Endovascular Stent Graft Repair of Localized Acute Aortic Intramural Hematoma: A Case Report and Literature Review

Lokalize Akut Aortik İntramural Hematomun Endovasküler Stent Greft ile Onarımı: Olgu Sunumu ve Literatür İncelemesi

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ABSTRACT

Aortic intramural hematoma (IMH) is a variant of acute aortic syndrome, which can be life-threatening. Ascending aorta IMHs, particularly accompanied by penetrating aortic ulcer (PAU), can cause dissection, rupture, and cardiac tamponade. Therefore, early surgical treatment is recommended for IMHs of the ascending aorta. Herein, we present the case of a 60-year-old male patient who was on warfarin sodium treatment and in whom an IMH localized to the arcus aorta was detected incidentally via computed tomography, with the suspicion of pulmonary embolism, and an endovascular stent graft was inserted into the arcus aorta. This case highlights the importance of following ulcerated aortic plaques and suggests that IMH can be successfully treated with endovascular stent grafting.

Keywords: Hematoma, endovascular procedures, ulcer

ÖZ

Aortik İntramural Hematom (İMH), hayatı tehdit edebilen önemli bir akut aortik sendrom tipidir. Özellikle penetran aortik ülserin eşlik ettiği çıkan aorta İMH'ları diseksiyon, rüptür ve kardiyak tamponada neden olabilir. Bu sebeple çıkan aortada saptanan İMH'da erken cerrahi tedavi önerilmektedir. Biz bu çalışmada oral warfarine kullanan 60 yaşında erkek hastaya pulmoner emboli şüphesi ile bilgisayarlı tomoğrafi çekilmesi sonucunda tesadüfen arkus aorta lokalize intramural hematom tespit edilen ve arkus aorta endovasküler stent greft yerleştirilen bir vakayı sunduk. Bu olgu ülsere aortik plakların takibinin önemini vurgulamakta, intramural hematomun endovasküler stent greft ile başarılı bir şekilde tedavi edilebileceğini göstermektedir.

Anahtar Kelimeler: Hematom, endovasküler işlemler, ülser

Introduction

Spontaneous intramural hematoma (IMH) is an aortic wall hematoma in the absence of an intimal flap. As in dissections of the thoracic aorta, IMH can be classified as Type A if it involves the ascending aorta, aortic arch, or both, and as Type B if it involves the descending aorta. Prognosis in IMH is similar to that in aortic dissection and it can be with or without penetrating aortic ulcer (PAU). Early repair with surgery or endovascular stent grafting (ESG) is of utmost importance [1]. Herein, we present the case of a 60-year-old patient with spontaneous, acute, and localized aortic IMH treated with ESG, with the discussion of current literature. This report has attempted to highlight the importance of follow-up in PAU.

Case Report

A 60-year-old male patient, who was on oral warfarin sodium (Coumadin; Zentiva Medical) treatment with the diagnosis of deep venous thrombosis for about three years, was admitted to our hospital with cough, difficulty in breathing, and hoarseness. Thoracic computed tomography (CT) (Siemens, Germany) was performed upon the suspicion of pulmonary embolism and it revealed a mass, around 42×48 mm in diameter, localized at the arcus aorta with increased pressure on the pulmonary artery (Figure 1). The mass was considered as a periaortic IMH. Thoracic CT scans obtained three years ago were evaluated and ulcerated atherosclerotic plaque formations were observed in the same arcus aorta area (Figure 2), and these were thought to have formed due to the plaque rupture of an IMH. Transesophageal echocardiography (TEE) and CT showed no dissection flap. Physical examination revealed blood pressure of 150/90 mmHg and regular pulse of 90 beats/minute. Transthoracic echocardiography showed mildly reduced left ventricular function with an estimated ejection fraction of 50% and pericardial effu-

Cite this article as: Kaya U, Colak A, Becit N, Ceviz M, Kocak H. Endovascular Stent Graft Repair of Localized Acute Aortic Intramural Hematoma: A Case Report and Literature Review. Eurasian J Med 2017; 49: 211-3.

