Journal on Surgery

www.journalonsurgery.org

*Case Series*

***Open Access, Volume 2***

# Treatment of Iatrogenic Femoral Pseudoaneurysm: Case Report and Review of the Literature

***Liu Yong****

*Department of General Surgery (Vascular Surgery), The Affiliated Hospital of Southwest Medical University, Luzhou 646000, China.*

**Abstract**

Iatrogenic femoral artery pseudoaneurysm is usually caused by poor compression of the femoral artery after puncture during endovascular surgery, or by guide wire puncture of the femoral artery branch, and a few are caused by migration of small trochanteric fragments during internal fixation of hip fracture or trauma of the femoral artery by steel nails. Timely detection and treatment of femoral artery pseudoaneurysm will not only accelerate the patient's recovery, but also reduce the occurrence of serious complications. In this report, we will describe the successful treatment of many iatrogenic femoral artery pseudoaneurysms by six surgical methods. New therapeutic methods are explored and prospected.

**Keywords:** Femoral artery; Pseudoaneurysm; Thrombin; Gel sponge embolization; Coil embolization.

## Introduction

Pseudoaneurysm (PSA) is a pulsatile hematoma covered by fibromuscular tissue when the wall of the artery is torn or punctured, and when the rupture cannot be closed, the blood exosmosis forms a pulsatile hematoma covered by fibromuscular tissue [1]. In the past, pseudoaneurysms were usually caused by trauma, but in the past three decades, non-cardiac percutaneous transluminal surgery was mainly performed through the femoral artery approach, followed by a corresponding increase in common complications: inguinal hematoma and pseudoaneurysm [2]. At the same time, in patients with hip fracture, the insertion of screws, the use of retractors, the locking of the distal end of intramedullary nails and the movement of the fracture end during fracture reduction can lead to injury of the femoral artery, which is accompanied by the occurrence of pseudoaneurysm of the femoral artery [3]. There are many ways to treat femoral pseudoaneurysm, among which femoral aneurysm rupture repair is one of the most classical surgical methods, but it may be accompanied by the risk of aggravation of infection, increased nerve injury, bleeding and so on [4]. At the same time, it is not the best choice for patients with poor systemic tolerance, such as pseudoaneurysm caused by femoral artery puncture in patients with ruptured intracranial aneurysm, acute cerebral infarction and so on. Endovascular therapy is a minimally invasive and effective method for embolization or isolation of pseudoaneurysms with a variety of interventional devices and materials [5]. Therefore, this paper summarizes and analyzes the clinical data and surgical selection of patients with femoral artery pseudoaneurysm diagnosed and treated in our

**Manuscript Information:** *Received: May 14, 2022; Accepted: Jun 17, 2022; Published: Jun 23, 2022*

**Correspondance:** *Liu Yong, Department of General Surgery (Vascular Surgery), The Affiliated Hospital of Southwest Medical University, Luzhou 646000, China. Email: lyong74@163.com*

**Citation:** *Yong L. Treatment of Iatrogenic Femoral Pseudoaneurysm: Case Report and Review of the Literature. J Surgery. 2022; 2(1): 1029.*

center in the past half a year, combined with the relevant literature, so as to provide more effective treatment strategies for the diagnosis and treatment of patients with femoral artery pseudoaneurysm.

### Case 1

A 62-year-old female was admitted to the hospital after 4 days of finding a right inguinal mass. Digital subtraction angiography was performed through the right femoral artery 10 days ago because of sudden disturbance of consciousness, and a fluctuating mass of the right groin appeared after the operation. CT angiography (CTA) suggested that the pseudoaneurysm of the right deep femoral artery was about 4.0 x 5.0 cm in size and the diameter of the rupture was about 0.3cm. After preoperative preparation, the Seldinger technique was punctured through the left femoral artery, the 0.035 inch guide wire guided the angiographic catheter to the deep femoral artery, and under the guidance of the path, the Abbott balloon dilatation catheter was introduced to the deep femoral artery breach, and then punctured through the most obvious part of the right inguinal mass and injected a small amount of contrast medium into the tumor cavity. The blood flow at the rupture was blocked by dilated balloon catheter, and there was no blood reflux in the tumor cavity. The balloon was withdrawn 5 minutes after the right puncture needle was slowly injected with pre-diluted thrombin 2000IU. Angiography found that there was no leakage of contrast medium at the breach of the deep femoral artery, and the breach disappeared. The operation was successful and the patients were told to immobilize their lower limbs for 24 hours after operation (Figure 1).

