

## CASE REPORT

# Hemiplegia caused by inadvertent subclavian artery double-lumen catheterization

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## ABSTRACT

Arterial puncture during central venous catheterization (CVC) is a relatively rare complication that may have devastating consequences. We present a case of left sided hemiplegia after inadvertent, unidentified right subclavian artery double-lumen catheterization in a 60 years aged male who had to undergo central venous catheterization for hemodialysis. The patient had had hemodialysis from the same intra arterial route thrice. Twenty days later, he was successfully managed in OR by removal of the catheter from his artery and manual compression for 20 minutes to control the bleeding.

**Key words:** Central venous catheterization; Subclavian artery puncture; CVC complications

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## INTRODUCTION

Central venous cannulation is a very common catheter based technique used in clinical practice. It is used for hemodynamic monitoring, fluid resuscitation, administration of drugs, chemotherapy, parenteral nutritional support and hemodialysis access in renal failure patients.<sup>1</sup> Usually it is very effective and safe<sup>2</sup> but sometimes may be potentially associated with serious complications.<sup>3-9</sup> Majority of fatal complications are insertion related including tension pneumothorax and arterial puncture. Arterial punctures are associated with significant morbidity and mortality.<sup>3</sup> When recognized, prompt consultation and intervention is required. We present a case of inadvertent, unidentified right subclavian artery catheterization (SAC) with a double-lumen catheter, in a 60 years aged male, who had developed hemiplegia, probably due to thrombo-embolism from this malpositioned catheter.

## CASE REPORT

A 60 year old male patient with diabetes mellitus, hypertension, ischemic heart disease and chronic renal

failure on hemodialysis for nine month was admitted in medical ward with history of fever for one week and sudden weakness of left side of body for four days which aggravated progressively. Examination revealed an indwelling double-lumen catheter in his right subclavian, which was inserted for hemodialysis at a tertiary care health institution about twenty days back. He had had hemodialysis after insertion and during the process of hemodialysis he developed hemiplegia. Later on he had twice hemodialysis fifteen days after developing hemiplegia via the same double-lumen catheter.

The patient had altered mental status and left sided facial deviation indicative of upper motor neuron type lesion, GCS was 12/15 and power was zero in both upper and lower limbs on left side of body with decreased tone and hyperreflexia. Rest of the examination was unremarkable. Routine laboratory investigations were within normal limits except renal function tests which were abnormally high. Brain CT scan revealed cerebral edema extending from right temporoparietal region up to vertex with compression of frontal, lateral and occipital horns and minimal midline shift.

He reported to our hospital for management of renal failure. While performing his routine dialysis at our hospital, a very high venous pressure was observed at dialysis machine, which indicated catheter misplacement. This was further confirmed by attaching a syringe to the venous hub. The plunger of the syringe was rhythmically pushed out by the pumping heart. The blood sample was sent to laboratory for ABG's. An emergency x-ray chest was ordered. CT scan was also done. The blood sample was proven to be of arterial origin, and CT scan confirmed that the catheter was in fact in right subclavian artery instead of the vein.

The patient was referred to us for catheter removal, which was removed successfully in OT under aseptic conditions with the help of our surgical colleagues. Pressure for full 20 minutes successfully stopped bleeding, and pressure dressing was applied. The patient was observed in ICU for 24 hours. No further complication or bleeding was noted. Venous catheterization was later on done on the opposite side for intermittent hemodialysis.

## DISCUSSION

Subclavian or internal jugular vein catheterizations are frequently performed as a temporary route for hemodialysis in patients with renal failure. Successful catheterization depends upon many factors; experience of the operator, number of attempts, previous catheterization, obesity, local disease or trauma, and confirmatory facilities e.g. ultrasound, flow trace transducers and other imaging techniques. Ultrasound guidance is now-a-days widely used for this purpose, but in our country, this facility is available at any few select healthcare centers. Blood flow may be transduced at a monitor and the trace readily indicates whether it is arterial or venous in origin. Fluoroscopic or CT guidance can also be used for this purpose. The simplest method is to attach a running infusion line and a pulsating, rising column of blood in the infusion line will show that it is arterial. This test may however, be negative in shock and hypotensive patients. In our patient, the catheter was a large bore (G12), double-lumen catheter, and it is incomprehensible that the operator had not been able to identify its malpositioning; rather it is more probable that he felt himself incapable to deal with the consequences of removing it from the subclavian artery, hence left it in situ.

