Case Report

Percutaneous Subclavian Artery Covered Stent Placement Following Inadvertent Subclavian Arterial Cannulation

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Abstract

Inadvertent subclavian artery canulation although rare is a life threatening complication of central venous canulation. Its prompt recognition and management by stent placement, thrombin injection, Angio seal or gel foam embolization is essential to minimize fatal complications. We describe a case report of subclavian arterial canulation which was recognized and managed percutaneously by covered stent placement without complications.

Keywords*: subclavian arterial; cannulation; covered stent*

Introduction

Central venous catheter (CVC) cannulation in the subclavian vein of patients wounded in battle was first described by Aubaniac in 1952. [1] The CVC helps in the management of critical patients in that it provides reliable short to medium term venous access for hemodynamic monitoring, intravenous drug therapy, hemodialysis, parenteral nutrition and rapid fluid resuscitation and is now a commonly performed procedure in ICU setting. [2] Complications of Subclavian vein cannulation include pneumothorax, hydrothorax, hemothorax, local hematoma, vascular injury, thrombo-embolism, and site related infections. [3] Inadvertent subclavian artery puncture during subclavian vein cannulation is a known and serious complication of CVC placement which could lead to hematoma, pseudo aneurysm formation, arterial occlusion, embolism, dissection, stroke, severe airway obstruction and even fatal bleeding on sheath removal as it is an anatomically non compressible site[4, 5]. Removal of inadvertently placed CVC followed by manual compression can lead to complications like uncontrollable bleeding and death.[6] Various techniques have been described to treat the subclavian artery after an inadvertent puncture like stent placement, thrombin injection, Angio seal and gel foam embolization. Techniques such as stent graft placement, thrombin injection, Angio seal devices and Gel foam embolization have been used to repair the subclavian artery after inadvertent puncture [7, 8]. We report a case of inadvertent subclavian artery cancellation, which was successfully closed using a covered stent placed percutaneously. A percutaneous approach is appropriate and justified management strategy with lesser complications as compared to surgical treatment. [9-11]

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Case Report

A 45 -year-old gentleman, diagnosed with acute pancreatitis had a central venous catheter placement in the surgical ICU. As he was in shock an attempt was made to access the right subclavian vein to place the venous catheter by using an anatomic landmark technique with a 7F triple lumen central venous catheter. However, after gaining access the surgeons noted pulsating blood flow and an arterial puncture was suspected which was confirmed by sending the blood for arterial blood gas analysis. The CVC was not removed due to the risk

of life-threatening bleeding which may occur and the inability to directly press the arterial leakage site.

The patient was taken to the cardiac Cath lab for an angiography. A bilateral femoral artery approach was made. A 6F JR4 catheter was inserted through the left femoral artery into the right subclavian artery and was used as a diagnostic catheter to inject the dye and visualize the site of subclavian arterial puncture. A 9F sheath was introduced into the right femoral artery and the stent was passed through it. The angiogram showed the entry of the CVC in his proximal portion of his right subclavian artery, after the right vertebral artery. (Fig 1 & 2)

We planned to pull out the catheter and cover the entry point at the Subclavian artery with a covered stent with due precaution to avoid occlusion of right vertebral artery. A Fluency® Plus Vascular Stent Graft (Bard, Inc.) 10 x 40 mm covered stent was positioned in the right subclavian artery (Fig 3), the misplaced venous catheter was removed (Fig 4 & 5). The position of the stent was reconfirmed by dye injection with respect to the site of entry of the catheter and origin of the vertebral artery and the stent was deployed (Fig6)

Immediately we achieved successful hemostasis and it was angiographically confirmed that the subclavian and vertebral artery was patent with no leakage of contrast from the puncture point (Fig 7) The patient was shifted to ICU and recovered and was discharged after 2nd day in a satisfactory condition and has been doing well on follow up.*center mid-term results.*

Fig 1 : The central venous catheter seen entering into the right subclavian artery

Fig 2: Entry point of misplaced catheter confirmed to be beyond the right vertebral artery

