

# Subclavian Artery Occlusion After Radiotherapy for Carcinoma of the Breast: Case Report

## Meme Karsinomu Nedeniyle Radyoterapi Görmüş Bir Olguda Subklavyen Arter Oklüzyonu

Ömer TETİK, MD, Assoc.<sup>a</sup>  
Berkan ÖZPAK, MD, Msc,<sup>a</sup>  
Aykut ŞAHİN, MD,<sup>a</sup>  
Övünç ASLAN, MD,<sup>a</sup>  
Ali GÜRBÜZ, MD, Prof.<sup>a</sup>

<sup>a</sup>Clinic of Cardiovascular Surgery,  
İzmir Atatürk Training and  
Research Hospital,  
İzmir

Geliş Tarihi/Received: 21.01.2010  
Kabul Tarihi/Accepted: 01.04.2010

Yazışma Adresi/Correspondence:  
Aykut ŞAHİN, MD  
İzmir Atatürk Training and  
Research Hospital,  
Clinic of Cardiovascular Surgery, İzmir,  
TÜRKİYE/TURKEY  
draykutsahin@gmail.com

**ABSTRACT** Radiation injury to subclavian artery is a rare and late complication of radiotherapy. Numerous adverse reactions may occur secondary to radiation therapy. One of this radiotherapy caused reactions is arterial occlusion with atherosclerosis. We report a case of symptomatic right subclavian artery occlusion after radiation therapy for carcinoma of the breast. 50 years old female patient was admitted to our clinic for rest pain and weakness of the right upper extremity. After her exams we detected only right subclavian artery occlusion. Under general anesthesia right subclavian artery to right axillary artery bypass was performed with PTFE graft. The postoperative right upper extremity arterial pulses were palpable. The patient was discharged without any complication.

**Key Words:** Subclavian artery; radiotherapy; breast neoplasms

**ÖZET** Radyoterapiye bağlı subklavyen arter hasarı nadir ve geç bir komplikasyondur. Radyoterapiye sekonder birçok reaksiyon gelişebilir. Bunlardan biri de radyoterapiye bağlı aterosklerozis ile gelişen arteriyel tıkanıklıktır. Bu yazıda meme karsinomu nedeniyle radyoterapi görmüş ve sağ subklavyen arter tıkanıklığı gelişmiş bir olguyu sunduk. 50 yaşında kadın hasta sağ üst kolda istirahat ağrısı ve güçsüzlük ile kliniğimize başvurdu. Yapılan tetkikleri sonrası sadece sağ subklavyen arterde tıkanıklık saptandı. Genel anestezi ile sağ proksimal subklavyen arterden sağ aksiller artere PTFE greft ile baypas yapıldı. Operasyon sonrası sağ üst ekstremitede nabız elle alınıyordu. Hasta komplikasyonsuz taburcu edildi.

**Anahtar Kelimeler:** Subklavyen arter; radyoterapi; meme tümörleri

Türkiye Klinikleri J Cardiovasc Sci 2012;24(1):71-4

Arterial occlusion owing to radiotherapy is a rare but important ischemia situation in the exposed extremity. The vascular effects of radiation therapy are particularly challenging clinical problems and characteristically manifest after a long patency period. Clinical and experimental data suggest that radiation predisposes patients to atherosclerotic change by causing endothelial damage.<sup>1</sup> Symptomatic occlusion of the subclavian artery is a very rare complication of radiation therapy for carcinoma of the breast.<sup>2,3</sup> We report a case who presented with severe right upper limb ischemia following previous radiotherapy for breast carcinoma.

## CASE REPORT

A 50-year-old female had been treated with ionizing radiation after right mastectomy for breast carcinoma seven years before. She was admitted to our clinic for rest pain, numbness, and weakness of the right upper extremity. In physical examination, upper extremity brachial systolic blood pressure difference was detected. No arterial pulse was detected in the affected extremity. Aortic arch aortography demonstrated complete occlusion of the right subclavian artery after take off vertebral artery, which was presumed to be the result of previous radiation therapy (Figure 1). Coronary, carotid, and lower extremity angiography were normal. All routine blood tests were normal.

