Turk Gogus Kalp Dama 2016;24(3):569-572
doi: 10.5606/tgkdc.dergisi.2016.12282

Case Report / Olgu Sunumu

Treatment of endoleaks after endovascular abdominal aorta aneurysm repair

Endovasküler abdominal aort anevrizma tamiri sonrası kaçak tedavisi

Enes Duman,[1] Egemen Çifçi,[1] Erkan Yıldırım,[1] Fatih Boyvat[2]

Institution where the research was done:
Başkent University Konya Hospital, Konya, Turkey

Author Affiliations:
[1]Department of Radiology, Başkent University Konya Hospital, Konya, Turkey
[2]Department of Radiology, Medical Faculty of Başkent University, Ankara, Turkey

ABSTRACT

Percutaneous thrombin injection is an effective procedure for the treatment of pseudoaneurysms. In this article, we report two cases who had endoleaks after endovascular aneurysm repair and were successfully treated with computed tomography-guided thrombin injection.

Keywords: Abdominal aortic aneurysm; endoleak; percutaneous treatment; thrombin.

ÖZ

Perkütan trombin enjeksiyonu, psödoanevrizmaların tedavisinde etkili bir işlemdir. Bu yazıda, endovasküler anevrizma tamiri sonrasında kaçak gelişen ve bilgisayarlı tomografi eşliğinde trombin enjeksiyonu ile başarılı bir şekilde tedavi edilen iki olgu sunuldu.

Anahtar sözcükler: Abdominal aort anevrizması; kaçak; perkütan tedavi; trombin.

The success of endovascular aneurysm repair (EVAR) relies on achieving an adequate proximal and distal seal to exclude the aneurysm sac from the systemic circulation.[1] Type 1 endoleaks are associated with an increased risk of post-procedural aneurysm rupture and late aneurysm related death, and re-intervention is recommended as soon as possible upon the diagnosis.[1] Anatomical segments of the aneurysm neck can create a predisposition for type 1 endoleaks.[1] Several factors such as short neck, a neck degree higher than 60, thrombus or plaque in the neck wall, mural calcifications, ulcers in the neck may increase the type 1 endoleaks after the stent-graft placement.[2] Endovascular treatment options for persistent type 1 endoleaks include balloon angioplasty, extension stent grafts or cuffs, bare stents, or embolization.[1] Thrombin injections directly into the aneurysm sac are described as safe and efficient alternatives with a high success rate and fewer complications in several case series in the treatment of type 2 endoleaks.[3]

Herein, we report two cases who had endoleaks after EVAR and were successfully treated with computed tomography (CT)-guided thrombin injection. To the best of our knowledge, these are the first reported cases in the literature.

CASE REPORT

Case 1– A 76-year-old male patient underwent EVAR for abdominal aortic aneurysm in 2011. The length of aneurysm neck was 14 mm, neck angle was 77°, and the diameter of the aneurysm was 100 mm with 9 mm bilateral common iliac arteries. Endurant (Medtronic, Santa Rosa, CA, USA) endografts were deployed. The patient presented with proximal type 1 endoleak three years after the EVAR procedure. There was a saccular space between the aortic neck and stent graft (Figure 1a), which resulted from the inappropriate apposition of the graft due to the high neck angle. Due to the anatomy and shape of the aneurysm neck and saccular space, we planned to perform percutaneous CT-guided thrombin

Available online at
www.tgkdc.dergisi.org
doi: 10.5606/tgkdc.dergisi.2016.12282
QR (Quick Response) Code

Received: August 16, 2015 *Accepted:* December 04, 2015

Correspondence: Enes Duman, MD. Başkent Üniversitesi Konya Hastanesi Radyoloji Kliniği, 42080 Selçuklu, Konya, Turkey.
Tel: +90 332 - 257 06 06 e-mail: drenesduman@hotmail.com

injection instead of standard treatment options such as coil embolization or embolization with liquid agents (n-butyl 2-cyanoacrylate or ethylene vinyl alcohol copolymer). The angle of the aneurysm neck was 77° and the length was 14 mm with tortuous distal iliac arteries. Therefore, selective catheterization was challenging. Due to the saccular space, our technique was practical, easier and more comfortable. The use of standard techniques would prolong the duration of examination and pose a higher level of radiation exposure. In addition, our technique would offer several advantages such as shorter time and lower radiation exposure.

