



Contents lists available at ScienceDirect

International Journal of Surgery Case Reports

journal homepage: www.casereports.com

Breakdown of spontaneous fused bilateral hip with heterotopic ossification to staged bilateral total hip arthroplasty through a direct lateral approach: A case report

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ARTICLE INFO

Article history:

Received 14 August 2020

Received in revised form 3 November 2020

Accepted 3 November 2020

Available online 7 November 2020

Keywords:

Hip

Heterotopic ossification

Ankylosis

Fusion

Total hip arthroplasty

ABSTRACT

INTRODUCTION: Heterotopic ossification (HO) is the abnormal bone formation in soft tissue where bone normally does not exist. HO can occur secondary to musculoskeletal trauma, burns, spinal cord injury, or traumatic head injury. The treatment of HO ranges from simple medical treatment to advance surgical intervention; it is largely dependent on the amount of bone formation, the location, the limitation of motion, and the severity of the joint disease.

PRESENTATION OF CASE: We present the case of a 26-year-old man who presented to an orthopedic clinic with pain in the lower back and both knees, which was not relieved by conservative treatment. The clinical examination revealed a loss of motion in both hips. Radiography of the pelvis showed bilateral fused hips and Brooker type IV HO in both hips. The patient underwent HO resection and converted the fused hip to total hip arthroplasty (THA) through a direct lateral approach. The patient was satisfied with the outcome of over 18 months of follow-up.

DISCUSSION: A direct lateral approach, as what we performed, is a simple approach that can expose the acetabulum and proximal femur. The presence of intraoperative fluoroscopy can help identify HO's extension with less damage to the soft tissue and blood loss.

CONCLUSION: The surgery appears to be a doable, effective, and safe procedure to treat fused bilateral hip with HO. This is the first study to report staged bilateral THA for HO through a direct lateral approach to the best of our knowledge.

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1. Introduction

Heterotopic ossification (HO) is the abnormal formation of bone in non-osseous tissues, including muscles and connective tissues [1]. HO usually arises from soft tissues around large joints and can occur secondary to musculoskeletal trauma, burns, spinal cord injury, or traumatic head injury [2]. The early stage of HO can present with localized pain, tenderness, and swelling. In the advanced stage, the HO becomes massive, leading to complete ankylosis of the affected joint and restricted motion [3]. The treatment of HO ranges from simple medical treatment to advance surgical intervention; it is largely dependent on the amount of bone

formation, the location, the limitation of motion, and the severity of the joint disease [4].

The surgical procedure, arthrodesis, carried out to immobilize the joint by fusion, was innovated by Eduard Albert in 1877 [5]. Hip fusion can be induced surgically (arthrodesis) or occur spontaneously (ankylosis) following developmental dysplasia, rheumatoid arthritis, ankylosing spondylitis, HO, infection, or trauma. Hip arthrodesis can provide a stable and painless joint, but it limits mobility and function [6,7]. It is no longer considered a gold standard for the treatment of end-stage hip disease [8]. Fused hip was found to increase the risk of adjacent joint arthritis in the lumbar spine, contralateral hip, and ipsilateral knee [9].

On the other hand, the conversion of the fused hip to total hip arthroplasty (THA) can improve the patient's function and lifestyle and reduce adjacent joint arthritis. The conversion surgery is challenging and technically demanding due to the abnormal bony and soft tissue anatomy and previous operation [10–14]. The early

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Fig. 1. Anterior-posterior pelvis radiograph showing marked reduced joint space bilateral hip and Brooker type IV HO in both hips.

results are promising, but the long-term complications are high compared with primary THA [15–18]. This study has been reported in line with the SCARE criteria [19].

2. Case report

A 26-year-old man presented to our clinic with pain in the lower back and both knees, which was not relieved by conservative treatment. He had difficulty standing and walking for a short distance and had limited mobility at home. He had a motor vehicle accident 8 years ago and sustained a traumatic head injury, which required intubation and mechanical ventilation due to a low level of consciousness. He was admitted to the intensive care unit for nearly 40 days. Then, after recovery from his head injury, he developed bilateral hip stiffness and ended up with Brooker class IV HO of both hips (Fig. 1). Over the last 8 years, the patient was suffered from being tied down gradually. There was no associated medical condition or family history of genetic disease, nil history of tobacco usage in any form, and did not drink alcohol. The clinical examination revealed normal vital signs, left hip in a fixed abducted position at 40°, and no range of motion (ROM) in both hips. He had a swing type of gait, and he used an assistance device for standing and walking. No lymphadenopathy was present. His Harris Hip Score was 33 at the initial presentation. Further imaging study with computed tomographic scan and three-dimensional reconstruction of the pelvis was undertaken to assess the joint and HO extension (Figs. 2, 3).

