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Transcatheter Embolization of Traumatic Pseudoaneurysms

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〈국문초록〉

외상성 동맥류의 경피경관색전술

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과거에는 동맥류의 치료에 수술이 최선의 방법이었지만 최근에는 경피경관 색전술이 새로운 치료방법으로 각광을 받고있다. 저자들은 지난 12년 동안 외상성 동맥류 13례를 경피경관색전술로써 치료 하였다.

13례의 혈관분포는 신동맥에 3례, 간동맥, 둔근동맥(gluteal artery), 표재성 측두골동맥(superficial temporal artery)에 각각 2례 그리고 비골동맥(peroneal artery), 위십이지장동맥(gastroduodenal artery), 위대망막동맥(gastroepiploic artery), 영속적 좌골동맥(persistent sciatic artery)에 각각 1례이었다. 이들 중 표재성 측두골동맥 2례, 위대망막동맥 1례, 영속적 좌골동맥 1례는 문헌검토상 경피경관색전술로 치료한 국내외 첫 보고이다.

색전술에 사용한 물질은 gelfoam 절편, steel coil, 분리성 풍선이었으며 모든 환자에서 특이할 만한 합병증 없이 성공적으로 치료 되었다. 경피경관색전술은 외상성 동맥류 치료에 안전하고 효과적인 치료방법이라 사료된다.

Index Words : Arteries, Therapeutic Blockade 9,1299
Artery, Trauma, Aneurysm

Introduction

Surgery had been the treatment of choice for arterial pseudoaneurysms before the advent of transcatheter arterial embolization(TAE). Recently, TAE proved to be a simple, safe, and effective method of the treatment(1–5). We present 13 cases of arterial traumatic pseudoaneurysm, treated by TAE.

Their vascular territories are as follows: hepatic artery, superficial temporal artery, renal artery, peroneal artery, gastroduodenal artery, gastroepiploic artery, superior gluteal artery and persistent sciatic artery. Embolization of pseudoaneurysms of the persistent sciatic artery, gastroepiploic artery, and superficial temporal

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artery which have not previously been reported will be discussed in detail.

Materials and Methods

Since 1977, we have treated a total of 13 patients (6 cases at Chonbuk National University Hospital, 5 at the Hospital of the University of Pennsylvania, 1 at Seoul National University Hospital, and 1 at Won Kwang University Hospital) with traumatic arterial pseudoaneurysm by TAE.

There were 8 male and 5 female patients, ranging from 14 to 78 years of age.

Five cases resulted from previous surgical procedures, 7 cases from blunt trauma, and 1 case from multiple stab wounds(Table 1). All patients underwent diagnostic arteriography and TAE at the same sitting. After selection of the feeding artery, we used gelfoam, steel coils, a detachable balloon or combinations thereof for occlusion of the feeding artery.

Results

Thirteen patients were treated successfully with TAE. We used gelfoam in 3 cases, steel coils in 7 cases, gelfoam and steel coils in 2 cases, and a detachable balloon in 1 case(Table 1).

Patient 1 complained of a progressively enlarging pulsatile mass in the left gluteal region after blunt trauma 3 years ago. Numbness and radiating pain to the left lower extremity appeared 3 months before admission. Clinical examination revealed a pulsatile mass, measuring 20×15 cm by palpation. CT demonstrated an aneurysm situated between the gluteal muscles(Fig. 1). The initial angiogram revealed a huge aneurysm arising from the persistent sciatic artery. Initial

Table 1. Data on Patients with Arterial Pseudoaneurysms

Patient Age (y)/ Sex	Involved Artery	Etiology	Clinical Presentation	Embolization Material	Follow-up(mo), Subsequent Tx necessary
1/67/F	Persistent sciatic	blunt trauma	growing pulsating mass	detachable balloon	27*
2/14/F	Rt. superficial temporal	blunt trauma	pulsating mass	gelfoam	17, no further therapy
3/18/M	Lt. superficial temporal	blunt trauma	growing pulsating mass	coil	19, no further therapy
4/61/F	Lt. gastroepiploic	surgery(Sugiura Op)	hematemesis	gelfoam×coil	17, no further therapy
5/50/F	Gastroduodenal	surgery(unknown Op)	hematemesis	coil	lost
6/49/M	Rt. hepatic	blunt trauma	hematemesis	gelfoam	24, no further therapy
7/78/M	Rt. hepatic	choledocostomy	bleeding(tube)	gelfoam×coil	36, no further therapy
8/22/M	Rt. renal	blunt trauma	hematuria	coil	lost
9/57/F	Rt. renal	nephrostomy	hematuria	coil	24**
10/57/M	Lt. renal	nephrostomy	hematuria	gelfoam	4, no further therapy
11/23/M	Lt. peroneal	stab wound	calf swelling	coil	lost
12/51/M	Rt. superior gluteal	blunt trauma	painful swelling	coil	48, no further therapy
13/46/M	Lt. superior gluteal	blunt trauma	painful swelling	coil	5, no further therapy

