



## Case report

## Midterm follow-up of total hip arthroplasty in a patient with contralateral Van Nes rotationplasty for congenital proximal femoral focal deficiency

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## ABSTRACT

Total hip arthroplasty is a durable and effective operation in those with normal gait patterns. However, to our knowledge, there is no current literature on longevity in patients who have had a contralateral Van Nes rotationplasty for proximal femoral focal deficiency. We found evidence that patients who underwent rotationplasty have increased demands on the contralateral extremity and higher percentage of their gait cycle on the unaffected extremity. Here, we present a unique case report of a 59-year-old male patient with a 6-year follow-up status after left total hip arthroplasty and a right-sided rotationplasty performed during adolescence. Upon chart and radiograph review, we found no early signs of wear of his hip arthroplasty and a fully functioning lower extremity. In our limited experience, we found that total hip arthroplasty was a safe and durable operation for our patient who underwent a contralateral Van Nes rotationplasty at the 6-year follow-up period.

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## Introduction

Congenital proximal femoral focal deficiency (PFFD) is a rare disorder characterized by a spectrum of disease with variable treatment options. Van Nes Rotationplasty, whereby the lower leg is brought proximal with the ankle rotated 180 degrees, has been used as a treatment option for children with unilateral involvement. This allows ambulation with a more normal gait pattern and decreased energy expenditure through the use of a below-the-knee prosthesis. This ultimately results in a more effective single-leg support [1–6]. Long-term follow-up suggests it is a durable operation, but we present a concern that the nonprosthetic limb will endure longer stress during the gait cycle and increased propulsion power needed at the hip and knee may lead to pain and ambulatory dysfunction on the unaffected extremity [7–12].

To our knowledge, there are no studies as of this publication date looking at the sequelae of this contralateral extremity. More specifically, we were unable to find any other case reports documenting a total hip arthroplasty (THA) in a patient who underwent a contralateral Van Nes rotationplasty for congenital PFFD. We feel this is significant and worthy of discussion here because of the likelihood of increased joint reactive forces to the contralateral unaffected extremity. This has a two-fold matter of significance. First, we can infer that the unaffected extremity will undergo a larger portion of mechanical stress under normal ambulation to support the prosthetic limb and may increase likelihood of arthritic changes to the unaffected extremity. Second, owing to the aforementioned mechanical stress, a patient who undergoes a hip arthroplasty on the nonrotationplasty side may be at risk for early loosening or accelerated polyethylene wear.

## Case history

Our patient presented in 2012 as an obese (33 kg/m<sup>2</sup> body mass index) 59-year-old smoker with a history notable for three coronary stents on clopidogrel who suffered from congenital PFFD and underwent a right-sided rotationplasty to assist ambulation at the age of sixteen. He still used a right-sided prosthesis for ambulation