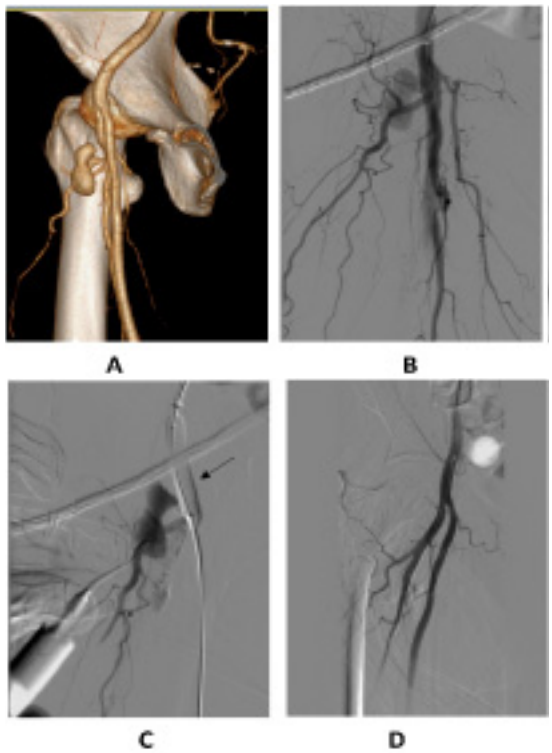


**Figure 1:** A and B show the results of CTA and DSA of femoral artery pseudoaneurysm. Figure C shows balloon-assisted injection of thrombin, and figure D shows the disappearance of pseudoaneurysm after thrombin injection.

### Case 2

A 58-year-old female patient was admitted to hospital because of patent foramen ovale occlusion through the right femoral artery approach, and a fluctuating mass in the right inguinal region was found after operation. CTA examination showed that there were multiple contrast media filling areas adjacent to the right femoral artery, the maximum plane diameter was about 3.0 x 2.0 cm, which communicated with the superficial femoral artery, and the diameter of the tear was about 0.3 cm. Considering the pseudoaneurysm of superficial femoral artery, after sufficient preparation before operation, the 6F puncture sheath was punctured and inserted through the left femoral artery with seldinger technique, and the COOK 7F 70 cm long sheath was introduced under the support of guide wire. The diameter of superficial femoral artery and the rupture of pseudoaneurysm were confirmed by angiography, and the GORE VIABAHN stent was precisely released at the rupture. After release, angiography found that a little contrast medium was spilled from the proximal end of the stent. Considering type I internal leakage, abbott balloon was used to dilate the proximal stent. No contrast medium spill was found after balloon dilatation, and the operation was successful. The left femoral artery puncture site was treated with Cordis exoseal vascular closure device (Figure 2).

**Figure 2:** A and B show the results of CTA and DSA of femoral artery pseudoaneurysm. Figure C indicates the disappearance of pseudoaneurysm after stent implantation.

### Case 3

A 81-year-old female patient with intracranial aneurysm underwent endovascular treatment through the right femoral artery approach, and the right inguinal region was found to be distending pain after operation. Ultrasonography showed that the right deep femoral artery pseudoaneurysm was about 3.0 x 4.0 cm in size and the rupture was about 0.4 cm, accompanied by thrombosis in the deep veins of the right lower extremities (superficial femoral vein, posterior tibial vein, peroneal vein). After sufficient preparation, the 6F puncture sheath was inserted through the Seldinger technique of the left femoral artery, the misgurnus anguillicaudatus guide wire combined with a single curved catheter super selectively entered the lumen of the deep femoral aneurysm to release the coils, and then the GORE VIABAHN stent of appropriate size was released from the deep femoral artery to block the pseudoaneurysm laceration. the operation was successful. The left femoral artery puncture site was treated with 7F Cordis exoseal vascular closure device (Figure 3).

