Peripheral pseudoaneurysm is a common complication of both diagnostic and therapeutic procedures performed by interventional radiologist and cardiologist [1-2]. We report two cases of pseudoaneurysms of subclavian and superficial femoral arteries successfully treated by percutaneous endovascular stenting. A self-expanding Wallgraft endoprosthesis was deployed under fluoroscopic monitoring. Immediate occlusion of the aneurysm was confirmed at the follow-up angiography. Endovascular treatment of peripheral pseudoaneurysm appears to be a good alternative to surgery especially in high-risk patients, with a high technical success rate and low morbidity.

Key words: Pseudoaneurysm; Stent graft

CASE REPORT

Case 1

A 53-year old female with congestive heart failure, FcIII and pulmonary edema underwent cardiac catheterization. She was diagnosed to have a triple vessels coronary artery disease with left main coronary artery stenosis. Coronary artery bypass graft surgery was performed and the left internal mammary artery was grafted to the left anterior descending coronary artery. Five days later, her blood pressure dropped to 69/43 mmHg, therefore blood transfusion, fluid challenge, and intra-arterial balloon pump catheter was inserted through the right femoral artery. Urgent re-exploratory pericardiotomy was performed with surgical findings of massive pericardial and pleural hemorrhages due to ruptured left internal mammary artery that was then ligated. One week later, acute renal failure was noted and she underwent hemodialysis and was discharged 18 days later. However, she visited our emergency room one day later with the chief complaint of productive cough and decreased urine output. Chest radiograph showed cardiomegaly with pulmonary edema and she was intubated for respiratory failure. On examination, there was a large pulsatile mass at the right groin and the patient was referred to the radiology department for angiography. Ultrasound
(US)-guided compression on the lesion was done for 30 minutes but in vain. Selective right femoral angiography through the contralateral left femoral puncture demonstrated a pseudoaneurysm of the superficial femoral artery measuring about 6mm in diameter near the bifurcation of the profunda femoris and lateral circumflex femoral artery (Fig. 1a). The angiographic catheter was exchanged with 10Fr vascular sheath (Terumo, Tokyo, Japan) through the guidewire. A self-expanding Wallgraft endoprosthesis 7x30mm diameter (Boston Scientific, USA) was advanced over the guidewire and positioned at the area of the lesion. Gradual stent deployment under fluoroscopic guidance was done smoothly. Implantation of the endovascular graft resulted in successful exclusion of the pseudoaneurysm, which was confirmed by post-stenting angiogram (Fig. 1b, 1c). The patient was transferred to another hospital and we were not able to follow-up her.

Case 2

A 40-year old male prisoner visited our outpatient department with a chief complaint of odynophagia for a few months. Chest routine examination showed a right paratracheal mass while CT scan revealed a well marginated soft tissue mass measuring about 4X5cm in size with minimal peripheral calcifications. Small area of homogeneous vascular like enhancement was noted at the post-contrast study. After plain film and CT study, differential diagnoses of pseudoaneurysm of right subclavian artery with thrombus formation and intrathoracic goiter was considered. The patient underwent exploratory mediastinotomy and a mass with arterial origin from right subclavian artery was found, thus surgical resection was not performed. He was referred to our department and thoracic aortography confirmed the diagnosis of right subclavian artery pseudoaneurysm (Fig. 2a). The diameter of right subclavian artery was 8mm while the size of the pseudoaneurysm was 20X50mm with neck diameter of 4mm. Percutaneous endovascular graft stent placement was advised. Three days later, repeated angiography via right brachial puncture with retrograde catheterization to right innominate artery was performed. After the location of the pseudoaneurysm was confirmed, the angiographic catheter was replaced by a 10 Fr vascular sheath (Terumo, Tokyo Japan) through a