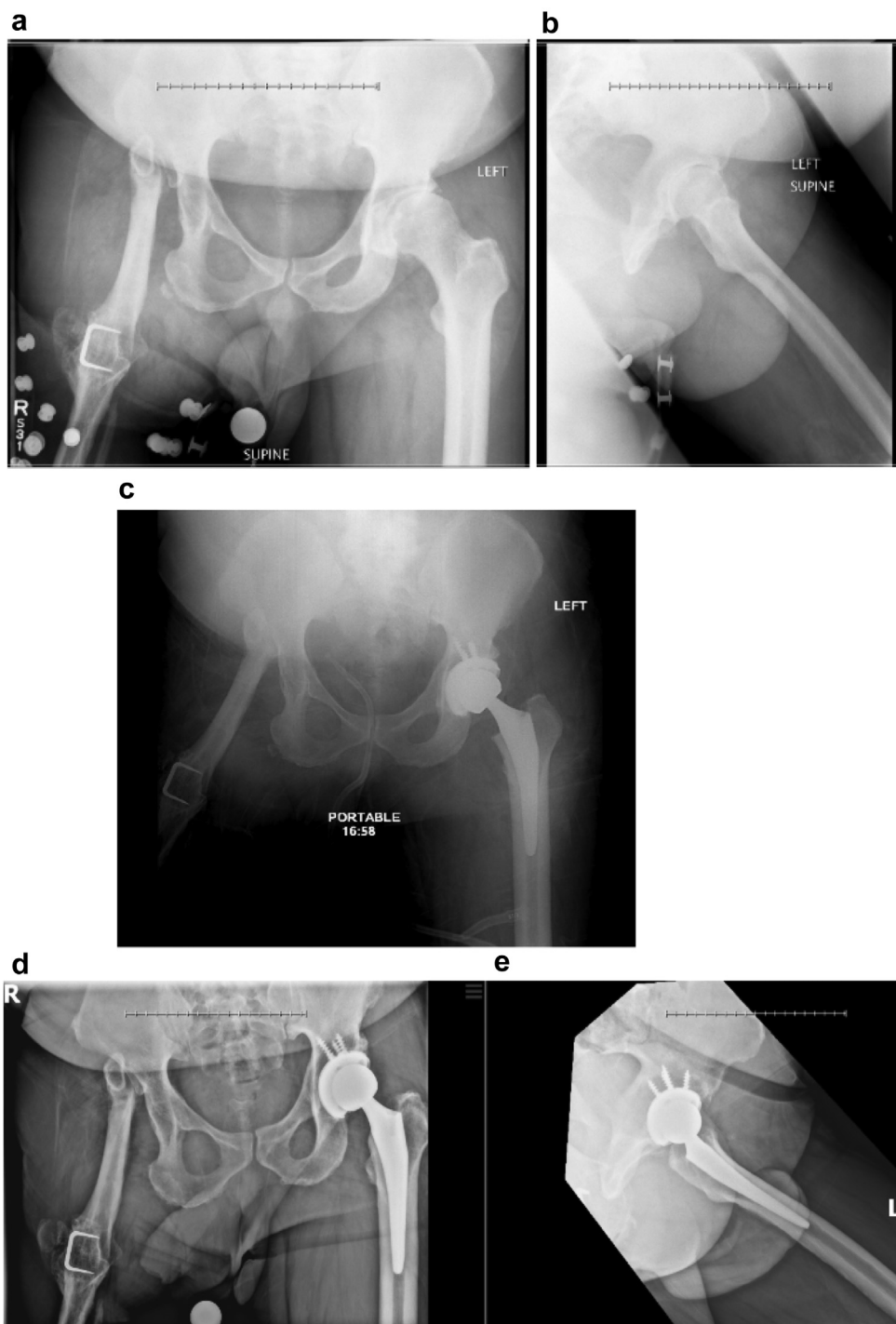
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**Figure 1.** Preoperative (a) and lateral (b) radiographs. Immediate post-AP pelvis (c) after left THA. Six-year follow-up AP (d) and lateral (e) radiographs after left THA. AP, anteroposterior.

at the time of presentation. For the last three years, he has been having difficulty walking secondary to his left hip and has been using crutches to assist his ambulation. In the last year, his pain has worsened and he was diagnosed with a left hip labral tear. After referral to our arthroplasty team, his examination was significant for severely decreased hip internal rotation and standing radiographs demonstrated left hip arthritis with moderate joint space collapse. He then underwent a left THA with ceramic-on-polyethylene bearing surfaces in July of 2012 to relieve his discomfort and assist ambulation. Intraoperatively, a radiograph

was used to verify the cup inclination secondary to the patient's pelvic obliquity on positioning. Additional acetabular screws were also used to enhance initial fixation. The patient did well in the immediate postoperative period and presented back to office in December of 2018 for final follow-up visit. He stated he had no hip pain at the time of the visit but occasionally has minor aches after prolonged standing. Of note, owing to back pain that developed from the use of his right-sided rotationplasty prosthetic device, he actually discontinued its use and has not placed any weight on his right lower extremity for the last three years. He solely ambulated

with his left extremity with the assistance of crutches and sees a pain-management specialist for back and neck pain. Our patient was deemed to have a successful result and will remain in our practice to return at his 10-year visit.