* Percutaneous aspiration of a liquefied blood clot.
** Died of lymphoma 2 years after embolization.

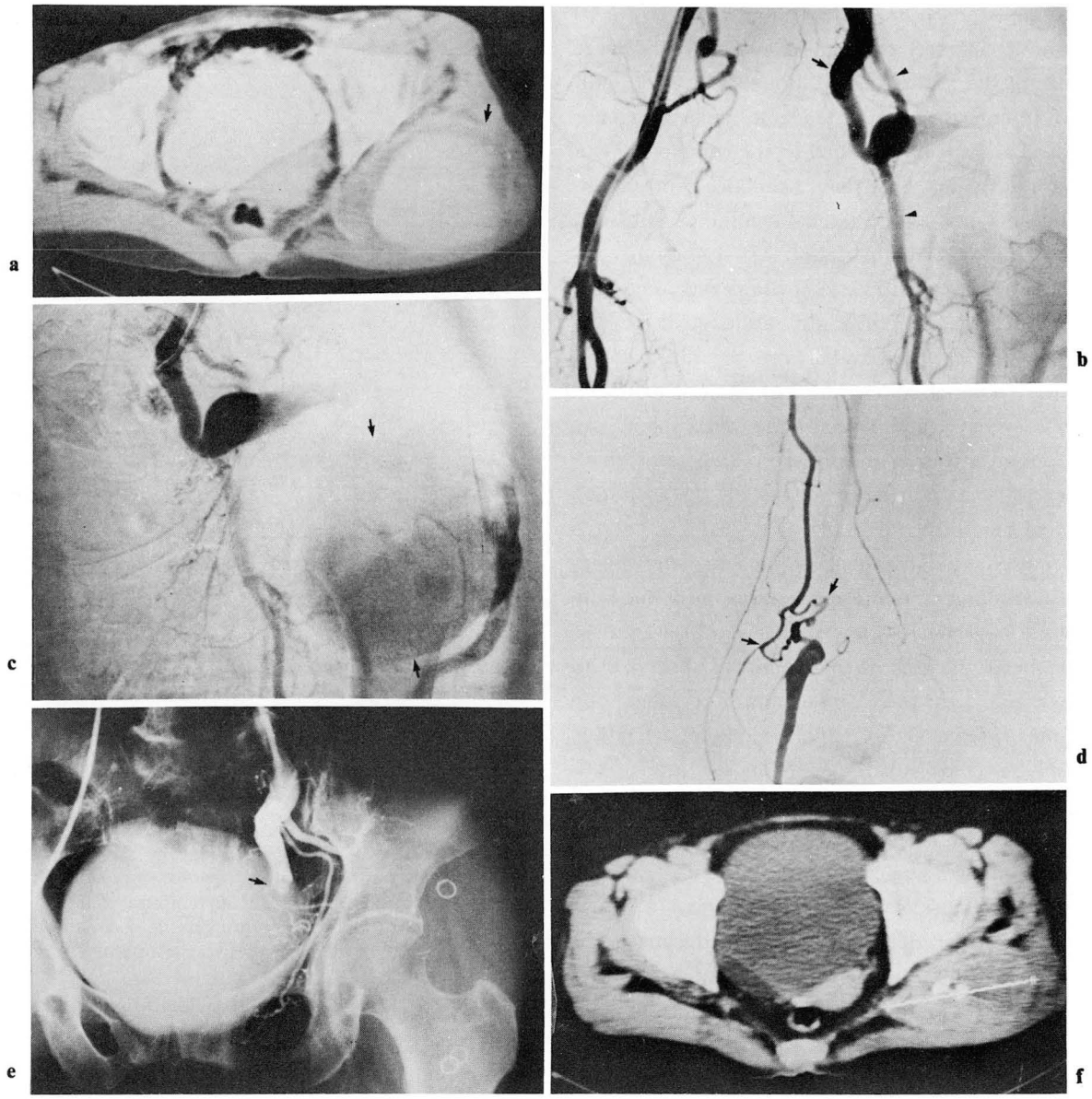

Fig. 1. Patient 1.
a. Postcontrast CT scan shows a mass (arrow) with enhancing center and peripheral low density between the gluteal muscles.
b. Left internal iliac artery (arrow) is arteriomegalic and left external iliac and femoral arteries (arrow heads) are hypoplastic compared with the right side.
c. Selective left internal iliac arteriogram reveals huge aneurysm (arrows) arising from the tortuous persistent sciatic artery.
d. Left superficial femoral artery is connected with the popliteal artery via small collaterals(arrows).
e. Selective left internal iliac arteriogram after embolization demonstrates complete occlusion(arrow) of the feeding artery. Three coils are within the pseudoaneurysm.
f. CT after percutaneous drainage of liquefied blood clot shows that the aneurysm decreased in size and volume.

attempts to occlude the feeding artery with 10 mm×5 cm steel coils failed owing to the large size of the feeding artery, but embolization with a 14 mm Debrun detachable balloon(Ingenor Medical Systems) resulted in the complete occlusion of the feeding artery. Numbness and radiating pain and other clinical symptoms subsided gradually after embolization. On a 4-month follow-up CT scan, the size of the pseudoaneurysm was decreased significantly, although there was still some asymmetry between the hips. Therefore, 180 cc of a chocolate-colored liquefied blood clot were removed from the aneurysmal sac through a 6 French drainage pigtail catheter after a follow-up arteriogram, solving the asymmetry of her hips.

