Permanent pacemaker wires causing subclavian vein stenosis in presence of AV fistula—is it ever wrong to try angioplasty and stenting?

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Introduction

A reliable vascular access, preferably a Brescia–Cimino arteriovenous (AV) fistula, is the lifeline for haemodialysis patients. Fistula function may be impaired by subclavian stenosis or occlusion, mainly due to previous subclavian cannulation for temporary vascular access [1]. The demographic changes that take place in the current dialysis population are characterized by a growing proportion of older patients, an increasing survival time, and a significant cardiovascular comorbidity. For these reasons the coincidence of an ipsilateral arteriovenous fistula and pacemaker wires will become more common and of increasing practical interest. Recently, a case report was published in this journal where the dilatation of a subclavian stenosis in the presence of permanent pacing wires was felt to be hazardous and the insertion of a stent impossible [2]. We present a case of successful treatment with balloon angioplasty (PTA) and stent insertion to make the point that this manoeuvre is advisable even in such difficult cases.

Case Report

A 69-year-old woman suffering from chronic renal failure due to chronic glomerulonephritis started haemodialysis treatment in September 1970 with a Brescia–Cimino side-to-side AV fistula above the left wrist. In 1982, 4 years after a successful renal transplantation, a Mobitz type II heart block required a cardiac pacemaker, which was introduced via the left subclavian vein while the ipsilateral AV fistula was functioning well. The pacemaker generator was replaced in 1989.

In May 1994, haemodialysis treatment was restarted after chronic rejection of the transplanted kidney. A change of the dual-lumen cardiac pacemaker became necessary at the beginning of June 1995 due to impending loss of function of one of the wires. The two pacemaker wires could not be removed and were left in situ. A venography performed prior to the change of the pacemaker did not reveal any pathomorphological alteration of the subclavian vein at that time (Figure 1). Native X-ray demonstrated an advanced calcification of the arteries in the forearm (Figure 2). In late June 1995 a pre-existing, now clinically relevant decreased arterial blood volume of the AV fistula was observed. An additional, complementary side-to-side anastomosis between the dilated, widely calcified radial artery and the cephalic antebrachial vein below the elbow region was constructed.

In March 1996, the patient presented significant clinical symptoms of venous hypertension in the left arm: a swelling from the hand up to the shoulder with venous collateralization and an increase in venous pressure during dialysis treatment. An angiography revealed a 70% stenosis of the subclavian vein at the entrance of the pacemaker wires and close to the junction with the internal jugular vein (Figure 3a).

While permanent ECG monitoring was performed, the stenosis was passed by a guide-wire and a multipurpose catheter. After introduction of a 9F sheath, the stenosis was first dilated by a 10-mm non-profile balloon catheter (Meadoc Inc., Denmark). Next, a 12-mm wide and 3-cm long self-expanding stent (Wallstent, Schneider Inc., Zürich, Switzerland) was implanted across the lesion and was dilated in place by use of a 10-mm balloon catheter. Collateral flow, which was present prior to the intervention, dramatically decreased after stenting, indicating haemodynamic improvement (Figure 3b, c). The complete intervention was done via an AV fistula vein from an elbow cannulation site which was closed by a single suture after removal of all material; 5000 IU of heparin were administered intravenously during the intervention. Pacemaker function was tested after the procedure and no abnormalities were detected. Haemodialysis treatment was performed on the same day via the AV fistula and the patient was discharged 1 day later.
Venous hypertension due to subclavian stenosis/occlusion in haemodialysis patients with a history of previous subclavian cannulation for temporary vascular access and an ipsilateral AV fistula is a well-known complication. Therefore, subclavian cannulation should be abandoned [1,3]. Several techniques were described for surgical repair of subclavian obstruction [4–6]. During recent years, successful interventional procedures like balloon angioplasty and stent placement have largely replaced major surgery in these mostly multimorbid patients [7].

Patients on maintenance chronic haemodialysis treatment are often elderly, and present intrinsic cardiac disease frequently requiring a permanent cardiac pacemaker. The coincidence of an ipsilateral AV fistula and pacemaker wires inserted into the subclavian vein may cause central venous obstruction as reported first by Korzets et al. [8]. They solved the problem by ligation of the ipsilateral AV fistula and by construction of a new AV fistula in the contralateral arm. Deighan et al. recently presented a case of unsuspected subclavian vein stenosis due to a permanent pacing wire. Dilatation was felt to be hazardous and stent placement impossible [2].

In our case the insertion of the pacemaker became necessary during the 4th year of a 16-year period of successful renal transplantation. Obviously, minor attention was payed at that time to the presence of the clinical signs of subclavian restenosis. The function of the permanent pacemaker was found to be normal.
Permanent pacemaker wires causing subclavian vein stenosis in presence of AV fistula—is it ever wrong to try angioplasty and stenting? 1737

well-functioning ipsilateral AV fistula. After recommencement of maintenance haemodialysis, the pacemaker was replaced and an additional AV fistula was constructed to overcome the problem of decreased arterial output due to arterial calcification. Nine months later, signs of venous hypertension were observed, caused by a subclavian stenosis secondary to the four pacemaker wires.

Prior to the interventional procedure main risks were seen from the potential risk of damaging the pacemaker wires, on the one hand by the angioplasty balloon, and on the other hand by the stent itself.

Theoretically, permanent pacemakers can cause an initial endothelial injury at the point of insertion of the pacemaker into the subclavian vein, resulting in excessive proliferation of fibrous tissue around the electrode. It may be speculated that the increased blood flow following the revision of the arteriovenous fistula has contributed to the development of the subclavian stenosis in our patient. The alternative to create a new AV fistula in the contralateral arm was abandoned due to the loss of suitable veins and the advanced calcification of the arterial system. Thus, ligation of the ipsilateral AV fistula would not have solved the problem, and preservation of the existing vascular access was mandatory. Furthermore, the patient was found unsuitable for major surgery due to advanced age and cardiovascular disease.

Conclusions

The insertion of a permanent pacemaker in patients on chronic haemodialysis treatment should be avoided in the presence of an ipsilateral arteriovenous fistula. This may be of special interest in patients with a successful renal transplant, where only little attention is paid to a functioning ipsilateral AV fistula.

Percutaneous transluminal angioplasty and stent placement proved successful for treatment of subclavian stenosis with an ipsilateral AV fistula, even in the presence of permanent pacemaker wires. ECG monitoring and stand-by of a vascular surgeon and a cardiologist as well as an intensive care unit for monitoring after the procedure are required.

References


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