



# Avascular Necrosis of the Femoral Head in a Patient with Poliomyelitis Treated by THA with a Large-diameter Metal Head - A Case Report -

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Total hip arthroplasty (THA) can be a good treatment option for avascular necrosis (AVN) of the femoral head. However, because dislocation can frequently occur after surgery, THA is a concern in patients with a neuromuscular disease, such as cerebral palsy or poliomyelitis. In patients with poliomyelitis, only one case of AVN of the femoral head in the affected limb has been reported in the English literature. Here, the authors report on a case of AVN of the femoral head in a patient with poliomyelitis, who was treated with a large diameter femoral head metal-on-metal THA using a modified minimally invasive-2-incision technique.

**Key Words:** Total hip arthroplasty, Poliomyelitis, Avascular necrosis of the femoral head, Large metal head

## Introduction

Avascular necrosis (AVN) of the femoral head is a disease that affects younger patients (age range usually from 15 to 50 years), and which leads to debilitating arthritis often requiring total hip arthroplasty (THA) for

disabling pain. However, neuromuscular diseases, such as, cerebral palsy and poliomyelitis, are a concern in patients with THA, because dislocation frequently occurs after surgery<sup>1,2</sup>. AVN of the femoral head in a patient with poliomyelitis has only been reported once in the English literature<sup>3</sup>. Here, we report a case of femoral head AVN in a patient with poliomyelitis, who was treated with a large diameter femoral head metal-on-metal THA using a modified minimally invasive (MI)-2-incision technique<sup>4,5</sup>. The patient was informed that case data would be submitted for publication, and provided consent.

## Case Report

A 59-year-old male presented at our clinic complaining of right hip pain of 2 months duration. When he was 5 years old, he had contracted poliomyelitis and the right side of his body continued to show motor weakness (his upper extremity motor grade was normal but his lower

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extremity was only fair to good). The left side of his body showed normal motor power, but his left ankle showed adduction, supination, and inversion deformities. Nevertheless, despite the right lower extremity motor weakness and the left ankle deformity, he had been able to walk with a cane. However, after the right hip pain developed, he required a wheel-chair. He was a heavy alcohol drinker without a trauma or a steroid usage history. A physical examination of the right hip revealed a mild range of motion limitation (flexion 100°, external rotation 40°, internal rotation 5°, abduction 30°, adduction 20°), and a positive Patrick test. Regarding right leg motor power, hip flexion was good, knee extension fair, hip abduction poor, and ankle dorsiflexion and plantar flexion were poor. He had scoliosis with a fixed right pelvic obliquity and a Trendelenburg gait (Fig. 1).

Radiography revealed a sclerotic line at the periphery of the right femoral head and a crescent sign (Fig. 2). MRI of the hip showed a huge right side femoral head AVN lesion with a double line sign and left femoral head had no specific bony signal change. We decided on THA to manage the hip pain, and to prevent dislocation

after operation due to abductor weakness we decided to perform a surgery of modified minimally invasive (MI)-2-incision THA<sup>4,5)</sup> with large diameter femoral head metal-on-metal articulation. The muscle plane was distinguishable despite muscular fatty degeneration and because of fixed pelvic obliquity, the surgeon undertook to increase the lateral opening angle of the acetabular cup to 55°. A cementless acetabular cup (Magnum<sup>®</sup>, Biomet, Bridgend, South Wales, UK) with a modular 44 mm head, and a cementless femoral stem (M/L taper<sup>®</sup>, Zimmer, Warsaw, USA) was used. Postoperatively tolerable weight bearing ambulation was allowed with a walker and range motion exercise was encouraged on the first postoperative day.

The patient was discharged at 12 days postoperatively without any complication. He was followed for 2 years, and his walking ability improved to ambulation with a cane (Fig. 3). The follow-up was uneventful, and in particular, no dislocation of the right hip occurred.