Conversion of the bilateral fused hips to staged THA was suggested because of the following issues: symptomatic fused hips with failed conservative treatment, improper position of spontaneous fused hips, poor function, and the presence of bilateral hip



Fig. 2. Axial computed tomographic scan of the pelvis, showing ankylosed bilateral hip.

fusion, which is not an ideal hip fusion. The decision was made after the patient was explained the benefits and risks of the surgery.

The first-stage surgery consisted of treating the left hip by the resection of HO and conversion of the fused hip to THA. The patient received intravenous tranexamic acid 1 g and prophylactic antibiotic cefazolin 1 g prior to skin incision. He was then placed in the

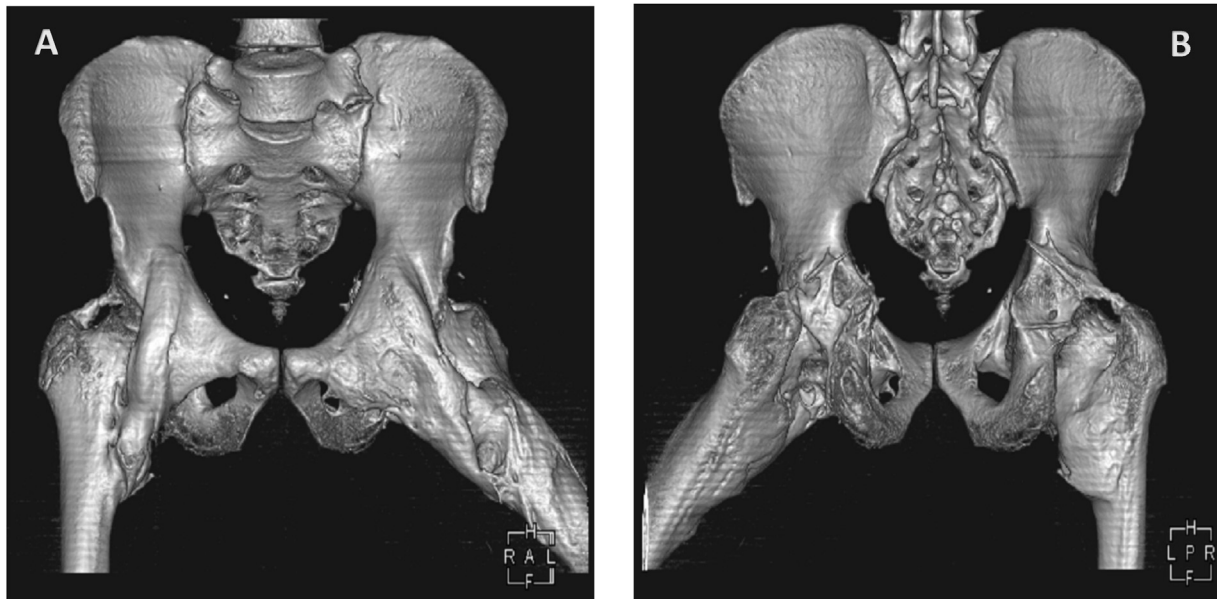


Fig. 3. Computed tomographic three-dimensional reconstruction of the pelvis, which is visualizing the extent of HO in both hips from front (A) and back (B).

lateral decubitus position, and a direct lateral approach was used, as described in detail elsewhere [20].

The color and thickness of the hip abductors were evaluated intraoperatively as good. The femoral neck and the ilium were difficult to visualize as osseous bridges were formed between the ilium and femoral head, ischium, and femur. Intraoperative fluoroscopy was used to visualize the normal bone and HO margins. HO resection was conducted using an osteotome and an oscillating saw. HO resection aims to visualize and separate the hip joint by preventing impingement and gaining good ROM, which requires meticulous skills to reduce blood loss and protect bone and soft tissue damage. The femoral head was found to be fused in the acetabulum. An in situ femoral neck osteotomy was then performed based on preoperative planning, followed by soft tissue release in the proximal femur to help identify the normal bone from the ossified bone and help mobilize the proximal femur. Acetabular preparation was started with reaming in situ and was completed with the insertion of a cementless cup and one-screw fixation. The femur was then prepared as the standard technique. The patient received a cementless ceramic on a 52-mm ceramic acetabular component size with one screw (6.5 mm × 35 mm) and a cementless femoral component (size 12). Intraoperative stability was checked, and the artificial hip was found to be mobile and stable.

