INTRODUCTION

Since its inception in the 1960’s, total hip arthroplasty (THA) has grown in volume and complexity. Total hip arthroplasty has revolutionized the treatment of end-stage hip arthritis and is felt to be among the most cost effective of all medical interventions available.(1) The complications associated with THA have been increased as a result of increasing life expectancy and widened indications for THA. But the complications related to total hip arthroplasty are not common. Especially vascular injuries are very rare but can cause limb loss or become life threatening. A thorough understanding of the possible complications following total hip arthroplasty aids in optimizing patient outcomes. The occurrence of the complication related to THA has not been emphasized enough in anesthesia literature and has been overlooked in the anesthetic field. So we present a case of a massive retroperitoneal bleed due to a perforation of the external iliac vein during total hip replacement, which resulted in hemorrhagic shock.

CASE REPORT

A 63-year-old female patient (150 cm, 59 kg) was diagnosed as secondary osteoarthritis of left hip joint. She was scheduled to undergo total hip replacement. The patient’s previous medical history entailed ten years of hypertension, which was well-controlled with oral anti-hypertensive drugs. Routine monitors such as electrocardiogram, pulse oxymeter, non-invasive blood pressure were used. Induction of anesthesia was achieved with propofol 120 mg, rocuronium 50 mg intravenously. Anesthesia was maintained with sevoflurane. After loss of all four twitches from the train-of-four obtained by ulnar nerve stimulation, endotracheal intubation was performed. The patient’s lungs were mechanically ventilated with a mixture of nitrous oxide (50%) in oxygen (fresh gas flow rate=3 L/min-1, inspiratory : expiratory ratio=1 : 2). The arterial blood pressure was maintained to be 120~130/60~70 mmHg with the radial artery pressure monitoring. Intraoperative monitoring also included heart rate, central venous pressure (CVP), end-tidal carbon dioxide (EtCO₂), peak airway pressure, urine output, and temperature. Hemoglobin (Hb) con-
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Fig. 1. This figure shows the patient’s distended and tense lower abdomen.

Fig. 2. A CT scan of the abdomen shows large amount of hemoperitoneum and hemoretroperitoneum around liver, spleen and left abdominal wall and pelvic cavity. Active extravasation is noted in the pelvic cavity and abdominal wall hematoma. This figure reveals that active bleeding from the left inferior phrenic artery or vein between the left external iliac and the femoral vein is suggestive.

Centration was 14.6 g/dL before surgical incision, and then 11.7 g/dL 1 hour after operation. Her blood pressure suddenly dropped from 100~130/60~80 mmHg to 50 mmHg of mean arterial pressure during closure of the incision. Tachycardia and low EtCO₂ (20~25 mmHg) were then followed by hypotension. Fluid resuscitation including blood transfusion and vasoressor support were done. However, blood loss was estimated to be about 300~400 mL by external observation of suction bottle, operation field, floor, surgeon’s gown, blood-soaked gauzes and so on. Hb concentration was 8.8 g/dL just before the end of operation.

After removing the surgical drapes and turning the patient to the supine position, we could not find any other serious signs except that she was pale and determined transferring her for computed tomography (CT) to rule out pulmonary embolism. Her vital signs became deteriorated just before exiting operating theater and she was back in the operation room again. We found that her lower abdomen was distended and tense (Fig. 1). An abdominal sonography revealed a huge hematoma in the retroperitoneal and intraperitoneal cavity. Transthoracic echocardiography showed no signs of cardiac dysfunction but hypovolemia. Angiogram with C-arm radiography was performed in the operation room for immediate arterial embolization but no definite source of bleeding was observed. A blind embolization with gelfoam was done via left internal iliac artery but was not so effective. She was transferred for CT and then angiography room with digital fluoroscopy systems. An active extravasation was noted between the left external iliac vein and the left common femoral vein (Fig. 2, 3, 4). She was transferred back to operation room. A laparotomy was undertaken for venous ligation and bleeding control. Until the end of surgery, she was transfused with 35 units of packed red blood cells, 35 units of fresh frozen plasma, and 40 units of platelets. Three weeks later, she was discharged without any further complications.

DISCUSSION

Major vessels may be injured during total hip arthroplasty (THA), although rare. The incidence of blood
Vessel injury has been reported to be approximately 0.1 ~ 0.2%. (2) The most prevalent injury areas are the external iliac artery, the common femoral artery, and the external iliac vein.(3) It occurs frequently in female patients and left hip arthroplasty, and it is associated with infection or resurgery in many cases.(4) The mechanisms that are associated with blood vessel injury include cement incorporation of the iliac vessels, retractor injury, reaming injury, excessive traction on vessels, and improper intrapelvic cup migration, etc. (2,3) It is considered that in this patients, blood vessel injury is caused by the pelvic bone being pushed inward excessively during osteotomy to resect acetabular labrum and osteophyte or transacetabular screw fixation. The injury types are vessel lacerations, thromboembolism, pseudoaneurysm, and arteriovenous fistula. (2,3,5) In acute cases, severe hemorrhage occurs in most cases. The injury that may develop delayed symptoms is broadly divided to three types, and in such cases, symptoms may be developed from few days to few years after surgery. The symptoms are first of all, pain in the hip caused by pressure of pseudoaneurysm, second ischemic symptoms in the affected limb due to impaired blood flow or distal microembolization, and third severe hemorrhage when extracting a hip prosthesis.(4)

