patients with non-vascularized fibula grafting for AVN. En bloc extraction could be effectively performed in our series using fine gouges without the need for high-speed burrs. Davis et al. [20] proposed the use of high-speed burrs to achieve complete removal of the graft and prevent varus placement of the femoral component. However, high-speed burrs are expensive and not readily available and significantly add to the operative time [20]. Furthermore, high-speed burrs may not help in complete removal of the fibular graft near the lateral cortex increasing the risk of malalignment of the femoral component due to inadequate canal preparation.

Intraoperative bleeding was minimal without post-operative hematoma formation in our series since all hips had a non-vascularized fibular graft. Ryan et al. [19], in an analysis of 144 THAs performed in patients with a free vascularized fibular grafting, reported

increased blood loss and operative time (mean 26.5 min), the need for blood transfusion in 31.9% of patients, and post-operative hematoma formation in 5.6% of patients. Excessive blood loss and hematoma formation may be due to active bleeding secondary to an intact anastomosis at the ascending branch of the lateral femoral circumflex artery in patients with a free vascularized fibular

graft [19]. Although our technique of en bloc extraction should be effective even in hips with free vascularized fibular graft, correction of anemia and treatment of any potential bleeding disorders preoperatively and meticulous intraoperative hemostasis before wound closure will help prevent post-operative complications.

Conclusion

The en bloc extraction technique is safe and effective for complete removal of fibular graft during THA performed in patients with non-vascularized fibula grafting for AVN. This allows proper sizing and placement of the femoral component and achieves optimum stability during THA.

Declaration of patient consent: The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the Journal. The patient understands that his name and initials will not be published, and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

Conflict of Interest: NIL; **Source of Support:** NIL

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