Figure 1. a. Right femoral angiogram shows pseudoaneurysm of the superficial femoral artery (arrows) b. Plain radiograph demonstrates a Wallgraft stent prosthesis (7 x 30mm) implanted at the area of superficial femoral artery (arrows) c. Post graft-stenting angiogram shows immediate exclusion of the pseudoaneurysm
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guidewire. A self-expanding 8 X 50mm Wallgraft endoprostheses (Boston Scientific, USA) was passed through the sheath and positioned at the level of the targeted lesion (Fig. 2b). Deployment of the stent was done under fluoroscopy and post-stent graft implantation angiogram demonstrated successful exclusion of the pseudoaneurysm (Fig. 2c). The patient was discharged two days later with partial improvement of odynophagia, and he did not comeback to our hospital for follow up after discharge.

DISCUSSION

Pseudoaneurysm can develop as a result of trauma, inflammation, tumors, or interventional procedures. The standard treatment of peripheral pseudoaneurysm is surgical repair. However, the role of surgery became less important after the development of less invasive methods of treatment such as ultrasound guided compression, thrombin injection, and endovascular placement of coil or detachable balloons [5-9]. Nowadays, percutaneous endovascular stent-graft placement is becoming popular as a therapeutic option in the management of pseudoaneurysm or arteriovenous fistula [10-12]. The procedure can be done under local anesthesia and it is well tolerated by some high-risk patients. In our case 1, the cause of femoral artery pseudoaneurysm was intra-arterial balloon pump insertion and it presented as a pulsatile mass at right groin one day after removal of the catheter. The incidence of post-catheterization pseudoaneurysm varies from 0.05% to 14% [1,13-15]. Previous reports showed that most post-catheterization pseudoaneurysms occurred at the groin region because the majority of arterial catheterization was done through the femoral artery. However, recently, radial puncture has been used for cardiac catheterization procedures and this may probably lower the complication rate. Evidence showed that the incidence of pseudoaneurysm at superficial and deep femoral arteries was higher than at common femoral artery. This is related to the anatomical support provided by the femoral head to the common femoral artery during compression after the procedure, while lack of support by the femoral head to the superficial and deep femoral arteries [16-17]. The formation of pseudoaneurysm at right superficial femoral artery in our case 1 was secondary to intra-arterial balloon pump catheter insertion, and most probably due to poor external compression after catheter removal.

Ultrasound (US) guided compression of the femoral pseudoaneurysm was first described by Fellmeth et al in 1991 [18] and has become the procedure of choice for the treatment of pseudoaneurysm since the past decade. The main factor that determines the success rate of US-guided compression is the coagulation status of the patient at the time of compression, and the reason why case 1 US-guided compression failed was probably that she was under coagulation therapy. Nevertheless, the use of US-guided compression in the treatment of femoral pseudoaneurysm has a technical success rate of 63-88% [5-6].

The way of endoluminal management of pseudoaneurysm depends on the inexpedability or expendability of the donor artery. In cases of inexp-
pendable donor artery with narrowed neck, coil embolization is the treatment of choice. In a wider neck pseudoaneurysm, stent graft placement or embolization with stent and balloon remodeling is indicated. If the donor artery is expendable artery without collateral supply, proximal embolization of the donor artery is effective to occlude the lesion. In the presence of collateral supply, both proximal and distal embolization of donor artery is needed to exclude the pseudoaneurysm.

There are two manufactured vascular stents marketed at Taiwan. The Wallgraft endoprosthesis has expandable stent diameter ranging from 5mm to 12mm and length from 20mm to 70mm. The other one is Fluency vascular stent graft by Bard USA, which has expandable stent diameter ranging from 6mm to 10mm and stent length from 40mm to 80mm. Radiopaque marker bands on the interior and exterior tubes aid in monitoring during deployment of the stent that may have a radiopaque core to improve radiopacity. The interior tube of the coaxial system contains central lumen that can accommodate a 0.035 in guidewire. It has 2mm bare flared graft ends to minimize the risk of dislocation. The Wasstent graft is composed of biomedical superalloy monofilament wire, braided in a tubular mesh configuration, while the Fluency vascular stent is made of nitinol skeleton encapsulated with two ultra-thin ePTFE layers. They are both MRI compatible and will not affect the image quality.