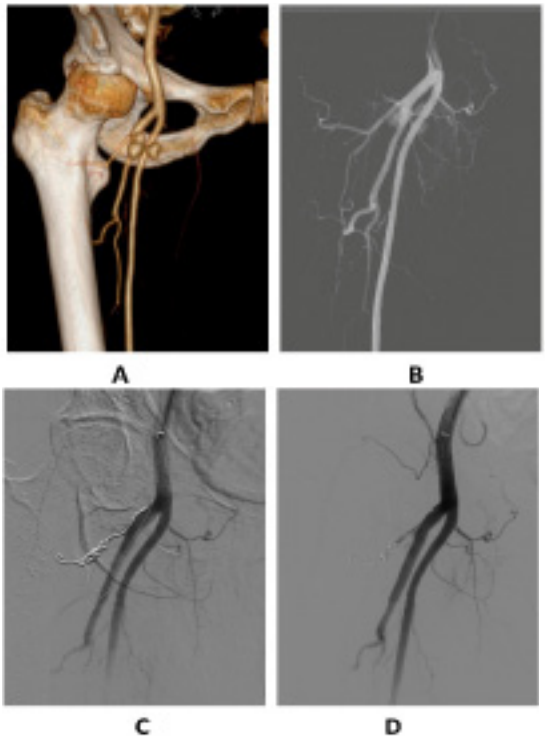


**Figure 3:** A and B show the results of CTA and DSA of femoral artery pseudoaneurysm. Figure C and D indicates the disappearance of pseudoaneurysm after stent implantation and coil embolization.

### Case 4

A 72-year-old female was admitted to hospital for pain after right knee arthroplasty and underwent revision of loosening of the right hip joint after admission. The groin was swollen 6 hours after operation. CTA revealed a pseudoaneurysm of the right deep femoral artery, about 5.0 x 3.0 cm in size, with massive hemorrhage in the subcutaneous soft tissue. After adequate preparation, the 10cm incision was made longitudinally through the right groin, the rupture of the aneurysm of the right deep femoral artery was repaired, and the hematoma was removed at the same time. The patient's blood pressure and heart rate were stable after operation and discharged from hospital after recovery (Figure 4).

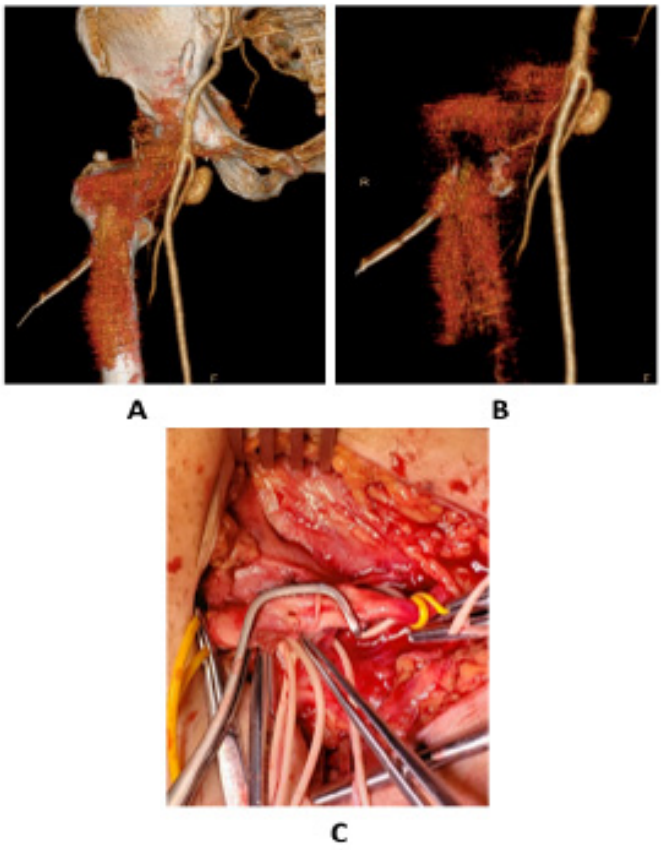


**Figure 4:** A and B show the results of CTA femoral artery pseudoaneurysm and hematoma. Figure C indicates that the pseudoaneurysm of the femoral artery is ruptured and repaired.