## SURGICAL TECHNIQUE

Patient was treated surgically under general anesthesia. The patient was placed supine position, with shoulder slightly elevated and the right upper extremity in a horizontal position at a 90° -angle with the body. Right supraclavicular incision was performed for proximal subclavian artery, and infraclavicular-deltopectoral incision was used for axillary artery exploration. For the subclavian artery, the skin incision was made 1 cm above the clavicle and extended from the sternoclavicular joint to the lateral portion of the supraclavicular region for about 8 cm. External jugular vein was exposed, divided, and ligated. Medially, sternocleidomastoid muscle was exposed, and its clav-

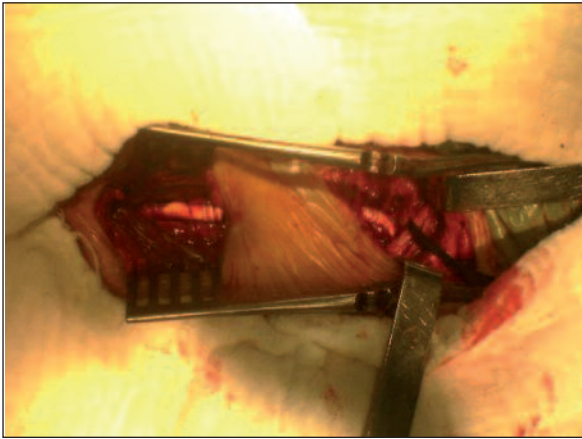
icular head was divided about 1 cm above its insertion on the clavicle, and sternal head was partially divided. The phrenic nerve was identified and retracted laterally; internal jugular vein was exposed and retracted medially. After anterior scalene muscle was divided, subclavian artery was exposed and a rubber vessel loop was passed around it. For the axillary artery, the skin incision was extended from the middle of the clavicle to the anterior axillary line in the direction of its apex. The pectoralis major muscle was divided along its fibers and the pectoralis minor muscle was transected. The axillary artery was exposed and a rubber vessel loop was passed around it. We created a tunnel under the clavicle for graft insertion. Proximal and distal arterial segments of the subclavian and the axillary artery were controlled with vascular clamping of the after the intravenous injection of 5,000 IU of heparin. Right subclavian artery to right axillary artery bypass was performed with 6 mm polytetrafluoroethylene (PTFE) graft (Figure 2). We did not observe any vascular problems or paralysis and paresthesia in the postoperative period. The postoperative right upper extremity arterial pulses were palpable but weakness compared to left upper extremity. In postoperative period, patient's ischemic complaints diminished. No complications observed in postoperative period. The patient was discharged without any complication. Selective control upper extremity angiography was performed after operation one year later. The graft patency was 100 % in follow-up period (Figure 3).

## DISCUSSION

Although arterial insufficiency is a rarely reported sequel to radiotherapy, it may be the cause of pain and disability in the affected extremity.<sup>1</sup> Radiation-induced arterial injury can be expressed many ways-acute thrombosis or arterial rupture in the early months of radiation arteritis, and later arterial fibrosis and stenosis, accelerated local atherosclerosis 3 to 10 years following treatment.<sup>4</sup> Our patient had been treated with ionizing radiation after right mastectomy for breast carcinoma seven years before.

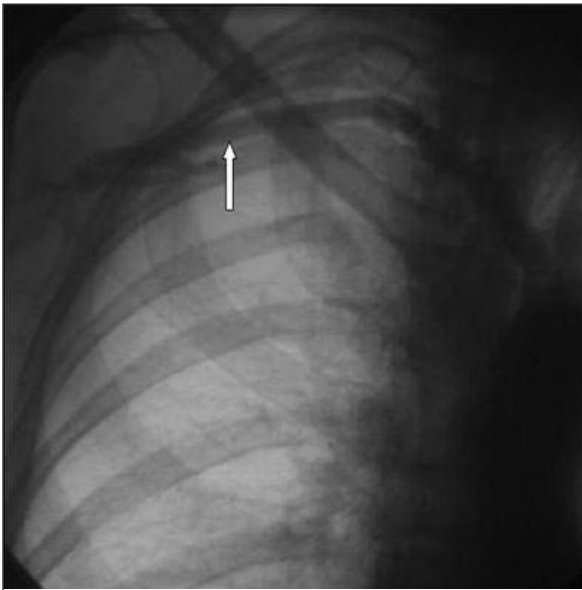


FIGURE 1: Angiographic view of the right subclavian artery occlusion.