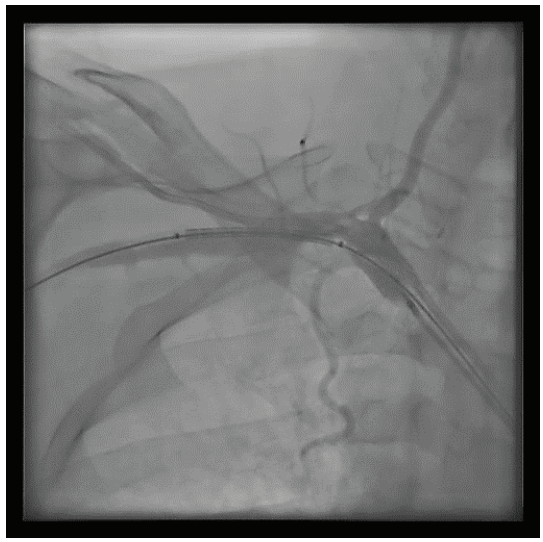

Fig 3 : The covered stent being positioned at site of entry of the catheter

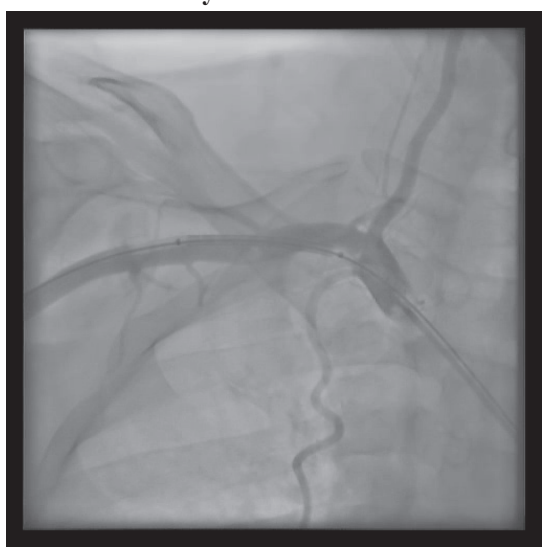

Fig 4 : The indwelling catheter being pulled out

Fig 5. Dye seen to extravasate and flow out to the site of skin entry of the catheter

Figure 6: The covered stent being expanded

Figure 7 : Check angiogram post deployement showing no extravasation of dye from entry point and no limitation of flow to vertebral artery

Discussion

There is extensive usage of a central venous catheter in critical care units to provide long term access and dedicated access for parenteral nutrition, hemodialysis and management of hydration in pre- and post-operative fasting states. Inadvertent arterial cannulation is seen in 3.2-3.7% of cases of CVC insertion. [12, 13] Usually a mistaken arterial puncture will be known by the spurt of blood from needle before insertion of a large bore canula, chances of arterial cannulation of CVC is very rare. [14] However patients with trauma or sepsis may be in shock and hence may not have pulsatile back flow and dark blood due to hypoxemic status and thus inadvertent arterial cannulation may not be recognized during needle puncture. Various other risk factors for complications in CVC has been described like obesity, short neck, urgent need for catheterization.[14] Arterial cannulation can be prevented by doing CVC cannulation under Ultrasound guidance. [15, 16]

Inadvertent arterial cannulations have been managed by removal of catheter and external compression, endovascular interventions like balloon inflation, stent placement, gel foam or Angio seal, or by surgical exploration and direct repair of arterial trauma. [6, 17, 18]. Inadvertently placed venous catheters have been traditionally removed directly with manual compression this practice is risky in arteries such as the subclavian artery, which are behind the clavicular bone and hence non compressible by direct pressure on skin. For removal of CVC by open surgical method the manubrium sterni, clavicle and first rib have to be resected in an extensive surgery. Direct pulling out of catheter and conservative monitoring for bleeding is not advisable currently because of increased mortality and complications with it and also availability of minimal invasive techniques these days [6, 19]. Endovascular approach is advisable for inadvertent arterial cannulations at sites which are difficult to compress manually or anatomically hidden areas. Subclavian vessels are large and readily accessible from the femoral or brachial approach making them well suited to endovascular therapy.[20] Technical success of endovascular repair in cases of subclavian artery injuries is reported between 94-100% with procedure-related complications between 0-22%.[21] Balloon tamponade has also been described as a accepted technique for endovascular repair of arterial punctures but carry a risk

of dissection and failure needing a stent placement at the site. There are no randomized control trials or guidelines specifying advantage of one technique over other due to low incidence of such complications reported and broad clinical profile of patients with these complications. However percutaneous stent placement for inadvertent subclavian artery cannulation is a safe and easy procedure to prevent a life-threatening complication

Conclusion

Inadvertent subclavian artery cannulation and hemorrhage can be a life-threatening complication during a commonly performed procedure. Ultrasound guidance and confirmation with non pulsatile back flow has been recommended as methods to avoid such complication. Manual compression, surgical repair and endovascular repair techniques have been described to handle such complications. We have described a case where inadvertent subclavian arterial cannulation was treated percutaneously with subclavian stent placement.

Ethical Clearance- As it is a case report consent from patient was taken for publishing article

Source of Funding- Self

Conflict of Interest- Nil

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