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Received: June 12, 2017
Accepted: June 20, 2017

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DOI 10.5152/eurasianjmed.2017.17151

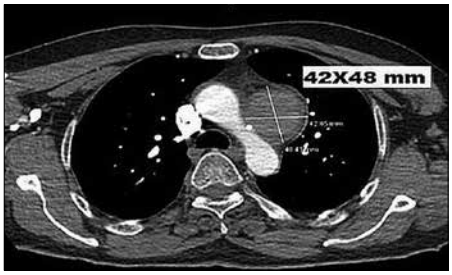

Figure 1. CT scans of intramural hematoma located in the arcus aorta

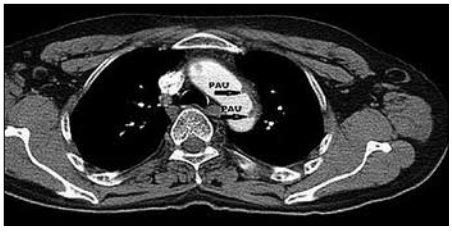

Figure 2. CT scans of penetrating atherosclerotic ulcer located in the arcus aorta

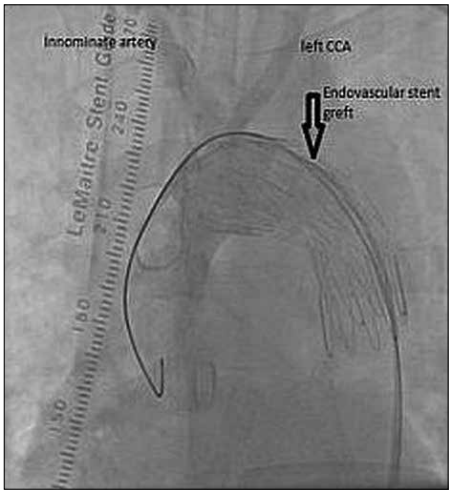

Figure 3. Final angiography showing orifices of the supra-aortic vessels and the endovascular graft located in the arcus aorta

sion. A written informed consent was obtained from the patient and he was operated upon to prevent rupture and relieve pressure symptoms. A two-stage operation was scheduled. At the first stage, an upper partial sternotomy would be performed and a graft bypass to the left common carotid artery from the ascending aorta and to the left subclavian artery would be performed (debranching of the supra-aortic vessels), and an endovascular stent graft would be inserted into the arcus aorta. At the second stage, left thoracotomy would be performed to drain the hematoma.

The operation was performed under general anesthesia in the hybrid operating room via femoral artery cutdown. Before inserting the stent graft, angiography was performed and

Figure 4. CT scan showing endovascular graft located in the arcus aorta

Figure 5. At 1 month follow-up, contrast-enhanced CT images demonstrating endovascular stent placement in the arcus aorta and descending thoracic aorta with interval resolution of intramural hematoma

supra-aortic vessel orifices were visualized. The ESG device was selected according to length, required diameter, and anatomical findings. The ESG diameter was calculated from the largest proximal neck diameter with an oversizing factor of 15%. The ESGs (30-mm diameter and 80-mm length, Zenith; Cook Inc. Bloomington, IN, USA) were advanced into the descending aorta beyond the right innominate artery under fluoroscopic guidance and deployed during systemic hypotension (systolic BP 50-60 mmHg) induced by the rapid cardiac pacing (frequency 180-220/min) method (Figure 3). As the left carotid artery originated from the right truncus brachiocephalicus, the left carotid and subclavian bypasses were not performed. No intra- or postoperative circulatory complication of the left arm was seen. Thoracotomy was cancelled as the pressure symptoms might relieve after the insertion of the stent and draining the hematoma with a left thoracotomy could lead to additional complications.

The patient was moved to the intensive care unit in the postoperative period. The patient was transferred to the regular ward on Day 1 as the patient had no problem during the follow-up. Repeated CT evaluated ESG and all vascular structures on Day 7 in the postoperative period (Figure 4). The position of the ESG was normal and endoleak was not observed. No complications occurred during and after the procedure, and the patient was discharged on Day 5 following surgery. Repeated CT at one month showed no problems and there was a decrease in the size of the IMH (31×44 mm) without any sign of an endoleak (Figure 5).