Patient 2 sustained trauma to the head, undergoing a subduroperitoneal shunt for subdural hygroma. Two weeks later a pulsatile mass on her right preauricular area was observed. An external carotid angiogram revealed an andeurysm of the superficial temporal artery(Fig. 2). Selected superficial temporal artery was occluded with gelfoam particles(1×1×2 mm) through a 6 French Head-hunter catheter. Three days after embolization, the initial 10×8 mm palpable mass collapsed, and showed a bluish skin discoloration. After 20 days, the mass and skin discoloration disappeared completely, leaving a small scar at the site. Patient 3 complained of a slow growing pulsatile mass on the left preauricular area, resulting from blunt trauma. Selective embolization was performed with a 5 mm, 5 cm steel coil(Cook) through a 6 French Head-hunter catheter without difficulty(Fig. 3). After 20 days, the initial 15×12 mm palpable mass disappeared completely without skin discoloration.

Patient 4 was admitted with hematemesis. She had previously had splenectomy and esophageal transection with paraesophageal devascularization(the so-called Sugiura procedure) for

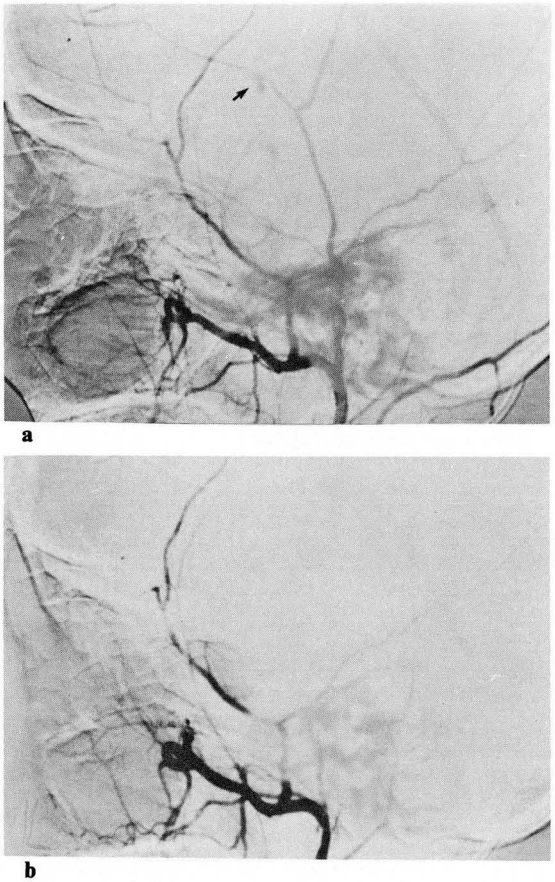

Fig. 2. Patient 2.
a. Right external carotid arteriogram shows oval shaped aneurysm containing thrombus(arrow) from frontal branch of the superficial temporal artery.
b. Postembolization arteriogram reveals occlusion of the proximal part of the superficial temporal artery.

esophageal variceal bleeding. Celiac angiography showed a pseudoaneurysm arising from the left gastroepiploic artery, it was successfully embolized with Gelfoam particles and a 3 mm steel coil into the distal splenic artery stump(Fig. 4). There was no recurrence of the pseudoaneurysm.