Common mechanical complications encountered during insertion of CVC include inadvertent arterial puncture (subclavian, carotid or innominate artery puncture), hematoma formation and pneumothorax,<sup>4,5</sup> whereas local toxicity, formation, venous thrombosis and neurological deficits can be caused by malposition of CVC.<sup>6</sup> CVC is also a risk factor for forming venous

thrombosis<sup>7</sup> including upper extremity deep vein thrombosis.<sup>8</sup>

All these complications usually do occur in subclavian, internal-jugular and femoral catheterizations<sup>4</sup> but in case of subclavian the occurrence rate is significantly higher (39%) compared to jugular (33%) and femoral (24%) routes.<sup>6</sup> Furthermore in up to 4% of cases, SCA puncture is also reported.<sup>6</sup> Due to the anatomic layout and preferences, all these reported injuries are right sided.<sup>8,9</sup>

The complication rate increases with the increase in duration of catheterization procedure and number of unsuccessful attempts. Catheterizations done by inexperienced person or performed at night have higher complication rates. Further, the altered anatomy of patients due to morbid obesity, surgery, irradiation dehydration, coagulopathy and previous catheterizations also causes complications.<sup>10</sup> Kinking of the guide wire, resulting in misdirection of the dilator, and perhaps insertion of the guide wire outside the vessel.<sup>1,11-13</sup> Recently introduced flexible catheters and the J-tipped guide-wire insertion technique has reduced the complication rate but the mortality still exists in such cases.<sup>12</sup>

To avoid arterial perforation, operator should know if the catheter is in vein, or in the artery. This can often be confirmed by the pulsating back flow offered by artery. Some other methods are also used for the same purpose, each having its own pros and cons but none of these are always accurate. So far ultrasound guidance is the best among currently available methods.<sup>6</sup> A rarely occurring but devastating complication is the cannulation of the carotid or subclavian arteries. It usually occurs in less than 1% of patients but if once occurred there are 30% chances of the patient to become symptomatic-bleeding, neurologic findings and its consequences. In such cases mortality rate is also high (up to 40%) while 27% of these results in Stroke or neurologic deficit particularly in association with infusions through the cannulated artery.<sup>6,14</sup>

A case has been described of bithalamic infarction during subclavian catheterization related to the accidental migration and complete occlusion of an arterial embolism to the Percheron's artery. Percheron's artery is an anatomical variation described in 1977, constituted by a solitary arterial trunk arising from one of the proximal segments of a posterior cerebral artery supplying the paramedian thalami and the rostral midbrain bilaterally.<sup>15</sup>

While dealing with these complications, it's wise not to remove the causative catheter until next procedure is decided.<sup>6</sup> The available procedures include both percutaneous and invasive techniques; choice of which depends on individual patient circumstances.<sup>6</sup> The

recently developed percutaneous techniques such as suture devices, stent graft placement, and balloon temponade are associated with less risks as compared to open surgeries. Percutaneous closure devices have been used to close arterial punctures in both emergency and elective scenarios. The Angio-Seal device is designed to provide rapid and secure haemostasis after arterial puncture and is currently licensed for use in femoral arterial puncture sites, where it has been demonstrated to be both safe and effective.<sup>16,17</sup>

When a line has been inadvertently inserted into an artery at a compressible site, this can be safely managed by removal and manual compression. However, if line removal is attempted at a non-compressible site, there is a greater propensity for serious complications such as haemorrhage or pseudoaneurysm to occur. Surgical repair may require addressing inadvertent injuries, even higher invasive operative techniques are required to treat subclavian injuries as Subclavian arteries cannot

be manually compressed.<sup>10,18</sup>

In our case the subclavian artery puncture was responsible for hemiplegia and a drop in GCS possibly by ischemic stroke as a result of thromboembolism. We successfully removed the catheter from artery and secured hemostasis with continued pressure for twenty minutes was achieved.

## CONCLUSION

We wish to highlight that all central catheterizations must be carried out under ultrasound or fluoroscopic guidance and correct placement confirmed by tracing central line waveform on a monitor. If inadvertent arterial placement is confirmed it must be replaced urgently with all precautions to secure excessive bleeding from the puncture site.

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