### Case 5

A 65-year-old female was admitted to the hospital because of repeated dizziness for one year, and the whole brain angiography was performed through the right femoral artery. There was a pulsatile mass in the right inguinal region after operation, but there was no improvement after local compression. CTA suggested a pseudoaneurysm of the deep femoral artery, the size of which was about 3.0 x 2.0 cm and the tear was about 0.14 cm. After comprehensive preparation before operation, the needle was punctured at the place where the pulsation of the right inguinal mass was most obvious under the guidance of ultrasound, the needle tip was displayed in time by ultrasound and the "back and forth" blood flow spectrum disappeared from the tumor neck to the tumor cavity with ultrasound probe, and the pre-diluted thrombin 2000 IU was injected slowly through the puncture needle. After continuous compression for 5 minutes, the compressed probe was released gradually, and there was no "back and forth" blood flow signal in the tumor cavity and no palpable pulsation was found in the blood flow spectrum pattern of ultrasound. The inguinal area was bandaged with elastic bandage, and the pulsation of the posterior tibial artery and dorsalis pedis artery of the right lower limb was examined satisfactorily (Figure 5).

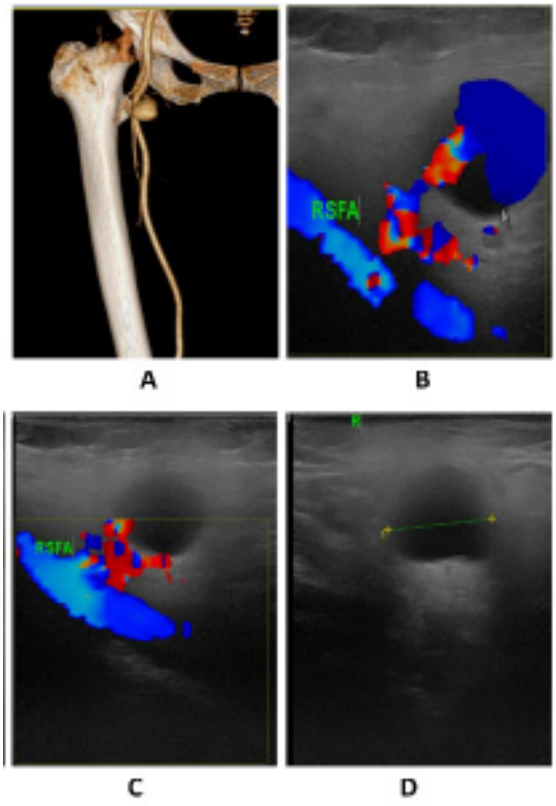


**Figure 5:** A and B show the results of CTA and ultrasound of femoral artery pseudoaneurysm. Figure C indicates the rupture of the pseudoaneurysm of the femoral artery, and figure D indicates that the pseudoaneurysm of the femoral artery disappeared after injection of hemagglutinin.

