Thrombin obliteration of subclavian artery aneurysm with intravascular balloon protection

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False aneurysms of the subclavian artery are relatively rare. They are usually either the result of penetrating or blunt trauma or iatrogenic [1, 2]. Various anatomical structures in the vicinity of the subclavian artery are responsible for complex and heterogeneous clinical symptoms. A considerable part of the clinical picture may be the result of microembolisation. The classical surgical procedure associated with resection and reconstruction of the damaged artery has been nowadays replaced by miniminvasive procedures. These are either percutaneous ultrasound-guided thrombin injection, endovascular coil embolisation, or covered stent placement. This patient has been treated with a combined endovascular and percutaneous ultrasound-guided approach.

Case report

A 56-year-old man with a history of hypertension presented with pain in the neck and suprascapular region. The patient gave a history of blunt trauma of this region some two weeks earlier. He was crushed incidentally by another man, following an episode of alcohol abuse.

Ultrasound study of the supraclavicular area showed a false aneurysm of the right subclavian artery. Further details were obtained upon CT angiography (Fig. 1). The patient was scheduled for endovascular treatment. The angiogram of the aortic arch performed via the left common femoral artery demonstrated false aneurysm. However, even selective angiogram of the right subclavian and right common carotid arteries could not precisely visualise the aneurysm neck. Then subclavian artery aneurysm was directly punctured under ultrasound guidance, and a selective angiogram was performed. This depicted exactly the false aneurysm neck in the right subclavian artery. In order to avoid thrombin backflow to the subclavian/carotid vessels, a balloon was placed in the right subclavian artery.
The balloon was expanded and – simultaneously – Doppler ultrasonography examination under the control of colour-coded ultrasonography was performed in order to verify that the flow in the aneurysm had ceased. This indicated that the catheter balloon was in the proper position and the aneurysm obliteration by thrombin could be securely performed. 400 units of bovine thrombin were administered through a needle into the aneurysm sac. The control angiogram demonstrated patent subclavian and common carotid arteries. Neither the angiogram nor ultrasound demonstrated blood flow within the false aneurysm. On the second day, control CT angiography was carried out, which confirmed the exclusion of the right subclavian artery false aneurysm (Fig. 2). On the first postoperative day, Horner’s syndrome signs were observed. They gradually withdrew within 21 days. Follow-up ultrasonography examination was performed following 1, 3, 6, 12 and 24 months. These examinations did not indicate flow within the aneurysm, but gradual diminution of the thrombosed aneurysmal sac was observed.

Discussion

Open surgical treatment of subclavian artery aneurysms is a technically complicated procedure. The most commonly used option is ligation of the proximal part of the subclavian artery. Following aneurysm excision, blood flow is usually restored with an inlay prosthesis – either a synthetic or an autologous venous graft. In the case of a large massive an-
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eurysm, such a procedure is often impossible to perform. In such a case blood flow is restored interposition of the subclavian artery to the carotid artery or by carotid-subclavian or subclavian-subclavian bypass. These complicated surgical procedures usually require thoracotomy and sternotomy, often complemented with an additional supraclavicular incision. The risk of such an operation in circulatory compromised patients is significant [3].

The development of endovascular techniques significantly facilitated treatment of subclavian artery aneurysms. The use of stent grafts enables simultaneous aneurysm exclusion and anatomical reconstruction of blood flow. The follow-up period of the patients after the operation in general does not exceed 3 years. Therefore long-term results are still unknown. Open surgery for subclavian artery aneurysm management is relatively rarely used. In order to protect the patient from these complications, an endovascular balloon was expanded in the subclavian artery, with subsequent aneurysm neck closure. This technique had been previously applied in the embolisation of femoral artery false aneurysms [8]. From a vascular surgeon’s point of view, this method of subclavian artery false aneurysm management is relatively simple, efficacious and safe. Over a one-year follow-up period the procedure efficacy was confirmed.

Taking into account a variety of complicated therapeutic methods – stent graft implantation, bypass surgery – we regard the thrombin injection method as a technically very simple solution. It is also undoubtedly the cheapest one. Due to the low incidence of subclavian artery false aneurysms, precise analysis of treatment results would demand multi-centre cooperation.

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