We performed percutaneous CT-guided thrombin injection preserving the coil embolization as the second option, if failed. We put the patient in the prone position on CT table and, then, we marked the entry point with a metallic marker. Under standard sterile conditions, 20 mL prilocaine hydrochloride as a local anesthetic agent was administered. Then, we reached the saccular space from the right posterior paravertebral region using a 22-gauge 20 cm Chiba needle (Geotek Medical, Ankara, Turkey). Once the tip of the needle was confirmed in the right place, we slowly injected 2 mL thrombin (Tisseel, Baxter, Austria) to the space. The duration of the procedure was 12 minutes. The patient was uneventfully followed by CT angiography at one and 12 months after the procedure. The diameter of the aneurysm decreased 8 mm at 12 months (from 90 mm to 82 mm). The patient is still uneventful (Figure 1b).

Case 2– A 60-year-old male patient had an infra-renal abdominal aortic aneurysm in 2013. The length of aneurysm neck was 80 mm and the neck angle was 45°. The diameter was 79 mm. The EVAR procedure was performed at another center. Repeated CT angiography showed type 1b endoleak from the left iliac limb. He, then, underwent re-intervention to treat endoleak at the same center and a limb-extending graft was deployed without embolization of the left internal iliac artery. At three months, repeated CT angiography showed persistent endoleak from the left internal iliac artery (Figure 2a). The endoleak was type 1b initially; however, it progressed to type 2 after the limb-extending graft implantation without internal iliac artery embolization.

We performed percutaneous CT-guided thrombin injection. We used the transperitoneal approach. We put the patient in the supine position on CT table, and, then, we marked the entry point with a metallic marker. Under standard sterile conditions, 20 mL prilocaine hydrochloride as a local anesthetic agent was administered. Then, we reached the left common iliac artery using a 22-gauge Chiba needle (Geotek Medical, Ankara, Turkey), positioning the needle tip between the native arterial lumen and graft (Figure 2b). Once the tip of the needle was confirmed in the right place, we slowly injected 2 mL thrombin (Tisseel, Baxter, Austria) to the space. The duration of the procedure was 16 minutes. The patient was uneventfully followed by CT angiography at one and six months after the procedure (Figure 2c). At six months, CT angiography showed that the diameter of the aneurysm was 76 mm (79 mm preoperatively).

DISCUSSION

The incidence of endoleaks increases in case of short-neck (proximal attachment zones <15 mm), large-neck (diameter >32 mm), irregular-neck (cone-shaped neck), uneven-neck (calcification or thrombus) abdominal aortic aneurysms with proximal angulations higher than 60°.[3] When the leak alongside the graft fixation zone is unable to be eliminated through balloon

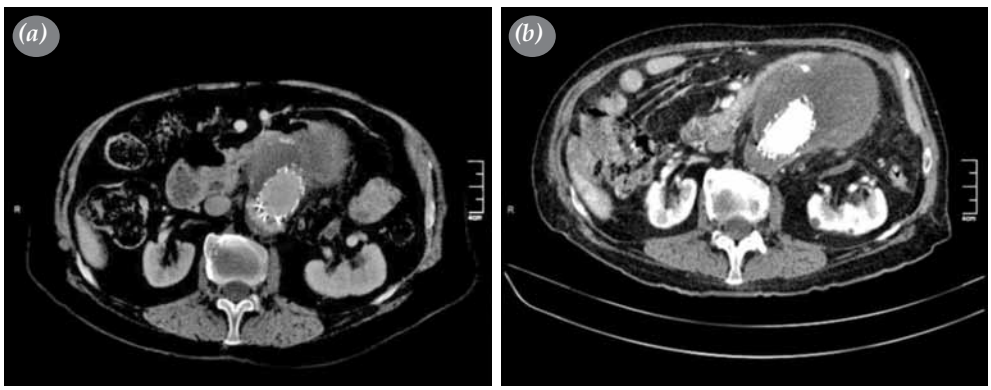

Figure 1. (a) A type 1a endoleak with a saccular space between aneurysm neck and graft wall. **(b)** Computed tomography angiography showing no endoleaks at 12 months after procedure.

