

SUBCLAVIAN VEIN INJURY AND MASSIVE HEMOTHORAX REQUIRING THORACOTOMY FOLLOWING INSERTION OF TUNNELED DIALYSIS CATHETER

- A Case Report and Review of Literature -

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Abstract

Tunneled dialysis catheters are widely used for hemodialysis. Large caliber dilator is used for insertion of such catheter which can result in serious vascular injury leading to haemothorax. Here we report such an inadvertent central venous injury requiring thoracotomy following blind dilator advancement along with review of literature and recommendation to prevent such complication.

Key words: Subclavian vein injury; Haemothorax; Tunneled dialysis catheter.

Background

Tunneled dialysis catheters (TDC) are widely used for hemodialysis^{1,2}. Insertion of such catheters requires large caliber dilator which can cause devastating vascular injury leading to cardiac arrest or even death particularly if there are anatomical abnormalities, stenosis, history of previous multiple insertion attempts.^{1,3-5} Here we report such a case of vascular injury leading to hemo-pneumothorax requiring thoracotomy following TDC insertion.

Case Report

A 54 year old female patient with end-stage renal disease (ESRD), hypertension, diabetes mellitus, cardiomyopathy, and left ventricular failure was admitted to our hospital. Patient was on irregular hemodialysis. This time she was admitted with respiratory distress and features of fluid overload. Consultant nephrologist decided to resume hemodialysis using TDC (Quinton Permcath, Kendall, Tyco Healthcare, USA). Informed consent was taken after explaining the procedure. Pulse oximetry, electrocardiogram and blood pressure (BP) monitoring were started. Right internal jugular vein (RIJV) was punctured after lignocaine infiltration under aseptic precaution using

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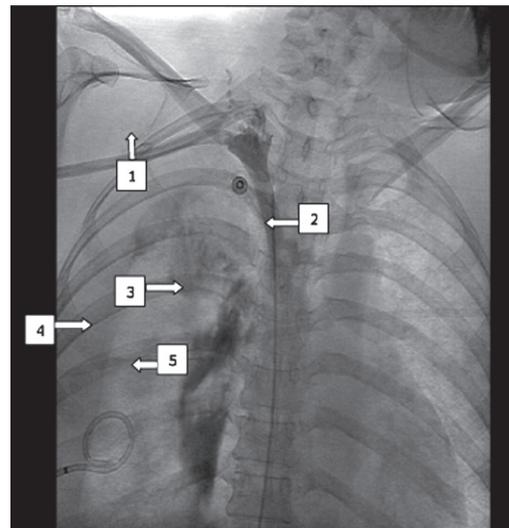
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ultrasound (Site Rite 5, BARD, USA). After obtaining free flowing dark coloured blood, a guidewire was inserted under ultrasound guidance till arrhythmia was noted. Guidewire was then withdrawn a little bit. Skin was infiltrated once again with lignocaine for subcutaneous tunneling of TDC. Then a 12 French dilator with the sheath was introduced over the guidewire. While doing so guidewire came out a bit, but it was still inside the vein. The dilator was then pushed blindly to its full length. After that the dilator was pulled out and TDC was introduced through the sheath. At this time patient complained of shearing pain and shortness of breath. Further advancement of catheter was stopped. On aspiration back flow of blood was obtained only from the proximal lumen. Immediately intravenous portion of TDC along with sheath was removed and pressure was applied. At this time fluoroscopy was used which showed right sided pneumothorax. Patient became more tachypneic and hypoxic, so a chest tube was inserted. This resulted in some clinical improvement. Femoral catheter (FC) insertion was planned as she needed urgent dialysis. During FC insertion she became more dyspneic, irritable and hypotensive. Vascular injury was suspected and the radiologist performed an angiogram through FC which showed minor spillage of dye into pleural cavity indicating pleural tear (Fig. 1). She was shifted to ICU for further observation. She became more unstable with increasing breathlessness, desaturation, and hypotension. She was resuscitated with fluids and put on oxygen by mask. Routine blood investigations were sent and cardiothoracic opinion was sought. Repeat chest X-ray revealed complete whitening of the right hemi-thorax (Fig. 2). A new chest tube was inserted as previous one was not working well. Immediately about 400ml of blood came out. Her hemoglobin dropped from 11.4 to 5.2gm/dL. Dopamine (10µg/kg/min) was started for maintenance of BP. Cardiothoracic surgeon decided to do urgent thoracotomy because of suspicion of continued vascular leak. A large clot amounting to 1.5 liter of blood along with tear in right subclavian vein was found during thoracotomy. After surgery she was shifted back to ICU for observation and mechanical ventilation. She received seven packed red blood cells perioperatively and her hemoglobin improved to 10.7gm/dL. Her BP improved and she could be weaned off from inotrope and ventilator. Hemodialysis was

started through FC. Later she developed thrombosis of right femoral vein due to longer stay of FC. So the FC was removed and she was put on enoxaparin and warfarin. Afterwards arterio-venous fistula (AVF) was created for regular dialysis and she is doing fine with that.