Discussion

Spontaneous IMH has been frequently reported in patients with acute aortic syndrome (AAS). The lack of a demonstrable intimal tear or dissection flap is essential for the diagnosis of IMH. Circular or crescent-shaped regional aortic wall with thickness >7 mm and/or intramural blood accumulation suggest the diagnosis of IMH [2]. The prevalence of IMH in AAS ranges from 6% to 30%. Rupture, true aneurysm, or pseudoaneurysm can develop; however, complete resolution can also be achieved [1]. In addition, IMH can be accompanied with or without PAU. However, many studies investigating the etiology of IMH have suggested that PAU is the cause of IMH [2]. PAU can be defined as the ulceration of an atherosclerotic lesion extending to the media by penetrating the internal elastic lamina. Stanson et al. [2] and Coady et al. [3] defined PAU as a malignant lesion. They suggested that patients designated as malignant cases exhibited acute symptoms, requiring the use of more aggressive treatment methods. Not only ulcers of the ascending aorta and aortic arch, but also ulcers of the proximal descending aorta have poorer prognosis than the ulcers of the mid or distal descending aorta. Therefore, early surgical intervention is recommended for the IMH of the ascending aorta. Follow-up with medical therapy is primarily recommended for the IMH of the distal descending aorta. In particular, the presence of an enlarging pleural effusion and/or uncontrolled pain must be considered as an indication necessitating early surgery or endovascular treatment in patients with IMH and PAU [1].

Spontaneous IMH and dissections of the aortic aneurysms can be successfully treated by endovascular methods [4]. This novel method offers an alternative treatment to traditional surgical methods, with lower mortality and complication rates.

Surgical replacement of the aortic arch with open surgery in arcus aortic pathologies is a diffi-

cult procedure that requires deep hypothermia, cardiac arrest, and extracorporeal circulation, with very high degrees of morbidity and mortality. However, endovascular treatment options in this area, which has a complex anatomy, is limited due to the technical challenges in the design and implantation of branched stent grafts [5]. Debranching and elephant trunk surgery, chimney techniques, and branched modular stent grafts are the methods that have been developed to allow the placement of endovascular stent grafts for aortic arch aneurysms [6, 7]. In distal arcus lesions, it is required to close the left main carotid artery and left subclavian artery exits to prevent a suitable clinging surface for the stent graft. In such indications, these arteries should be revascularized before the operation. For this purpose, various extra-anatomical bypass techniques can be used extra-thoracically [8]. According to the extension of arcus aortic aneurysms to the proximal segments, total arch replacement can be done in a hybrid treatment. Using this method, arcus aorta reconstruction can be performed through debranching bypass techniques and placing stent grafts [9].

Revascularization of the left subclavian artery was initially deemed mandatory. However, the current general opinion is that this procedure is unnecessary and collateral circulation as well as blood supply from the contralateral vertebral artery would provide sufficient circulation. In our case, the left carotid bypass was not performed as the left common carotid artery originated from the right truncus brachiocephalicus, and the subclavian bypass was not performed as there were no circulatory problems in the left arm. In addition, proximal ligation of the artery was not required as left subclavian artery-related endoleaks were not observed.

Another problem after IMH stenting is the decision to drain the hematoma. In the case study by White et al. [10], in which an acute IMH with PAU was treated using endovascular stenting, IMH resulted in full resolution within three months of follow-up after stenting. In our case, we did not intervene with the hematoma after stenting and found that the IMH diameter decreased, as confirmed by repeated CT after one month.

In conclusion, IMHs and PAUs are important variants of classical aortic dissection. Currently, there is evidence that the two may not be different diseases and both diseases share notable common themes in their pathophysiologies. Therefore, follow-up and the early treatment of PAU is very important for the prevention of further potential complications. In conclusion, we believe that aortic IMH can be successfully treated with ESG if it is accompanied by PAU.

Informed Consent: Written informed consent was obtained from patient who participated in this study.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - U.K., A.C.; Design - U.K., A.C.; Supervision - U.K., A.C.; Resources - U.K., N.B.; Materials - U.K., M.C.; Data Collection and/or Processing - U.K., A.C.; Analysis and/or Interpretation - M.C., N.B.; Literature Search - U.K., A.C.; Writing Manuscript - U.K., A.C.; Critical Review - M.C., H.K.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

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