

의인성 쇄골하정맥 파열로 인한 응급 혈관내 스텐트 삽입

동국대학교 의과대학 경주병원 심장혈관내과

강병우, 배준호, 정진욱, 조병주, 박준기, 나득영

- Abstract -

Urgent Endovascular Stent Graft Placement for Iatrogenic Subclavian Artery Rupture

Byung-Woo Kang, M.D., Jun-ho BAE, M.D., Jin-Wook Chung, M.D.,
Byeong-Joo Jo, M.D., Jun-Gi Park, M.D., Deuk-Young Nah, M.D.

*Division of Cardiology, Department of Internal Medicine, Gyeongju Hospital,
Dongguk University College of Medicine, Gyeongju, Korea*

Central venous cannulation is one of the most commonly performed procedures for critically ill patients in the emergency room. Serious complications like a rupture of subclavian artery may occur during this procedure. We report a case of successful stent graft deployment for iatrogenic ruptured subclavian artery after attempted right subclavian vein catheterization in a 31 year-old female patient with hypovolemic shock due to cervical os laceration during vaginal delivery. [J Trauma Inj 2015; 28: 83-86]

Key Words: Central venous catheterization, Endovascular procedure, Stent, Subclavian artery

I. Introduction

Percutaneous central venous catheter cannulation is a common procedure for critically ill patients in the emergency room. These catheters are useful for rapid volume resuscitation, hemodynamic monitoring, intravenous drug therapy, parenteral nutrition, and hemodialysis. However, mechanical complications may occur during this procedure, such as

pneumothorax, hemothorax, and arterial wall rupture.(1)

The most serious vascular complication is arterial wall rupture, which can result in critical hemorrhage and even death.(2) Surgical repair has been the preferred method of treatment.(3,4) In recent years, endovascular stent graft placement has emerged as a valuable alternative to surgery.(5-7) However, the number of patients with subclavian

* Address for Correspondence : **Deuk-Young Nah, M.D.**

Division of Cardiology, Department of Internal Medicine, Gyeongju Hospital, Dongguk University College of Medicine,
87 Dongdaero, Gyeongju, 780-350, Korea

Tel : 82-54-770-8561, Fax : 82-54-770-8529, E-mail : ptca@dongguk.ac.kr

Submitted : March 1, 2015 **Revised** : March 19, 2015 **Accepted** : May 15, 2015

artery injuries who undergo urgent endovascular stent graft placement is limited.(6,7) Herein, we report on a patient with a ruptured subclavian artery during central venous catheterization who was successfully treated by endovascular stent graft with no complications.

II. Case

A 31-year-old female visited our hospital emer-

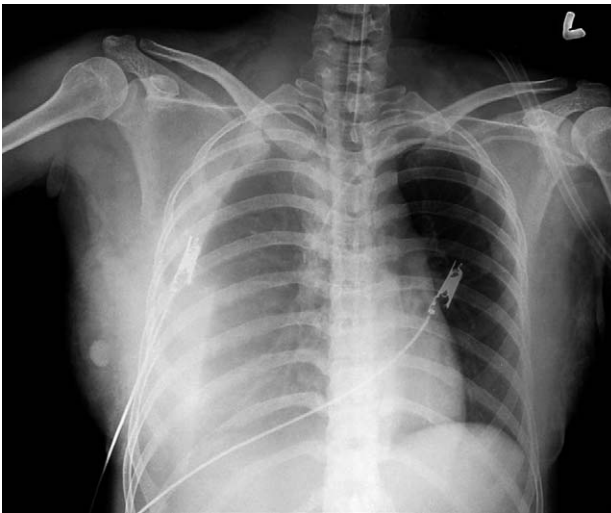


Fig. 1. Chest posterior to anterior radiography showed hemothorax on the right lung.