Postoperatively, the patient received two more doses of the prophylactic antibiotic cefazolin, oral indomethacin 25 mg three times a day for 6 weeks to protect from HO recurrence and subcutaneous low-molecular-weight heparin for deep vein thrombosis prophylaxis for 3 weeks. The patient received aggressive physiotherapy for the left hip, left knee, and lower back and passive range of motion for the left hip and left knee. Full weight-bearing was allowed immediately after the operation.

The second-stage surgery was conducted 6 weeks after the first-stage surgery. It involved resection of HO of the right hip and conversion of the fused hip to THA. We used the same approach and techniques as those in the left hip. The implants used were a 52-mm cementless cup size and a cementless femoral stem (size 12). Postoperatively, the patient received the same protocol for the left hip, including aggressive physiotherapy for both hips, knees, and lower back. (Fig. 4) shows postoperative bilateral THA.

At 18 months postoperatively, the patient's Harris Hip Score improved from 33 points to 85 points. He could use public trans-

portation without any assistance device, walk for a long distance for longer than 30 min, and be pain-free. Overall the patient was satisfied with the outcome, and he had significant improvement in the quality of life.

3. Discussion

HO is the abnormal formation of ectopic lamellar bone in soft tissues [1]. It is a common complication among patients previously hospitalized in an ICU, and the hip joint is commonly affected [21]. HO presents as a restriction of motion at the hip joint, and plain radiographs are considered initial imaging studies to detect HO [22]. Radiographs are the low cost and accessible images. Computed tomography is a modality of preoperative planning choice by improving three-dimensional visualization of heterotopic ossification concerning important anatomic structures and landmarks.

Conversion of the ankylosed hip to THA can be performed by using a variety of surgical approaches. Kaliyaperumal et al. [23] has published the first case report of unilateral THA for ankylosed hip secondary to HO, the posterior hip surgical approach was performed in his procedure. The lateral hip surgical approach with greater trochanter osteotomy was preferably performed by many arthroplasty surgeons on converting the fused hip to THA [15,18,24].

A fused hip conversion has traditionally required a trochanteric osteotomy for better visualization and exposure of fused hip. In our patient, we have performed the conversion of ankylosed hips to THA through a direct lateral approach; a trochanteric osteotomy was not performed in our case. Conversion of ankylosed hips can be performed successfully through a direct lateral approach without trochanteric osteotomy. The advantages of performing the procedure without trochanteric osteotomy are ease of rehabilitation and avoidance of trochanteric osteotomy complications.

Conversion to THA improved our patient's functional quality of life by providing a painless and mobile hip joint. However, conversion to THA has a higher rate of complications, such as HO, sciatic nerve injury, and dislocation, than primary THA. The risk of complications should not be underestimated, and patients need to be cautioned about them [18].

The hip's lateral approach provides excellent acetabulum and proximal femoral exposure, enabling easy insertion of the hip