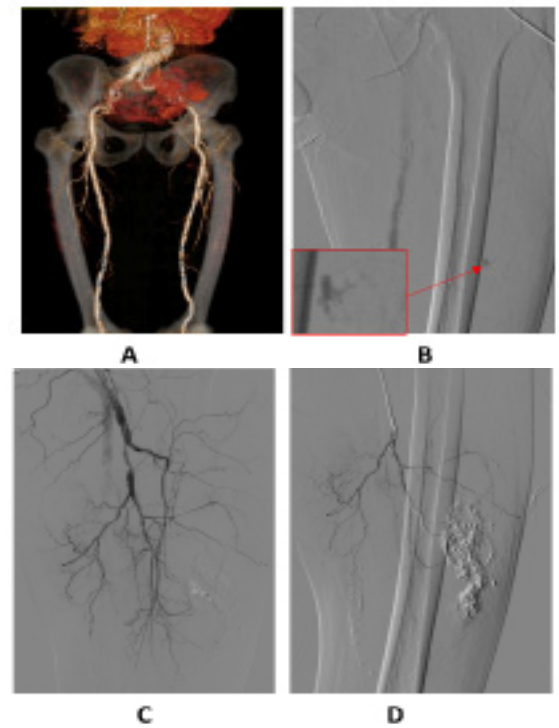


**Figure 6:** A shows arteriosclerosis obliterans of femoral artery. Figure B indicates rupture of branch artery of femoral artery. Figure C and D suggest disappearance of hemorrhage of branch artery of femoral artery after embolization with gelatin sponge.

### Case 6

A 65-year-old male patient underwent left lower limb angiography and balloon dilatation because of left lower limb arteriosclerosis occlusion. The left thigh swelling and pain occurred during the operation. The distal artery rupture of the branch of the left deep femoral artery was found immediately during the operation. Through the microcatheter to the place of vascular rupture, gelatin sponge was used to embolize the ruptured branch artery. No overflow of contrast medium was found after embolization, and the embolization effect was good (Figure 6).

### Discussion

Latrogenic femoral pseudoaneurysm is usually a complication caused by femoral artery puncture during endovascular treatment, with an incidence of about 0.6% to 3.2% [6]; it is also regarded as one of the late complications after orthopedic surgery (especially hip surgery) [7]. The clinical manifestations of femoral artery pseudoaneurysm include not only typical thigh swelling, bleeding and anemia, but also inguinal pain and limb dyskinesia [8]. The complications mainly include pseudoaneurysm rupture, inguinal infection, distal limb ischemia, nerve injury, deep venous thrombosis, arteriovenous fistula, osteofascial compartment syndrome and so on [9]. Studies have shown that: once the occurrence of femoral artery pseudoaneurysm, early selection of surgical treatment is the main strategy for the treatment of femoral artery pseudoaneurysm [10]. If iatrogenic pseudoaneurysm of femoral artery is not treated in time, it will not only increase the risk of complications and aggravation, but also increase local inflammation and increase the difficulty of follow-up surgical treatment.

The diagnosis of iatrogenic femoral artery pseudoaneurysm should include not only typical inguinal pain, inguinal puncture history and pulsatile mass in inguinal region, but also imaging changes in inguinal region. At the same time, the location, size and soft tissue injury around the aneurysm can be known by the impact examination, which can provide the key basis for the formulation of the operation plan. Ultrasound can make a summary analysis of the shape, size, internal echo, blood flow and frequency spectrum of pseudoaneurysms, and can identify whether there is deep venous thrombosis, which is simple and safe. It is the first choice for non-invasive examination of pseudoaneurysms [11]. Through a variety of three-dimensional reconstruction techniques, CTA can clearly show the size of the pseudoaneurys, the three-dimensional relationship of the surrounding soft tissue [12]. CTA examination provides a basis for the selection of the size of covered stents and coils, thrombin injection dose, traditional pseudoaneurysm resection, rupture repair, vascular patch, autogenous great saphenous vein transplantation and reconstruction during the follow-up endovascular treatment [13,14]. As the gold standard for the diagnosis of pseudoaneurysms, DSA can fully show the advantages of spatial anatomical relationship of pseudoaneurysms and simultaneous management of pseudoaneurysms, but it has some disadvantages, such as invasiveness, high price, complex operation and so on. At the same time, when pseudoaneurysm complicated with thrombosis, the display of real pseudoaneurysm by DSA is worse than that by CTA, so it is generally not the first choice for the diagnosis of pseudoaneurysm [15].

The principle of treatment of pseudoaneurysm is to eliminate the lumen, reconstruct blood vessels, restore blood supply, relieve local compression symptoms and eliminate complications. Ultrasound-guided compression therapy has been the first-line choice for the treatment of pseudoaneurysm [16].