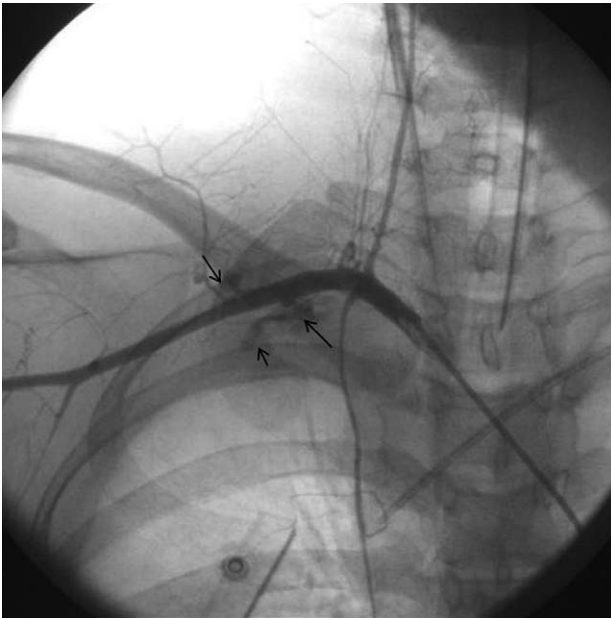


Fig. 2. Contrast extravasation (arrow) in the right subclavian artery on angiography.

gency room with hypovolemic shock due to cervical os laceration during vaginal delivery at a local obstetrical clinic. She was very pale in appearance and her mental status was drowsy. Systolic blood pressure was 60 mmHg. Hemoglobin level was 5.1 g/dL and hematocrit was 15.5%. Twelve lead electrocardiogram showed sinus tachycardia. The emergency physician attempted right subclavian vein catheterization for infusion of saline and blood transfusion, but failed. She was moved to the surgical intensive care unit and received blood transfusion but she did not recover from hypovolemic shock and hemothorax had occurred (Fig. 1). Obstetric & Gynecology doctors consulted to the cardiologist after 8 hours. Impression was iatrogenic subclavian artery rupture due to misplacement of the central venous catheter. Angiography was performed and demonstrated contrast extravasation in the site of the right subclavian artery (Fig. 2). Percutaneous balloon expandable stent graft (8.0×50 mm, GORE® VIABAHN®) placement was performed, through an 8F-12 cm introducer sheath placed into the right femoral artery. Active bleeding subsided after placement of a stent graft (Fig. 3) and her vital signs stabilized rapidly. The patient was discharged from the hospital without complication.

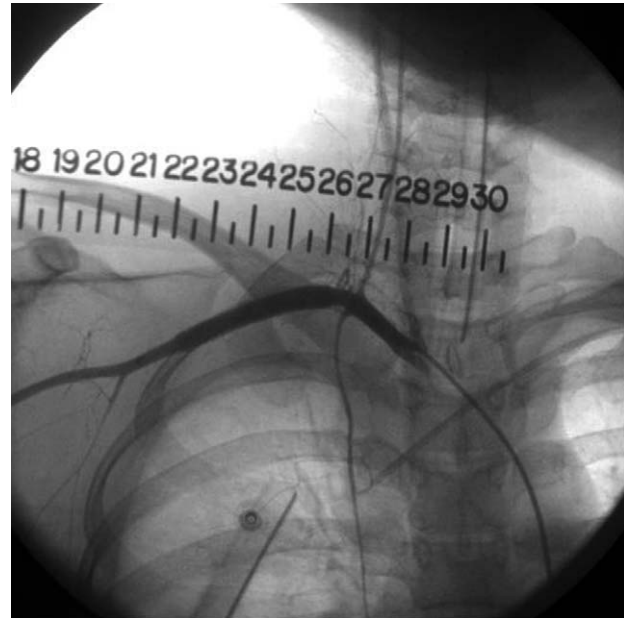


Fig. 3. Active bleeding subsided after placement of the stent graft.

III. Discussion

Central venous catheterization is one of the most common procedures performed for the purpose of rapid volume resuscitation. However, accidental puncture of the surrounding major artery can occur during the procedure, which may lead to a more serious situation.

Several methods have been developed for safe central venous catheterization. Use of ultrasonography for placement of central venous catheters has been advocated to reduce iatrogenic complications.⁽⁸⁾ Real time ultrasonography during central venous catheterization significantly reduced the number of complications during the procedure, according to the meta-analysis of the literature, Randolph and colleagues⁽⁹⁾ however, they have also expressed concern about the cost of the technology. Inadvertent arterial puncture with a small needle is usually benign,⁽¹⁰⁾ however, arterial misplacement of a central venous catheter can cause a serious mechanical complication and requires urgent treatment.⁽¹¹⁾ Early detection of the complication is critical for physicians. Pulling a large-bore catheter from an artery and applying pressure is generally acceptable management when the provided artery is accessible to manual compression. However, an arterial puncture in the proximal common carotid artery, subclavian artery is unmanageable by external compression because of the overlying bony structure. Surgical repair has been the preferred method of treatment.^(3,4) However, surgical approaches are technically complex in an already debilitated patient and consequently entail considerable morbidity and mortality rates.^(3,4,12)

In this case, the patient visited our hospital with hypovolemic shock due to cervical os laceration during vaginal delivery. Rapid volume resuscitation was critical. The emergency physician attempted right subclavian vein catheter insertion several times but finally failed. The patient's blood pressure remained low even after administration of massive blood transfusion. Under the impression of iatrogenic subclavian arterial wall rupture due to misplacement of a central venous catheter, we concluded that endovascular stent insertion is a better option than

a surgical intervention for this patient in hypovolemic shock.