### Discussion

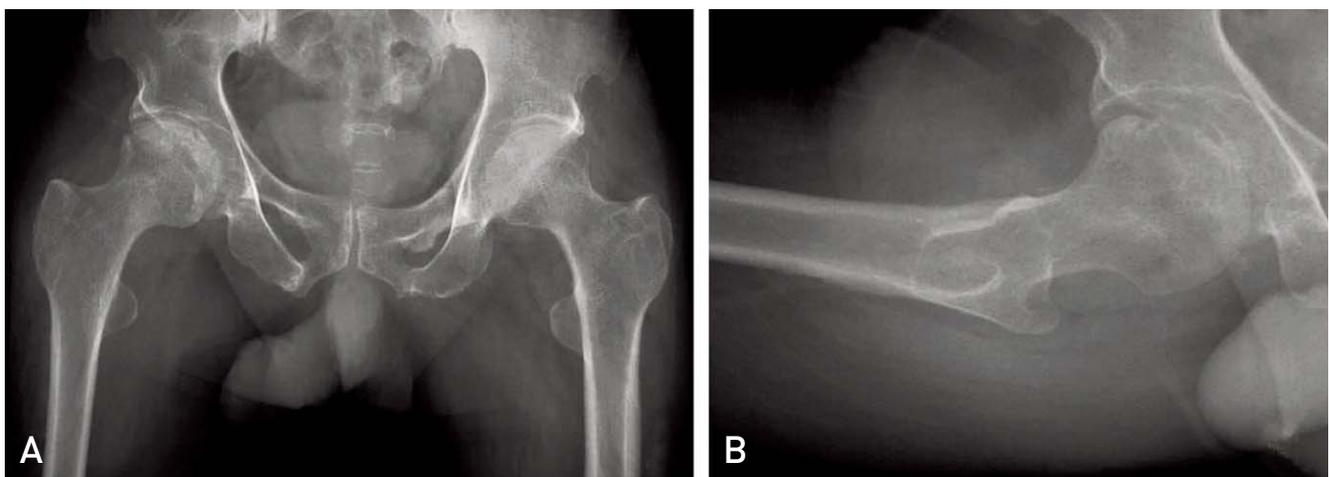


**Fig. 1.** (A, B) Preoperative clinical photograph of the patient walking. He had a left foot deformity, scoliosis with pelvic obliquity, and a Trendelenburg gait.

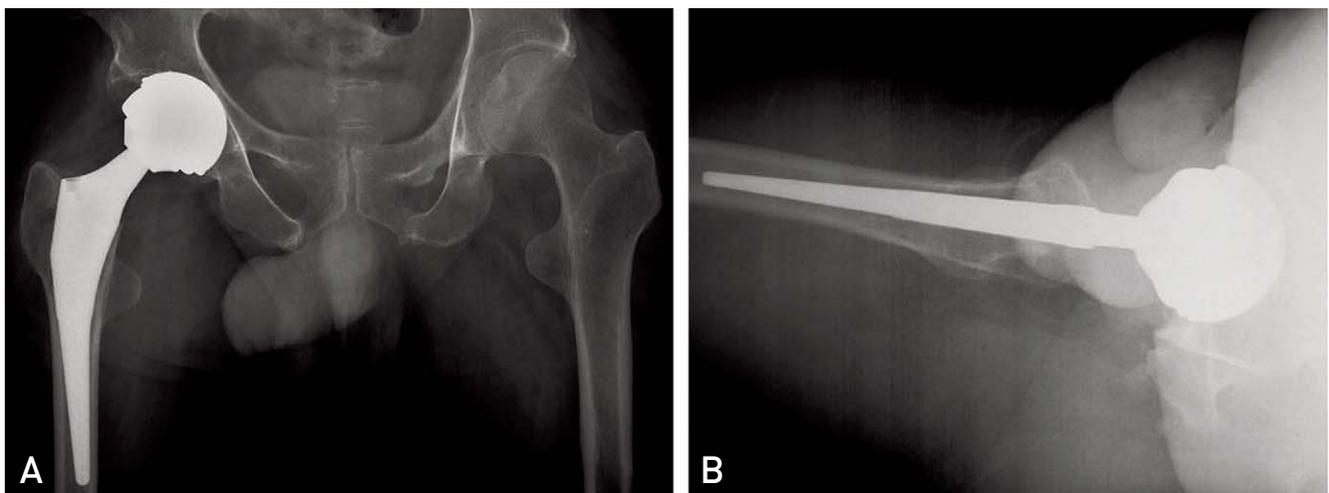
AVN of the femoral head often occurs after trauma, chronic alcohol consumption or steroid usage, or after diver's disease. However, in many cases it is idiopathic<sup>6)</sup>. In the described case, the patient was assumed to have developed AVN of the femoral head due to alcohol abuse, because he had no other risk factor. As far as we were able to determine, the treatment result with THA in AVN of the femoral head affected with poliomyelitis has been reported only in one patient in the English literature<sup>3)</sup>. Because poliomyelitis mainly affects the anterior horn cells of the spinal cord, sensation is intact and intelligence is unaltered, and thus, our patient was

able to carry out our instructions after THA.