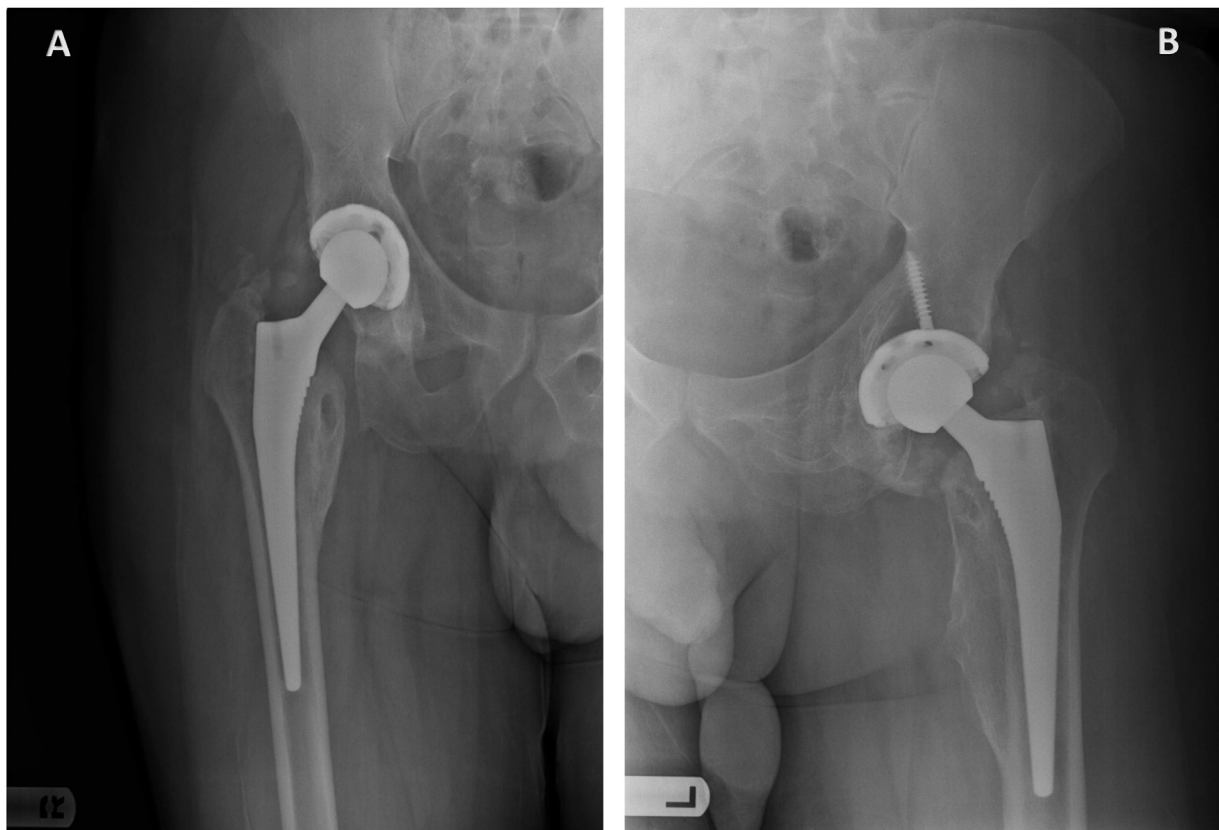


Fig. 4. An 18 months postoperative anterior-posterior radiograph of right hip (A) and left hip (B).

prosthesis components and fewer complications. Additionally, posterior hip structures are preserved, with less neurovascular injury [20]. This procedure requires intraoperative fluoroscopy radiographs to help identify the extension of HO margins, and the surgeon must have an adequate understanding of the patient's anatomy and good preoperative planning. Postoperative considerations include DVT prophylaxis, HO prophylaxis, and extended rehabilitation.

4. Conclusion

Staged bilateral THA surgery in previously fused hips is a technically demanding procedure with well-known reported complications. This case demonstrates that using a lateral hip approach without trochanteric osteotomy can provide adequate exposure and enable the surgeon to perform the required surgical techniques. This approach and proper rehabilitation can provide satisfactory functional improvement and symptomatic relief in the adjacent joints arthritis with a lower complication rate. Performing the THA in previously fused hips in young patients can provide an excellent outcome and function in short-term prognosis. Still, longer-term follow-up is suggested for better assessment and accurate prognosis. Staging with a 6-week interval between the two procedures facilitates better rehabilitation in bilateral THA. The surgeon should not underestimate the complications, and the patient needs to be cautioned about the complications.

Declaration of Competing Interest

The authors report no declarations of interest.

Source of funding

No source of funding.

Ethical approval

This is to certify that institutional review board of the College of Medicine, Prince Sattam Bin Abdulaziz University has approved the case report for publication.

Consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Dr. Osama Aldhafian is the corresponding author and the main contributor of this work, also Dr. Aldhafian has assisted in the operations, reviewed literature, wrote and revised the manuscript. Dr. Bashir Alenazi performed the operations, wrote the operation technique, and reviewed the manuscript. Dr. Abdulrhman Mohammed collected the patient data and assisted in the operations. Dr. Husam E Khairi followed the patient and assisted in the operations. Dr. Naif Bin Nwihadh reviewed the manuscript. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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Guarantor

Osama Aldhafian

Provenance and peer review

Not commissioned, externally peer-reviewed.

Acknowledgment

This publication was supported by the Deanship of Scientific Research at Prince Sattam bin Abdulaziz University, Alkharj, Saudi Arabia.

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