Fig. 1

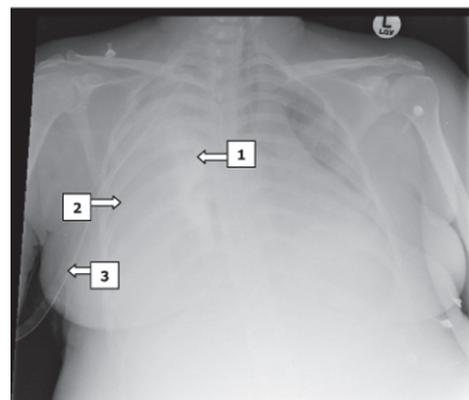
An angiogram done via femoral catheter (which is clearly visible coming up from inferior vena cava) revealing leak of dye in pleural cavity.



1. Right tunneled catheter in situ (which was not fully removed from subcutaneous tunnel, but was removed from the vein).
2. Angiography catheter passed through femoral vein for doing venography.
3. Spillage of dye into pleural cavity.
4. Re-reeching of lung margin due to pneumothorax.
5. Initial pigtail catheter inserted to drain pneumothorax.

Fig. 2

Right sided haemothorax with whitening of right chest cavity (Chest drain tube in situ)



1. Spillage of dye into pleural cavity.
2. Whitening of right hemi thorax due to haemo-pneumothorax.
3. Standard chest drain tube in situ.

Discussion

RIJV is often selected as ideal vein for hemodialysis access because of its straight course, reduced risk of malposition and thrombosis^{2,3,6}. Central venous catheter (CVC) insertion and dilator manipulation can lead to complications like pneumothorax, subcutaneous emphysema, thoracic duct injury, arterial puncture, hemothorax, pericardial tamponade, and mediastinal hematoma^{2-5,7-10}. In majority of reports hemothorax resulted from arterial injury, and rarely from venous injury due to faulty insertion of needle or catheter^{2-5,8,10}. Venous injury is most commonly reported to occur during left sided CVC insertion and arterial injury during right sided CVC insertion²⁻⁵. Very rarely it has been reported to occur from dilator⁵. Too deep insertion of dilator can result in injury of vessel or heart⁵. Because of its stiff texture it can cause more serious vascular injury than needle or catheter⁵. Safer dilator design and insertion technique have also been recommended to prevent such complication⁵. In our case the dilator was blindly and mistakenly inserted to full length, even though the guidewire came out partially, which probably had resulted in venous injury. This is very dangerous maneuver and should never be attempted. Also undue force should never be applied while advancing the dilator. Direction of dilator advancement is also important as RIJV maintains a medial course while draining to superior vena cava. So the dilator should always be advanced along the course of the vein. Use of real-time sonography or fluoroscopy is recommended especially in difficult cases during insertion of the needle and dilator for prevention

of such complication^{1-4,6,7}. Venography before or after CVC insertion may help to detect unexpected central venous anomalies, minimize the risk of complications and extravasal placement (as in our case)^{1,2,4,7}. Postprocedure X-ray, CT Scan, ultrasound or echocardiography are recommended to detect such complication^{2-4,9,10}. This is specifically indicated if patient complains of retrosternal pain and respiratory distress during insertion or aspiration of blood^{2,5}. Management of vascular injury includes endovascular repair, stent placement, embolization and or balloon tamponade^{3,7,10}. Even emergency thoracotomy like in our case may be needed to evacuate the hematoma and repair the vascular tear^{9,10}. Rare occurrence of dilator induced venous injury leading to hemo-pneumothorax requiring emergency thoracotomy prompted us to report this case. Our purpose to report this case was to notify that this type of misadventure can lead to serious consequences.

Inadvertent and blind insertion of large caliber dilator can result in serious vascular injury. Such dilator should never be inserted for a length more than necessary. We propose that graduated dilator with markings indicating the safe and dangerous lengths and should be used under real-time fluoroscopic and/or ultrasound guidance.

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