Ultrasound-guided thrombin injection is an effective treatment, but there is a risk of thrombin infiltrating into the arterial system through the breach and causing arterial thrombosis or embolism. Therefore, ultrasound-guided thrombin injection has a better effect on longer neck and smaller rupture, and the risk of arterial embolism will be reduced at the same time [17]. This scheme is chosen in case 5 in this paper. However, for pseudoaneurysms with short neck and large lacerations, balloon therapy is needed. Brief balloon compression at the rupture of pseudoaneurysms can avoid thromboembolism caused by thrombin flowing into the arterial system [18]. In this paper, case 1 chose this scheme. However, for pseudoaneurysms with large volume, large rupture and large hematoma, the therapeutic effect of ultrasound-guided injection of thrombin is not satisfactory [6]. At this time, the therapeutic effect of pseudoaneurysm resection, rupture repair and hematoma removal by open surgery exploration is often satisfactory [10]. Case 4 in this paper chooses this scheme. For case 6 in this paper, the pseudoaneurysm occurred during the operation, which was caused by the rupture of a small branch of the deep femoral artery, so the injection of gelatin sponge was used to embolize immediately during the operation, and the effect was satisfactory [19]. When pseudoaneurysm is complicated with ipsilateral femoral vein compression and thrombosis, ultrasound-guided injection of thrombin can not be used to treat pseudoaneurysm [6]. If open exploration is adopted, there is a risk of pulmonary embolism caused by thrombus shedding because of compression of femoral vein during operation. Of course, with the use of vena cava filter, ultrasound-guided injection of thrombin or open exploration will be performed after the implantation of vena cava filter [20]. But this will undoubtedly increase the economic burden of patients. At this time, the use of covered stent implantation to block the rupture of pseudoaneurysm is a wise schem e[21]. In this paper, case 2 chooses this scheme. If the pseudoaneurysm is large, it can be combined with coil-assisted embolization [14], which is selected in case 3 in this paper.

There are many reasons for iatrogenic pseudoaneurysm of deep femoral artery, although endovascular repair of pseudoaneurysm is an effective and less invasive treatment option at present, but there are still some disadvantages that lead to pseudoaneurysm at the puncture site of contralateral femoral artery [21]. After endovascular treatment, the use of puncture vascular closure device can significantly improve the satisfaction of patients, and more importantly, significantly reduce the occurrence of pseudoaneurysm and complications [22,23]. It is may a new method to treat iatrogenic femoral artery pseudoaneurysm with Perclose Proglide™ artery under the guidance of DSA, and this method has the advantages of less trauma, low risk of anesthesia and more economical.

## Conclusion

In a word, once iatrogenic femoral artery pseudoaneurysm occurs, it should be treated in time to avoid further aggravation of complications. The treatment should be considered according to many factors, such as the volume of pseudoaneurysm, the length of aneurysm neck, the size of rupture, the health of patients and related complications, so as to choose the optimal treatment scheme with less pain, economy, low risk, quick recovery and less complications.