Potential mechanism involved in vascular injury include cement incorporation of the iliac vessels, retractor injury, reaming injury, excessive traction on vessels and improper intrapelvic cup migration. (2,3) In this patient, vascular injury might be occurred due to pelvic bone being pushed inward excessively during osteotomy to resect acetabular labrum and osteophyte or transacetabular screw fixation. Types of injuries consisted of vessel lacerations, thromboembolism, pseudoaneurysm, and arteriovenous fistula. (2,3,5) The acute injury most often give rise to severe hemorrhage. Injury causing delayed symptoms are of three types and give rise to symptoms appearing between a few days and several years after the operation.

The external iliac artery and vein travel along the medial surface of psoas muscle obliquely. Several muscles as well as blood vessels are located between the anterior column of acetabulum. The external iliac vein is located more deeply in the medial side, it is located along the pelvic brim, and interposed tissues that protect the artery are not sufficient.(6,7) Nevertheless, actually, cases that the artery rather than the external iliac vein is injured are more prevalent. (3,4,6,8) In other words, it implies that the injury of the vein is not recognized in many cases. Hwang(9) has reported a case who developed shock 26 hours after THA, and by laparotomy, laceration 0.5 cm in size in the external iliac vein could be found. This implies that in cases with injury in the vein, regardless of the size of laceration, the development of shock may be delayed. In cases with intrapelvic arterial damage, severe hemorrhage through the drill hole and hypotension are shown characteristically.(3,4) However, in cases with venous damage, hypotension may not be detected clearly in the lateral position. In such cases, vein injury may be overlooked. Hence, anesthesiologists should pay attention on the hemodynamic state of patients.

The most common mechanism being direct injury from a retractor placed too far medially over the anterior acetabular rim. (2) Injury is less likely with more proximally placed retractors since there is increased soft-tissue coverage by the psoas muscle. Excessive medial acetabular reaming or cement extrusion through a medial acetabular defect(2,3,10) has been reported to result in direct injury to the external iliac vein.(11) Avoidance of the anterior-superior quadrant during insertion of acetabular screw fixation is recommended to avoid injury to the external iliac vessels.
When blood vessel damage occurs in the major vessel, surgical intervention is required. It is important to diagnose early and perform surgical treatments immediately. Surgery may have to terminate immediately, remove drapes, and turn the patient to the supine position. If internal bleeding that is associated with surgery is suspected first, the patient should be managed properly. Moreover, to understand the uncertain condition of patient, immediate sonographical examination performed in the operating room play a very important role in this case. Transthoracic and transesophageal echocardiography may be of great help to understand the hemodynamic state of patients. It is required for anesthesiologists to become familiar with operating ultrasonographic equipment for the rapid diagnosis and management of patients in emergency condition. In addition, beside blood vessel injury, other side effects such as nerve injury, leg-length discrepancy, and instability may be developed. To manage them properly, it is required to maintain a close collaboration with surgeons, and more attentions should be paid on the monitoring of patients.

In conclusion, to understand the anatomical relationship in the vicinity of hip joint and the mechanism of vascular complications may be of help for anesthesiologists to properly manage the patients who are receiving THA.

**ABSTRACT**

고관절 전치환술 동안 발생한 치명적인 외부 장골정맥 손상

이강우 · 조영현 · 이재우

경희대학교 의학전문대학원 마취통증의학교실

63세의 여자 환자가 고관절의 이차성 골관절염으로 인하여 고관절 전치환술을 받기로 하였다. 수술이 끝나갈 무렵 절개부위를 봉합하던 중 환자의 혈압과 혈색소치가 급격히 하락하기 시작하였으며 빈맥과 호기 말 이산화탄소 수치의 하강이 나타났다.
수술이 끝난 후 환자의 피부가 창백한 것을 제외하고는 별다른 이상은 발견할 수 없었으며 보다 자세한 검사를 위하여 전산화 단층촬영, 복부 초음파, 경식도 심장 초음파, 혈관 조영촬영을 시행하였다. 그 결과 좌측 외부 장골정맥과 좌측 총 장골정맥 사이에서 현상 출혈이 관찰되었다. 환자는 즉시 응급 수술을 받았으며 수술 도중 대량 수혈이 시행되었다. 이에 본 저자는 수술 도중 출혈을 거의 동반하지 않은 고관절 전치환술 동안 발생한 외부 장골정맥의 손상에 의한 대량의 뒤 출혈과 출혈성 쇼크를 경험하였기에 보고하는 바이다.

중심단어: 외부 장골정맥, 출혈성 쇼크, 고관절 전치환술

REFERENCES