In 10 of the 13 patients, embolization was definitive therapy and surgery was avoided completely. In one patient, percutaneous aspiration of a liquefied blood clot was performed 4 months after embolization. No major complications were noted in any patient.

Of the 13 patients, three were lost to follow-up.

We followed up the remaining 10 patients by arteriography in 5 cases and by clinical examination in 5 cases longer than 14 months. The mean-follow up period is 28 months. Of these 10 patients, 1 had died of lymphoma 2 years after embolization, and 9 did well so far without further treatment.

Discussion

The value and effectiveness of TAE for the treatment of aneurysms and pseudoaneurysms have been demonstrated in the literature inter-

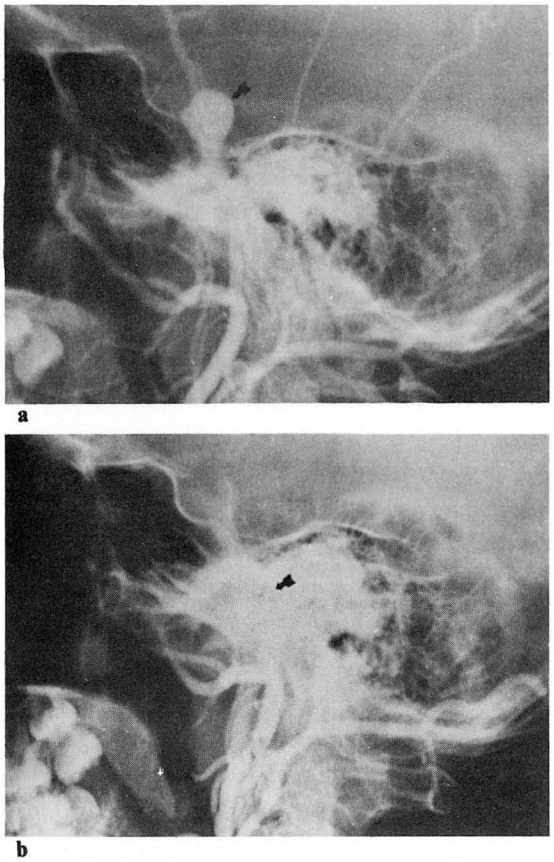

Fig. 3. Patient 3.
a. Left external carotid arteriogram shows an aneurysm from proximal part of the superficial temporal artery(arrow).
b. Postembolization arteriogram reveals complete occlusion of the aneurysm (arrow).

