Tension hydrothorax induced by central venous catheter migration in a patient with burns

Editor—We describe an unusual complication of tension hydrothorax, induced by migration of a central venous catheter in an ICU patient with burns. Correct clinical diagnosis resulted in an immediate intervention and insertion of pleural drainage.

A 48-yr-old male was referred to our hospital with deep, third degree 30% total body surface area flame burns. He had attempted suicide by self-immolation. He was transferred to burn ICU. According to standard protocol, his trachea was intubated because of suspected inhalation injury, and fluid replacement therapy was administered according to the Parkland formula and a central venous catheter (CV-catheter) was inserted.

A CV-catheter (Arrow International, Reading, PA, USA, triple lumen 20 cm) was inserted uneventfully through unburned skin to the right internal jugular vein. The puncture site was 3 cm above the clavicle between the lateral and medial parts of the sternocleidomastoid muscle. The CV-catheter set contains two suture sites: one near the puncture site with distinct locking system and the other one proximally in the catheter itself.

The catheter was fixed at the puncture site using the suture supplied. The proximal end of the catheter was not fixed with sutures. Because of close proximity of the burned area, the puncture site was covered with wound dressings. The control chest X-ray showed the tip of the catheter locating optimally, in the superior part of the vena cava, with no signs of complications (Fig. 1). The central pressure was monitored through the distal lumen of the catheter.

The waveform of the central pressure was optimal and was continuously monitored. Continuous infusion of Ringer’s acetate was started at 200 ml h⁻¹ to the proximal port of the CV-catheter.

At the beginning of the second post-injury day, the patient started to develop ventilatory and haemodynamic problems. Tidal volumes showed a significant decreasing trend, which was compensated by a higher peak inspiratory pressure. Simultaneously, central venous pressure was increasing although diminishing urine output and tachycardia indicated inadequate perfusion. Routine chest X-ray was obtained before operation and the patient was transferred to the operating theatre for operation. At this time the chest X-ray was not reviewed, because it was not available. During the skin graft taking procedure the lung compliance decreased causing serious ventilatory problems. Skin graft taking was discontinued immediately and fascial excisions were performed to the burned areas of the thorax and abdomen to minimize the effect of the hard burn eschar on thoracic compliance. Fine-tuning of the mechanical ventilation improved the condition only temporarily. At the same time the patient became increasingly tachycardic with high central venous pressures.

During the operation the preoperative chest X-ray became available, showing a clear tension hydrothorax (Fig. 2) and the tip of the catheter was 2 cm higher than on the previous chest X-ray. After the diagnosis was made, pleural drainage was initiated by intercostal chest tube insertion in the midaxillary line in the fifth intercostal space. Four litres of clear fluid emerged under pressure from the interpleural space. The ventilatory and
haemodynamic status of the patient improved immediately: central venous pressure decreased to acceptable levels, mean arterial pressure could be maintained with less vasoactive support and lung compliance was enhanced. A repeat chest X-ray showed resolution of the tension hydrothorax. The operation was completed uneventfully.

Catheter tip migration is a documented event after central venous cannulation, occurring in up to 17% of percutaneously introduced catheters. The chest X-ray obtained in ICU (Fig. 2) after the patient showed signs of deteriorating ventilation and tissue perfusion, revealed migration of the CV-catheter because of poor fixation. The distal and medial lumens were inside the vessel, which was verified by testing the backflow of the blood. The proximal lumen of the catheter was located in the interpleural space. There was no backflow from the proximal lumen, indicating its extravascular location. The patient’s clinical condition showing signs of elevated intrathoracal pressure, chest X-ray and lack of s.c. effusion all implied an interpleural location.

The usual cause for hypotension and tachycardia in burn patients is hypovolemia as a result of increased permeability and wound exudate. The clinical signs of escalating central venous pressure and falling lung compliance should alert the clinician to the possibility of catheter tip misplacement. The continuous monitoring of the central venous pressure through the proximal lumen may reveal the tip misplacement at early stage. It should be kept in mind that complications as a result of central venous catheterization can occur also at a later stage.

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There are, however, two points that arise from their management that perhaps could be challenged. First, the use of mivacurium for a rapid sequence induction (RSI). The authors quote Naguib and colleagues for suggesting that mivacurium is a suitable alternative to succinylcholine for RSI. However, in that paper, it was the combination of rocuronium 0.45 mg kg\(^{-1}\) and mivacurium 0.15 mg kg\(^{-1}\) that could be considered as an alternative, not mivacurium on its own (which had slower onset than succinylcholine, high dose rocuronium or mivacurium and rocuronium together). While Pino and colleagues suggest that mivacurium in divided doses provides good or excellent intubation conditions, this is at 90 s. In their paper, rocuronium at higher doses (0.9 and 1.2 mg kg\(^{-1}\)) provided faster onset. Ali and colleagues specifically state that although mivacurium in divided doses does provide good to excellent intubation conditions after 90 s, their conclusion does not apply to RSI. While the patient wished to avoid succinylcholine given her poor respiratory function and reduced functional residual capacity, from pregnancy and pre-existing disease, it would seem appropriate to minimize the apnoea time as much as possible. A Cochrane review suggested that there was no statistical difference between rocuronium and succinylcholine in providing clinically acceptable conditions for RSI intubation.

Second, the use of neostigmine for antagonization of a mivacurium-induced neuromuscular block. The data for the use of neostigmine in antagonizing mivacurium-induced neuromuscular block are conflicting with some studies showing an increase in block duration and some a reduction. Given that the usual duration of an uncomplicated caesarean section is ~30 min and the duration of a mivacurium block is between 10 and 20 min it would seem reasonable to have used edrophonium or avoided antagonization entirely.

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Editor—Thank you for allowing us to respond to Dr Geoghegan’s comments. We acknowledge his reservations concerning our use of mivacurium instead of rocuronium and there is good evidence of rocuronium adequately substituting succinylcholine as a drug for RSI. Our primary aim was to choose a neuromuscular blocking agent of relatively short duration of action with potentially less incidence of residual motor block because of the possibility of a difficult intubation and the patient’s clinical condition. Mivacurium despite its slightly less suitability for RSI fulfilled this criterion better than rocuronium. It has been shown that intubating conditions are good or excellent with the method of administration used.

Neostigmine is still the most common drug utilized for reversal of neuromuscular function block and the patient may have been adequately reversed without any

Caesarean section in a patient with torsion dystonia

Editor—Olufolabi and Wee’s excellent case report emphasizes the need for good communication and early referral from our obstetric colleagues. Their patient obviously presented a difficult anaesthetic dilemma. The ability to have all appropriate preoperative investigations and a balanced discussion with a challenging patient in an outpatient setting makes planning their anaesthetic considerably easier. One could imagine the difficulties had this lady presented de novo in labour requiring an emergency Caesarean section.