Figure 2. (a) A type 2 endoleak from the left internal iliac artery. **(b)** Needle distal tip between native arterial lumen and graft. **(c)** Computed tomography angiography showing no endoleaks at 12 months after procedure.

dilation and additional bare stents, other practical options are needed for endoluminal treatment.

Embolization techniques were originally introduced for treating type 1 endoleaks.[4] Recently, the use of micro-coils and liquid embolic agents (n-butyl 2-cyanoacrylate or ethylene vinyl alcohol copolymer) have been increasingly utilized in the treatment of treat type 1 endoleaks.[4-6]

In our both cases, we performed percutaneous CT-guided thrombin injection for the treatment of endoleaks. Standard techniques such as cuff, coil embolization or others might be also performed in Case 1. However, we performed the first option upon the preference of the patient, after informing him on both treatment modalities. For the surgeons, the reason for choosing this practical unproven treatment option was the existing anatomic structures. In Case 1, there was a suitable saccular space, posterior to the graft fixation zone, between the aneurysm sac and stent-graft. However, there was no other endovascular treatment option in Case 2. The main question is that: although we were able to use other liquid embolic agents (n-butyl 2-cyanoacrylate or ethylene vinyl alcohol copolymer), why did we prefer thrombin for embolization? The answer lies in the following facts: First, as thrombin is a ready to use agent for use, it does not require a special preparation. Second, as it does not cause non-target embolization and beam hardening artifacts on CT angiography, it does not limit the diagnostic imaging during follow-up.

The other major advantages are *(i)* lower radiation exposure than other endovascular treatment procedures both for patient and surgeon, *(ii)* lower procedural costs, *(iii)* shorter procedural time, and *(iv)* suitability in an outpatient setting.

In the published reports, embolization with thrombin, glue, and ethylene-vinyl alcohol copolymer was effectively performed for type 2 endoleaks with satisfactory long-term results.[7] However, there is no study with thrombin for type 1 endoleaks. The main goal of standard techniques such as coil embolization is to prevent the flow to the aneurysm sac.[7] There are also several reports of thrombosis with coils.[7] In our cases, we performed thrombosis with thrombin and we observed no significant difference in the risk for growing aneurysm size and rupture between our technique and standard techniques.

In conclusion, as a safe, effective, and cost-effective treatment modality, percutaneous computed tomography-guided thrombin injection for the treatment of endoleaks should be considered as an alternative practical treatment option in eligible patients.

Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

Funding

The authors received no financial support for the research and/or authorship of this article.

REFERENCES

1. van Marrewijk C, Buth J, Harris PL, Norgren L, Nevelsteen A, Wyatt MG. Significance of endoleaks after endovascular repair of abdominal aortic aneurysms: The EUROSTAR experience. J Vasc Surg 2002;35:461-73.
2. Parıldar M, Posacıoğlu H. Endovasküler aortik anevrizma tamiri sonrası görülen kaçaklar (endoleak): Tanım ve tedavi. Turk Gogus Kalp Dama 2011;19:46-50.
3. Kasthuri RS, Stivaros SM, Gavan D. Percutaneous ultrasound-guided thrombin injection for endoleaks: an alternative. Cardiovasc Intervent Radiol 2005;28:110-2.
4. Rosen RJ, Green RM. Endoleak management following endovascular aneurysm repair. J Vasc Interv Radiol 2008;19:37-43.

5. Maldonado TS, Rosen RJ, Rockman CB, Adelman MA, Bajakian D, Jacobowitz GR, et al. Initial successful management of type I endoleak after endovascular aortic aneurysm repair with n-butyl cyanoacrylate adhesive. J Vasc Surg 2003;38:664-70.
6. Grisafi JL, Boiteau G, Detschelt E, Potts J, Kiproff P, Muluk SC. Endoluminal treatment of type IA endoleak with Onyx. J Vasc Surg 2010;52:1346-9.
7. Carrafiello G, Ierardi AM, Radaelli A, De Marchi G, Floridi C, Piffaretti G, et al. Unenhanced Cone Beam Computed Tomography and Fusion Imaging in Direct Percutaneous Sac Injection for Treatment of Type II Endoleak: Technical Note. Cardiovasc Intervent Radiol 2015 Oct 16. [Epub ahead of print]