Angiography was performed and demonstrated contrast extravasation in the site of the right subclavian artery. Active bleeding subsided after placement of a stent graft (Fig. 3) and her vital sign stabilized rapidly. After a successful angioplasty, the patient was discharged from the hospital without complication. She visits our hospital regularly, and she actively uses her right arm without numbness or claudication. Both radial arterial pulses are equally palpable.

Based on the long-term results of stent graft treatment of subclavian artery injuries by du Toit DF,⁽¹³⁾ stent restenosis is problematic. However, most cases were managed well with conservative treatment. The technology of endovascular stent graft intervention has shown continuous improvement, so far. We conclude that endovascular stent graft is a very attractive alternate to open surgery, when inadvertent arterial wall rupture occur. Regular follow up of the stented artery by Doppler sono is recommended after successful angioplasty.

REFERENCES

- 1) Guilbert MC, Elkouri S, Bracco D, Corriveau MM, Beaudoin N, Dubois MJ, et al. Arterial trauma during central venous catheter insertion: Case series, review and proposed algorithm. *J Vasc Surg* 2008; 48: 918-25.
- 2) Lee JH, Kim YB, Lee MK, Kim JI, Lee JY, Lee SY, et al. Catastrophic hemothorax on the contralateral side of the insertion of an implantable subclavian venous access device and the ipsilateral side of the removal of the infected port -A case report-. *Korean J Anesthesiol* 2010; 59: 214-9.
- 3) Shah PM, Babu SC, Goyal A, Mateo RB, Madden RE. Arterial misplacement of large-caliber cannulas during jugular vein catheterization: case for surgical management. *J Am Coll Surg* 2004; 198: 939-44.
- 4) Kalakuntla V, Vijaykumar P, Tagoe A, Weaver W. Six-year experience with management of subclavian artery injuries. *Am Surg* 2000; 65: 927-31.
- 5) Schoder M, Cejna M, Holzenbein T, Bischof G, Lomoschitz F, Funovics M, et al. Elective and emergent endovascular treatment of subclavian artery aneurysms and injuries. *J Endovasc Ther* 2003; 10: 58-65.
- 6) Patel AV, Marin ML, Veith FJ, Kerr A, Sanchez LA. Endovascular graft repair of penetrating subclavian artery injuries. *J Endovasc Surg* 1996; 3: 382-8.
- 7) duToit DF, Strauss DC, Blaszyk M, deVilliers R, Warren

- BL. Endovascular treatment of penetrating thoracic outlet arterial injuries. *Eur J Vasc Endovasc Surg* 2000; 19: 489-95.
- 8) American College of Emergency Physicians. Emergency ultrasound guidelines. *Ann Emerg Med* 2009; 53: 550-70.
 - 9) Randolph AG, Cook DJ, Gonzales CA, Pribble CG. Ultrasound guidance for placement of central venous catheters: meta-analysis of the literature. *Crit Care Med* 1996; 24: 2053-8.
 - 10) Sznajder JI, Zveibil FR, Bitterman H, Weiner P, Bursztein S. Central vein catheterization: failure and complication rates by three percutaneous approaches. *Arch Intern Med* 1986; 146: 259-61.
 - 11) Powers CJ, Zomorodi AR, Britz GW, Enterline DS, Miller MJ, Smith TP. Endovascular management of inadvertent brachiocephalic arterial catheterization. *J Neurosurg* 2011; 114: 146-52.
 - 12) Lin PH, Koffron AJ, Guske PJ, Lujan HJ, Heilizer TJ, Yario RF, et al. Penetrating injuries of the subclavian artery. *Am J Surg* 2003; 185: 580-4.
 - 13) du Toit DF, Lambrechts AV, Stark H, Warren BL. Long-term results of stent graft treatment of subclavian artery injuries: management of choice for stable patients? *J Vasc Surg* 2008; 47: 739-43.