## Discussion

Our literature review provided us with ample information regarding the technique and use of rotationplasty for congenital PFFD. However, there were no sources that discussed sequelae for the contralateral extremity requiring arthroplasty. We found one such study that reported long-term results which mentioned the unaffected side. In this study, Ackman et al. reviewed 12 patients at a mean follow-up of 21.5 years (range: 11 to 45 years) who underwent Van Nes rotationplasty for congenital PFFD [13]. They noted that 2 of 12 patients had contralateral hip pain. In addition, they found all the patients had a significant increased time weight-bearing on the non-Van Nes rotationplasty side and difficulty shifting their weight to the prosthetic side. Essentially, the patients with PFFD used the unaffected side as their dominant extremity, and their asymmetrical gait cycle reflected this. Because of this, they needed this extremity to generate more power from their ankle and hip [13]. Recently, Cho et al performed a retrospective review looking at midterm results of THA performed in 54 patients with a contralateral below-knee amputation [14]. They reported good clinical outcomes with no statistically significant increase in complications such as loosening or osteolysis. Two patients in this series suffered a periprosthetic fracture requiring revision surgery which is consistent with an increased risk of falls secondary to long-term use of prosthetics and altered gait mechanics and balance [14].

In this case report, our patient developed end-stage arthritis in the unaffected hip over 3 decades later and needed a THA. Interestingly, he discontinued the use of his Van Nes rotationplasty prosthetic device for approximately three years before returning for his last follow-up. His left extremity was his only weight-bearing extremity along with the use of crutches for support, and he reported only minimal pain after prolonged standing at the six-year mark after his THA. We believe his left hip is certainly sustaining greater-than-normal reactive forces, and we do not see any signs of early loosening nor any accelerated polyethylene wear. Even though an intraoperative radiograph was used in our case report, we do note that the cup inclination appears to be more vertical than typically used in our practice. Edge loading is widely recognized to be a cause for late wear and failure in metal-on-metal hip articulations. However, it has not been shown to be the same in metal-on-polyethylene and ceramic-on-ceramic THA and even less appears to be studied in ceramic-on-polyethylene articulations [15–17]. As such, a systematic algorithm has been used with anatomical landmarks and calculations of pelvic tilt through X, Y, and Z axes by the senior author. The patient is positioned in lateral decubitus position on a peg board, and both anterior superior iliac spines are palpated. An imaginary axis is drawn along this plane, and then using the peg position in relation to this, the patient's pelvic tilt can be triangulated. Any deviation from perpendicular is noted, and adjustments are made when using the acetabular cup positioner. This allows for a patient-positioning adjustment that is repeatable when using the final inserter to ensure final cup placement is consistent with any deviations from aberrant positioning on the operating table [18]. With our case report, we expect

to see the patient at the 10-year follow-up and evaluate his radiographs for any complications associated with this unique case and slightly vertical cup positioning.

## Summary

In conclusion, THA appears to be a successful operation to relieve arthritis in patients with contralateral Van Nes rotationplasty for PFFD. We found that the long-term effects of Van Nes rotationplasty may include pain and dysfunction of the unaffected extremity. Our patient who underwent a THA on his unaffected side did not appear to be at higher risk for any increased complications such as implant loosening or early polyethylene wear at the 6-year follow-up period. However, owing to a more technically challenging surgery in this patient population, we advocate the use of intraoperative radiograph and a systematic algorithm in assessing pelvic tilt to ensure correct cup placement. Finally, further long-term follow-up is needed to fully assess for any increased implant wear due to the increased gait demands on the dominant extremity (Fig. 1).

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