Neuromuscular diseases, such as, cerebral palsy, poliomyelitis, and hemiparesis, are of concern when THA is contemplated, because muscle imbalance increases the risks of cement loosening and hip dislocation. The incidence of hip dislocation after THA in patients with neuromuscular disease is unknown, because it is not the procedure of choice in these patients. Frackler and Poss<sup>2)</sup> reported higher than normal dislocation rates for neuromuscular and cognitive disorder patients. They considered muscle weakness, imbalance, and an inability to comply with activity



**Fig. 2.** (A) Preoperative anteroposterior radiograph of both hips showing the crescent sign and sclerotic lesions of the right femoral head. The pelvis was mildly distorted and both proximal femurs were deformed (hip medullary canals were narrow and neck shaft angles were high). (B) Lateral radiograph of the right hip showing the crescent sign on the anterior part of the femoral head.



**Fig. 3.** Plain radiographs taken at two year postoperatively. (A) Both hips anteroposterior and (B) right hip lateral radiographs showing a well bone ingrown acetabular cup and femoral stem. Acetabular abduction and anteversion angles were 57° and 14°, respectively.

restriction to be causative factors. Cabanela and Weber<sup>1)</sup> classified neuromuscular diseases into two categories, those associated with reduced muscle tone, such as, poliomyelitis, Down syndrome, and myelomeningocele, and those associated with increased muscle tone, such as, cerebral palsy, Parkinson's disease, and stroke. In this previous study, 5 THAs were introduced contralateral to hips affected by poliomyelitis, and postoperative results were described to be similar to those of the general population. Furthermore, it was postulated by the authors that reduced activity levels contributed to these results. Spinnickie and Goodman<sup>7)</sup> reported a case of dissociation of the femoral head and trunion after constrained THA in poliomyelitis with intertrochanteric nonunion, which they revised to a 40 mm femoral head and a non-constrained liner with a 15° elevated lip. In our case, a large modular 44 mm metal head was used because large head metal-on-metal systems are stable and offer a wide range of motion due to a larger femoral diameter ( $\geq 38$  mm).

Although metal-on-metal bearing results high levels of cobalt and chrome ions found in the blood stream and urine, and pseudotumours, we thought the risk reduction of dislocation was the main issue in this patient. On the other hand metal-on-metal bearings with a larger femoral head size decrease friction and improve the lubricative features of the prosthesis, which improve abrasion resistance<sup>8)</sup>. Another option for bearing with large diameter head is a ceramic articulation ( $\leq 40$  mm). But ceramic articulation needs more exact acetabular cup positioning and otherwise, squeaking and ceramic fracture can be developed.

According to a recent meta-analysis of 12,203 THA procedures, the dislocation rate of the posterior approach is 3.23% as compared with 2.18% for the anterolateral, 1.27% for the transtrochanteric, and 0.55% for the direct lateral approaches. Thus, in terms of the risk of dislocation, the posterior approach is of greatest concern<sup>8)</sup>. On the other hand, Palan et al<sup>9)</sup> concluded that dislocation rates after the anterolateral and posterior approaches are similar, and postulated that head size is related to dislocation rate.

MI-2-incision THA was introduced several years ago,

and its alleged advantages, which are attributed to no muscle detachment or tenotomy during the surgical approach, are a low dislocation risk and rapid rehabilitation<sup>10)</sup>. Accordingly, we considered that the MI-2-incision THA could be utilized in our patient to minimize of muscle damage to already jeopardized muscles.

Summarizing, THA appears to be a good treatment option for AVN of hips affected by poliomyelitis. However, additional efforts, such as, the use of a large femoral head and a minimally invasive technique, are required to prevent dislocation.

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# 소아마비 환자에서 발생한 대퇴골두 무혈성 괴사증에서 큰 금속 대퇴골두를 이용한 인공 고관절 전치환술 - 증례보고 -

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인공고관절 전치환술은 대퇴골두 무혈성 괴사의 치료 있어 좋은 수단으로 사용되고 있다. 그러나 뇌성 마비나 소아마비 등과 같은 신경근육성 질환이 있는 환자에게는 인공 고관절 전치환술은 술 후 잦은 고관절 탈구가 발생할 수 있어 주의가 요구 된다. 소아마비가 있는 환자에서 병변측에 대퇴골두 무혈성 괴사증이 발생한 경우는 외국 문헌상에는 단지 한례의 보고가 있다. 이에, 저자들은 소아마비가 있는 환자에서 발생한 대퇴골두 무혈성 괴사증을 변형된 최소 침습적 두부위 절개술과 큰 직경의 금속 대퇴골두를 이용한 인공 고관절 전치환술로 치료하였으며, 이에 대해 보고하고자 한다.

**색인단어:** 인공고관절 전치환술, 소아마비, 대퇴골두 무혈성 괴사, 큰 직경의 금속 골두