Tension Pneumothorax Presenting as Ischemia of the Hand

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PNEUMOTHORAX, a recognized complication of central venous catheterization especially when the subclavian route is used, can result in rapid collapse of the ipsilateral lung, mediastinal shift, and cardiovascular collapse.

We report a case of iatrogenic tension pneumothorax under general anesthesia presenting as ischemia of the contralateral hand.

Case Report

A 51-yr-old woman who had a subarachnoid hemorrhage was brought to the operating room for craniotomy and clipping of an intracerebral aneurysm. Bilateral ulnar artery circulation was confirmed by Allen’s test and palpation of ulnar artery pulses. Noninvasive monitoring was commenced, and anesthesia induced with 4 μg/kg fentanyl, 2 mg/kg propofol, and 0.1 mg/kg vecuronium. Tracheal intubation was performed without difficulty. The lungs were ventilated mechanically with oxygen and nitrous oxide 50:50 and 0.2% isoflurane. A 20-G cannula was placed in the left radial artery. Several attempts by the surgical team to cannulate the right subclavian vein failed. The right internal jugular vein was cannulated at the first attempt. Throughout the case, hemoglobin oxygen saturation ($SpO_2$) was 100% with unchanged cardiovascular parameters (blood pressure (BP) 110/65–130/80 mmHg, pulse rate 80–90/min). End-expired carbon dioxide ($EtCO_2$) 26 mmHg) and other ventilatory parameters (tidal volume (VT) 620–670 ml; peak inspiratory pressure (Pip) 25–27 cmH₂O) remained unchanged. Chest radiography was performed to check the position of the central venous catheter.

Five minutes after radiography and 20 min after attempts to cannulate the right subclavian vein were abandoned, the $SpO_2$, which was being monitored via a probe on the left index finger, decreased to 95%, and the arterial blood pressure trace became dampened. The left hand was noted to be pale, cold, and without circulation, although perfusion above the wrist appeared unchanged. No changes in perfusion were observed in the right arm. The oximeter probe was replaced on the index finger of the right hand. $SpO_2$ remained at 95%. Chest auscultation revealed diminished breath sounds on the right side. Depth of insertion of the endotracheal tube was unchanged. $EtCO_2$, and ventilatory parameters continued unchanged.

Six minutes after radiography, the chest radiograph became available. It showed a large right-sided pneumothorax (70%) with significant mediastinal shift to the left (fig. 1). Additionally, the heart shadow was displaced cephalad. Immediately, nitrous oxide was dis...
continued and 100% O₂ given. Hypotension (BP 130/75 decreasing to 75/40 mmHg) and tachycardia (pulse rate 110/min) developed. The right hemithorax was decompressed acutely by insertion of a 14-G cannula into the second intercostal space anteriorly, releasing air from the chest. A 32-G chest drain was inserted into the fifth intercostal space in the midaxillary line. Resolution of the pneumothorax was rapid and coincided with restoration of circulation to the left hand. The pulse and BP returned to previous levels. The arterial trace showed a satisfactory waveform, and the cannula remained in situ. Surgery proceeded as planned. No further compromise of the circulation to the left hand was noted at any time. The chest drain was removed 72 h later without complication.

**Discussion**

Local radial artery spasm leading to ischemia of the hand is unlikely in the presence of an adequate collateral ulnar circulation, which we had confirmed by palpation of the ulnar pulses and a positive Allen’s test before anesthesia.

The concurrent changes in left hand circulation with the appearance and resolution of the pneumothorax led us to assume a causal relationship. We hypothesize that left subclavian arterial flow was reduced by mediastinal compression. The consequent decrease in left arm perfusion resulted in a critical decrease in ulnar artery flow which, in the presence of a compromised radial circulation, resulted in an ischemic hand. Eliminating the pneumothorax reduced distortion of the mediastinum and restored circulation to the hand. Furthermore, the absence of any previous or subsequent ischemic episode suggests that any other explanation of vascular abnormality is unlikely.

The incidence of immediate pneumothorax after subclavian vein cannulation is approximately 2.2%, higher than that after internal jugular vein cannulation.¹ Radial artery cannulation has not been associated with altered performance of a pulse oximeter probe placed on the same side.² We think the SpO₂ of 100% before the ischemic event and the sudden decrease to 95% reflected events accurately. Immediate and delayed ischemia after radial artery cannulation is well recognized.³ It is most likely to occur when the ulnar artery circulation is absent or impaired by peripheral vascular disease. Neither of these was the case in our patient. As far as we are aware, this is the first published relationship of pneumothorax and ischemia of the contralateral hand.

**References**


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