**FIGURE 2:** Operative picture of the right proximal subclavian artery to the right axillary artery bypass.

(See for colored from <http://cardiovascular.turkiyeklinikleri.com/>)



**FIGURE 3:** Control upper extremity angiography: Arrow indicates graft patency.

Irradiation may cause damage not only to small vessels but also to large arteries such as the subclavian, carotid and femoral arteries.<sup>5</sup> Morpho-

logic changes in small arteries have been described by several investigators. These changes include endothelial proliferation, degeneration of the cells of the media with subsequent cystic medial necrosis, and fibrosis. Most injuries to the arteries present with late manifestations, and for the most part injury to the vasa vasorum is present.<sup>6</sup> Fonkalrud et al.<sup>7</sup> documented these changes by light-electron microscopy. Fibrosis of the arterial wall as a result of damage to the vasa vasorum leads to narrowing of the vessel lumen. We did not perform any histopathological examination in our case.

Presenting symptoms may include exsanguinating hemorrhage, acute arterial occlusion, claudication, transient ischemic attacks and stroke.<sup>8</sup> Symptomatic patients generally present at an earlier age with irradiation-induced disease and are less likely to have associated coronary or other vascular disease, since irradiation injuries are localized to the irradiated areas.<sup>9</sup> In our case, we did not find coronary or other vascular disease.

Treatment of radiation-induced arteritis has included percutaneous intervention, surgical and medical therapy.<sup>10</sup> It has traditionally been managed surgery, but, increasingly percutaneous transluminal angioplasty with or without stenting is being used a first-line minimally invasive treatment to manage symptomatic stenosis or occlusion.<sup>11</sup>

In conclusion, arterial occlusion is a long period after exposure of irradiated area. The symptoms vary in type and severity, but are consistent with peripheral arterial occlusive disease. To alleviate symptoms and prevent limb loss, reconstructive vascular surgery is advocated.<sup>10,12</sup> The vascular supply was successfully reconstructed by right subclavian artery to the right axillary artery bypass with a synthetic graft in our case.

## REFERENCES

1. Tetik O, Yetkin U, Calli AO, Ilhan G, Gurbuz A. Occlusive arterial disease after radiotherapy for testicular cancer: case report and review of the literature. *Vascular* 2008;16(4):239-41.
2. Stein JS, Jacobson JH 2nd. Axillary-contralateral brachial artery bypass for radiation-induced occlusion of the subclavian artery. *Cardiovasc Surg* 1993;1(2):146-8.
3. Hashmonai M, Elami A, Kuten A, Lichtig C, Torem S. Subclavian artery occlusion after radiotherapy for carcinoma of the breast. *Cancer* 1988;61(10):2015-8.
4. Himmel PD, Hassett JM. Radiation-induced chronic arterial injury. *Semin Surg Oncol* 1986;2(4):225-47.
5. Butler MJ, Lane RH, Webster JH. Irradiation injury to large arteries. *Br J Surg* 1980;67(5):341-3.
6. Kalman PG, Lipton IH, Provan JL, Walker PM, Miles JT, Yeung HP. Radiation damage to large arteries. *Can J Surg* 1983;26(1):88-91.
7. Fonkalsrud EW, Sanchez M, Zerubavel R, Mahoney A. Serial changes in arterial structure following radiation therapy. *Surg Gynecol Obstet* 1977;145(3):395-400.
8. Marcial-Rojas RA, Castro JR. Irradiation injury to the elastic arteries in the course of treatment for neoplastic disease. *Ann Otol Rhinol Laryngol* 1962;71:945-58.
9. Katras T, Baltazar U, Colvett K, Rush D, Dunn J, Stanton P Jr. Radiation-related arterial disease. *Am Surg* 1999;65(12):1176-9.
10. Roche-Nagle G, Fitzgerald T, McNeaney P, Harte P. Symptomatic radiation-induced upper extremity occlusive arterial disease. *EJVES Extra* 2006;11(1):5-6.
11. Farrugia M, Gowda KM, Cheattle TR, Ashok TP. Radiotherapy-related axillary artery occlusive disease: percutaneous transluminal angioplasty and stenting. Two case reports and review of the literature. *Cardiovasc Intervent Radiol* 2006;29(6):1144-7.
12. Jurado JA, Bashir R, Burket MW. Radiation-induced peripheral artery disease. *Catheter Cardiovasc Interv* 2008;72(4):563-8.