## References


1. Saydam O, Serefli D, Engin AY, Atay M, Kunt A. Percutaneous Treatment of Deep Femoral Artery Pseudoaneurysm Due to Penetrating Trauma. Ann Vasc Dis. 2018; 11: 569-571.
2. Stone PA, Campbell JE, AbuRahma AF. Femoral pseudoaneurysms after percutaneous access. J Vasc Surg. 2014; 60: 1359-1366.
3. Zhang BF, Cong YX, Wang PF, Huang H, Wang H, et al. Deep femoral artery branch pseudoaneurysm formation and injury after hip fracture surgery: A case series and a literature review. Medicine (Baltimore). 2018; 97: e9872.
4. Moini M, Rasouli MR, Rayatzadeh H, Sheikholeslami G. Management of femoral artery pseudo-aneurysms in Iran: a single centre report of 50 cases. Acta Chir Belg. 2008; 108: 226-30.
5. Le TD, Than VS and Nguyen MD. Percutaneous balloon-assisted ultrasound-guided direct glue embolization of deep femoral artery pseudoaneurysm rupture. Radiol Case Rep. 2021; 16: 425-429.
6. Hung B, Gallet B and Hodges TC. Ipsilateral femoral vein compression: a contraindication to thrombin injection of femoral pseudoaneurysms. J Vasc Surg. 2002; 35: 1280-3.
7. Nadal Bares L, Martínez Toribio M, de Miguel Artal M, Bonvehi Torres M. [Delayed pseudoaneurysm of deep femoral artery after surgical intervention of hip fracture. Presentation of a case]. Rev Esp Geriatr Gerontol. 2018; 53: 165-167.
8. Chong KC, Yap EC, Lam KS, Low BY. Profunda femoris artery pseudoaneurysm presenting with triad of thigh swelling, bleeding and anaemia. Ann Acad Med Singap. 2004; 33: 267-9.
9. Isoda R, Morita I and Yoshida M. Iatrogenic femoral vein pseudoaneurysm. J Vasc Surg Cases Innov Tech. 2020; 6: 285-287.
10. Papadakis M, Zirngibl H, Floros N. Iatrogenic Femoral Pseudoaneurysm and Secondary Ipsilateral Deep Vein Thrombosis: An Indication for Early Surgical Exploration. Ann Vasc Surg. 2016; 34: 269.
11. Mennitt K, Deol M, Gao J. Emergency color Doppler sonography of the extremity artery: A pictorial essay. Clin Imaging. 2017; 42: 240-248.
12. Hall HA, Minc S, Babrowski T. Peripheral artery aneurysm. Surg Clin North Am. 2013; 93: 911-23.
13. Imamura Y, Saito Y, Kondo N, Daitoku K, Fukuda I. Infected aortic pseudoaneurysm repair using autologous common femoral artery patch and fascia. Gen Thorac Cardiovasc Surg. 2020; 68: 1487-1491.
14. Pandey NN, Raju SN, Rajagopal R, Kumar S. Iatrogenic profunda femoris artery pseudoaneurysm: late presentation with successful endovascular microcoil embolisation. BMJ Case Rep. 2018; 11.
15. Kibrik P, Arustamyan M, Stern JR, Dua A. A systematic review of the diagnosis, management, and outcomes of true profunda femoris artery aneurysm. J Vasc Surg. 2020; 71: 2145-2151.
16. Ergun O, Çeltikçi P, Güneş Tatar İ, Yılmaz M, Hekimoğlu B. Percutaneous thrombin injection treatment of a femoral artery pseudoaneurysm with simultaneous arterial balloon occlusion: Case report

and review of the literature. Turk Kardiyol Dern Ars. 2016; 44: 684-689.

17. Schneider C, Malisius R, Küchler R, Lampe F, Krause K, et al. A prospective study on ultrasound-guided percutaneous thrombin injection for treatment of iatrogenic post-catheterisation femoral pseudoaneurysms. Int J Cardiol. 2019; 131: 356-61.

18. Gummerer M, Kummann M, Gratl A, Haller D, Frech A, et al. Ultrasound-Guided Fibrin Glue Injection for Treatment of Iatrogenic Femoral Pseudoaneurysms. Vasc Endovascular Surg. 2020; 54: 497-503.

19. Mayer J, Tacher V, Novelli L, Djabbari M, You K, et al. Post-procedure bleeding in interventional radiology. Diagn Interv Imaging. 2015; 96: 833-40.

20. Craxford S, Gale M, Lammin K. Arterial Injury to the Profunda Femoris Artery following Internal Fixation of a Neck of Femur Fracture with a Compression Hip Screw. Case Rep Orthop. 2013: 181293.

21. Tsetis D. Endovascular treatment of complications of femoral arterial access. Cardiovasc Intervent Radiol. 2010; 33: 457-68.

22. Del Prete A, Della Rocca DG, Calcagno S, Di Pietro R, Del Prete G, et al. Perclose Proglide™ for vascular closure. Future Cardiol. 2021; 17: 269-282.

23. Hackl G, Gary T, Belaj K, Hafner F, Rief P, et al. Exoseal for puncture site closure after antegrade procedures in peripheral arterial disease patients. Diagn Interv Radiol. 2014; 20: 426-31.