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# Transient right phrenic nerve palsy associated with central venous catheterization

**Y. Takasaki[1*] and T. Arai[2]**

*[1]Department of Anesthesia, Uwajima Social Insurance Hospital and [2]Department of Anesthesiology and Resuscitology, Ehime University School of Medicine, Ehime, Japan*

**Corresponding author*

An 85-yr-old woman with advanced sigmoid colon cancer developed right phrenic nerve palsy following central venous catheterization for preoperative nutritional and fluid balance improvement. The central venous catheter was successfully placed via the left subclavian vein at the first attempt. Blood returned freely through the catheter. The chest x-ray film taken immediately after the catheterization showed the proper placement of the catheter, but it revealed a significant right hemidiaphragmatic elevation indicating phrenic nerve palsy. A chest computed tomography scan and bronchoscopy were normal. As the patient did not complain of dyspnoea and vital signs were normal, tumour resection was performed. The operative and postoperative course was uneventful. The chest x-ray film after the surgery still showed the elevation of the right hemidiaphragm. It resolved completely within 3 days of withdrawing the central venous catheter by 3 cm on the fourth postoperative day. We concluded the likely cause of the phrenic nerve palsy was that the catheter tip impinged upon the thin venous wall and compressed the phrenic nerve running alongside the superior vena cava.

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Phrenic nerve palsy has been reported as one of the possible complications of central venous catheterization. Although the incidence of this is rare, it may worsen the respiratory function of patients who have been compromised under pulmonary illness. We present a case in which a patient developed right phrenic nerve palsy after central venous catheterization, the cause of which was most likely the compression of the phrenic nerve, running alongside the superior vena cava, by the impinged catheter tip upon the wall of the vein.

## Case report

An 85-yr-old woman with advanced sigmoid colon cancer was admitted to hospital as an emergency because of increasing abdominal distension. The plain x-ray film showed distended large bowel with gas, suggesting a deterioration of bowel obstruction. A rectal tube was raised beyond the obstruction site into the descending colon under fluoroscopy to lessen the abdominal distension. The chest x-ray film was normal.

On the third day of admission, central venous catheterization was attempted to improve the nutritional and fluid balance of the patient before surgery. A 16-G catheter was passed into the left subclavian vein through an infraclavicular approach at the first attempt. Blood returned freely through the catheter. The chest x-ray film confirmed the proper placement of the catheter, but it also showed an elevation of the right side hemidiaphragm (Fig. 1). The patient was not dyspnoeic and the arterial blood gas data were normal.

A chest computed tomography scan (CT) revealed a single metastatsic nodule in the lower lobe of the right lung and a small amount of pleural effusion in the right hemithorax. Neither the chest CT scan nor subsequent bronchoscopic examination demonstrated any other abnormaity that might explain the right hemidiaphragmatic elevation.

On the 18th day of admission, resection of the sigmoid colon with formation of a colostomy was performed under general anaesthesia. In spite of the persistent elevation of the right hemidiaphragm, the patient's postoperative recov-

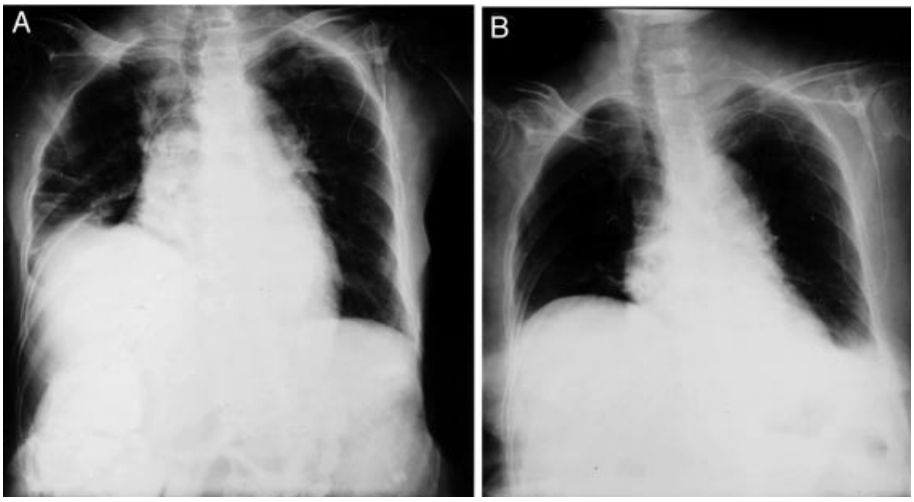


**Fig 1** (A) On the left side, supine chest film immediately after inserting the central venous catheter via the subclavian vein, showing the proper placement of the catheter and the right hemidiaphragmatic elevation. (B) On the right side, supine chest film 3 days after withdrawing the catheter, demonstrating the complete restoration of the right hemidiaphragm.

ery was uneventful. On the fourth postoperative day, the tip of the catheter was withdrawn by 3 cm because the flow rate of infusion fluid through the catheter was sluggish and the chest X-ray film showed the catheter tip to be impinged more perpendicularly on the wall of the superior vena cava than in the previous films. The infusion speed improved and the chest x-ray film 3 days after the withdrawal revealed complete resolution of the right phrenic nerve palsy (Fig. 1). On the 17th postoperative day the patient was discharged from hospital with no recurrence of the phrenic nerve palsy.

## Discussion

Phrenic nerve palsy related to central venous catheterization is uncommon. There have been several reports, and various causes proposed. Direct nerve injury as a result of repeated venipuncuture at the internal jugular vein while siting the catheter;[1 2] haematoma produced by an inadvertent arterial puncture during catheterization of the right subclavian vein;[3] lidocaine instillation before right internal jugular vein catheterization;[4] and nerve compression from the inflamed venous wall adjacent to the phrenic nerve 55 days after catheterization.[5]

In our case we punctured the left subclavian vein by the infraclavicular approach where there is no possibility of damaging the right phrenic nerve with the needle, local anaesthetic infiltration and/or haematoma formation at the puncture site. One possible cause for the right phrenic nerve damage was the compression of the nerve through the vein wall by the tip of the catheter. When a central venous catheter is introduced through the left subclavian vein, the tip of the catheter hits the wall of the superior vena cava more perpendicularly than when it is introduced from the right side. Central venous catheter-related vascular erosion or perforation is more common when the catheter is introduced from the left subclavian vein.[6 7] Therefore, we concluded that the cause of the phrenic nerve palsy was the tip of relatively rigid polyurethane catheter impinging upon the thin venous wall and compressing the phrenic nerve running alongside the superior vena cava.

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