Radiotherapy-related axillary arteriopathy

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Abstract

Treatment of breast cancer involves surgery, then perhaps radiation, hormonal or chemotherapy. Radiation-induced arterial injury is a well-known entity that represents a rare cause of arterial occlusion. We present the case of a 76-year old woman who complained of a severe intermittent claudication of the right upper limb. Twenty years before, she underwent a right-sided radical mastectomy followed by intense radiation therapy for several weeks. The patient was found to suffer of a radiotherapy-related axillary artery thrombosis and was successfully treated by angioplasty and stenting.

Keywords: Axillary artery • Subclavian artery • Stenosis • Thrombosis • Angioplasty • Endovascular treatment • Radiotherapy • Breast cancer

INTRODUCTION

Radiotherapy-related arteriopathy (RA) represents an underestimated entity whose incidence is in progression because of an ageing population increasing cancers and patients’ survival. It concerns all the layers of the wall and induces premature stenosis or thrombosis of the artery. Various territories can be involved, depending on the type of malignancy previously treated [1].

CASE REPORT

A 76-year old woman was referred to our service because of an 8-month history of severe intermittent claudication of the right upper limb associated with the hand’s paresthesia and vertigo episodes. Twenty years before, the patient underwent a right-sided radical mastectomy followed by intense radiation therapy for several weeks. Questioning of the patient revealed two episodes of subacute ischaemia of the right hand, before the appearance of claudication. Her past medical history included coronary artery disease, bilateral Morton’s foot, appendectomy and sigmoid diverticulitis. Clinical examination revealed, on the affected side, hand paleness, hypothermia and absent brachial, radial and ulnar pulses. Blood pressure was measured at the brachial arteries and the measurements were substantially asymmetric between the two arms. In fact, a 70-mmHg difference between the right and the left arm was found. Doppler ultrasound (USs) and computed tomography (CT) angiography were performed and diagnosed a 36-mm long occlusion of the right axillary artery (Fig. 1). The supra aortic trunks were normal. Laboratory findings were unremarkable. Electromyography of the right arm revealed a reduction in the potential consistent with a mild brachial plexus neuritis. The patient was then scheduled at the operating theatre with the diagnosis of a radiotherapy-related right axillary artery thrombosis. Under local anaesthesia, we performed a 2-cm right humeral approach and the artery was punctured. This retrograde route was assured with a long 6F introducer sheath. The intra-operative arteriography confirmed the localization of the occlusion at the middle portion of the axillary artery. A 0.035 hydrophilic guidewire easily passed through the thrombosis. A gentle pre-dilatation using a 6 × 40-mm balloon catheter (Phantom, Bard) was realized in order to subsequently deploy a 7 × 40-mm autoexpandable nitinol stent (Life-stent, Edwards), post-dilated with the same balloon. The distal humeral artery was clamped just before pre-dilatation and flushed at the end of the procedure to eliminate emboli. The post-procedure angiography (Fig. 2) showed a good result with no significant residual stenosis or dissection. There were no postoperative complications and the patient was discharged on postoperative day 1 with 75 mg aspirin daily. Symptom relief was almost immediate except for the hand’s paresthesia. Brachial arterial pressure normalized postoperatively. At clinical and US follow-up, 18 months later, the patient continues to report acceptable function and range of motion, normal radial and ulnar pulses and the absence of ischaemic complications.

DISCUSSION

RA of the axillary artery is a rare complication of radiotherapy treatment for breast cancer. Its incidence is undetermined and reportedly it can develop between 6 months and 20 years after the exposition [2]. Stenotic lesions and occlusions are the most frequent presentations but aneurysmal dilation and arterial
rupture can be observed too [3]. In most cases, the patient is virtually asymptomatic and the arterial lesion is just an occasional diagnosis. Arterial symptoms may include vague upper limb pain, weakness at rest or during exercise, cramp, numbness, paleness, coldness, paresthesia and pain in the hand and fingers. Because radiation injury involves all tissues, various complications can be observed including also to the skin, nerves, veins and lymphatics such as skin necrosis, deep vein thrombosis, radiotherapy induced plexopathy and lymphoedema [3]. Thromboembolism is rare but it has been documented as well as gangrene of the hand or forearm [4, 5]. Radiotherapy enhances the development of atherosclerotic lesions, with some non-specific aspects, identical to those seen in atherosclerosis, and others more specific, such as the fibrotic changes of the adventitia. Histologically RA is characterized by intimal proliferation and thickening, smooth muscle cell hypertrophy and collagen deposition, fibrosis, disruption of elastic lamina and obliteration of the vasa vasaorum [6]. The vascular examination should include Doppler US with bilateral brachial blood pressure measuring. If a mean pressure gradient across the two upper limbs of more than 30 mmHg is found, further examinations are required such as magnetic resonance angiography or spiral CT. Electromyography is useful to estimate the degree of the brachial plexopathy. As surgical treatment carries a significant risk of complications, it should not be undertaken lightly and should be reserved for severely symptomatic patients [7]. For shorter (<5 cm) lesions, percutaneous transluminal angioplasty (PTA) seems to be the best treatment [7–10], although the long-term results are still unknown. Surgical reconstruction using an autologous vein graft is usually reserved for longer lesions (>5 cm). Prosthetic bypass in an irradiated territory should be avoided because of extensive fibrosis, enhanced risk of infection, anastomosis leakage and poor healing. As RA concerns also the adventitia, the anastomoses should be imperatively realized in ‘healthy’ zones and direct surgery of the diseased segment should be indicated only in the case of severe neuritis, in order to free the brachial plexus from extensive fibrosis.

In conclusion, for symptomatic patients and for shorter lesions, PTA is probably the first-line treatment, whereas surgery should be reserved for selected cases with longer occlusions or in the case of unsuccessful PTA. In our patient’s case, we believe that the radiation-induced injury was probably followed by plaque disruption and arterial thrombosis.

Conflict of interest: none declared.

REFERENCES