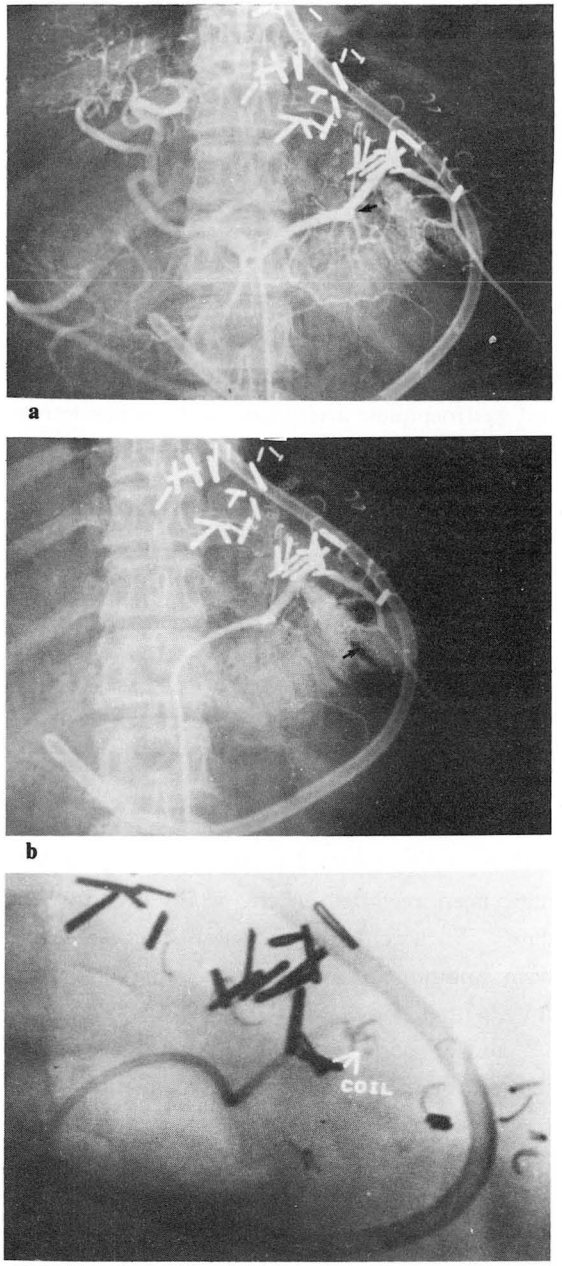

Fig. 4. Patient 4.
a. Postsplenectomy state and splenic artery was ligated at its third part(arrow).
b. Superselective left gastroepiploic arteriogram shows a pseudoaneurysm (arrow) and extravasation of the contrast media into the stomach.
C. Successful occlusion with a 3 mm coil(arrow) and Gelfoam particles.

mittently in different vascular territories, such as the hepatic artery, splenic artery, mesenteric artery, renal artery, gastroduodenal artery, pancreatic artery, left gastric artery, bronchial artery, internal carotid artery, internal maxillary artery, and extremity arteries[1~16].

Our experience with cases 5 through 11 seemed to support that opinion. To the best of our knowledge, the use of this modality to treat aneurysms and pseudoaneurysms of the persistent sciatic artery, superficial temporal artery, and gastroepiploic artery has not been previously reported.

The sciatic artery constitutes the arterial supply to the lower extremity during early embryologic development and can persist in adults in a complete or incomplete form. Although the persistent sciatic artery is very rare, it is commonly affected by atherosclerosis and aneurysms. The incidence of aneurysms in sciatic arteries is as high as 28 %, and the aneurysms are always located in the gluteal area at the level of the greater trochanter[17].

Thirty-nine cases of persistent sciatic artery have been recorded in the world literature to date[17~23]. Twenty-two of these 39 cases have been anatomic descriptions of cadaver dissections without any clinical data. Of the remaining 17 clinical cases, 13 were found to have persistent sciatic artery aneurysms. In one of these patients, acute rupture of the aneurysm caused death; the others were treated by surgery.

The conventional treatment has been ligation with or without end-to-end graft of the sciatic artery in the aneurysmal bed, or ligation and resection of the sciatic artery aneurysm with femoropoplteal vein bypass[21]. It was possible to successfully and safely treat patient 1 with TAE because there was adequate collateral blood supply to the lower extremity via the superficial femoral artery.

The course of the supericial temporal artery is relatively long and runs between the skull and the subcutaneous tissues with only inconstant cushioning by the temporalis muscles. An excellent review of the world literature on temporal artery aneurysms was presented by Schechter and Gutstern in 1970[14]. According to them, 131 cases of superficial temporal artery aneurysms were reported until 1970, and 92 % of them were pseudoaneurysms. The conventional treatrment has been excision of the pseudoaneurysm. We were able to treat patients 1 and 2 with TAE for the first time with excellent results.

TAE of gastroepiploic artery pseudoaneurysm has not previously been reported. In case 4, we obtained good results by occluding the proximal and distal arteries simultaneously to prevent retrograde circulation via the opposite epiploic artery.

Although there are a large number of embolization materials available, no one material is ideal in all cases. We tried to occlude the feeding artery with steel coils first because of their ready availability, along with the fact that they are relatively and easy to handle, but in the case of tortuous or small feeding arteries that is not sufficient to insert the coils gelfoam particles were used. A detachable balloon was used in one case in which embolization with large steel coils was not effective.

We embolized only the feeding artery of the pseudoaneurysm in 8 cases used steel coils or a detachable balloon, and the feeding artery as well as distal artery to the pseudoaneurysm in 5 cases used gelfoam particles.

Diagnostic angiography should be encouraged in the evaluation of posttraumatic or surgical complications. When pseudoaneurysms are uncovered, they can usually be safely and successfully treated at that time by selective embolization.

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