The use of percutaneous implantation of endovascular covered stents in 16 cases of postcatheterization femoral pseudoaneurysms was reported by Thalhammer et al with technical success rate of 100%. However, during the follow-up period, four patients (17%) developed stent occlusion and one patient underwent thromboendarterectomy after removal of stent. The other three patients were asymptomatic, probably due to good collateralization from the deep femoral artery.

Injury to the subclavian artery is relatively uncommon and can be result of penetrating trauma. Surgical repairment is difficult because it has close relationship to brachial plexus and this area is usually associated with traumatized surrounding structures and hematomas. Standard open surgical approach includes clavicular resection, medial sternotomy and thoracotomy [19]. Patel et al reported five patients with pseudoaneurysms of the subclavian artery successfully treated with endovascular stent graft using polytetraflouroethylene grafts and Palmaz stents [20]. Their technical success rate was 100% and patent grafts was noted during a follow-up period ranging from 7 to 30 months (mean 19 months). One procedure-related complication was managed by a brachial artery patch angioplasty at the site of device insertion, while another patient developed a stent fracture at 8 months follow up that was treated with insertion of a second stent. Hilfiker et al [12] reported nine patients with subclavian artery pseudoaneurysm or fistulas treated with stent-graft. The causes of subclavian artery lesions were traumatic injuries (n=6), atherosclerotic aneurysm (n=2), and arteriovenous malformation (n=1). Five of the six traumatic injuries were due to iatrogenic causes. Major procedure-related complications in their patients with groin pseudoaneurysms requiring surgical repairment occurred in two patients. All patients had patent stent-grafts at a mean follow-up of 29 months (range, 22 months to 5.5 years). Subclavian pseudoaneurysms caused by percutaneous internal jugular vein cannulation and secondary to mycotic infection in an immunosuppressed patient have also been reported in literature [21-22]. Our patient with subclavian artery pseudoaneurysm has no previous history of trauma or intervention, therefore we presumed that the cause of the pseudoaneurysm was probably atherosclerosis.

Before deployment of endoprosthesis stent graft, the potential risk of major branches of subclavian artery such as vertebral artery must be considered, and we should try our best not to occlude this artery. Thoracic aortography is necessary in order to delineate the relationship of the vertebral artery and the lesion. As for pseudoaneurysms of the femoral arteries, extreme elongation and tortuosity of the iliac artery and location of the pseudoaneurysm close to the femoral arterial bifurcation were regarded as contraindications of stent-graft procedure [11]. Complications of percutaneous endovascular graft stents implantation include stent occlusion, stent deformation and kinking, involuntary occlusion of the side branches after stent placement. Intimal hyperplasia after stent implantation has also been reported [11, 23-25].

In conclusion, implantation of endovascular stent-graft is an effective and safe method for the treatment of peripheral pseudoaneurysms. Its minimally invasive nature is helpful especially for high-risk patients. It provides a good alternative to surgical repairment, and should be considered as an ideal treatment of choice.
REFERENCES


以包覆性支架來進行周邊偽血管瘤之血管內治療

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周邊偽血管瘤是一個介人性放射科醫師及心臟內科醫師不管是在診斷或治療過程中常見的併發症。
我們報告二例藉由使用包覆性支架成功地治療鎖骨下動脈及股動脈偽血管瘤。將可自行擴張之包覆性支架置入周邊偽血管瘤處，緊接性血管攝影証實偽血管瘤被阻塞掉了。
在一些高危險性的病人，由於血管內周邊偽血管瘤的治療之高技術成功率及低併發症，是一個取代外科治療不錯的選擇。

關鍵詞：偽血管瘤；支架