Acute haemothorax—a hazard of subclavian vein cannulation

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DIRECT infusion of fluid into the pleural cavity via a cannula is a dangerous complication of subclavian venepuncture. Three previous cases have been reported (Smith *et al.*, 1965; Matz, 1965; Schapira & Stern, 1967). We report a fourth case and review the complications of subclavian vein cannulation.

Case report

A 44-year-old man was admitted to the Casualty Department following a severe haematemesis. He was unconscious, apnoeic, had a barely detectable pulse and an irreducible blood pressure. Intravenous infusions were started in the left subclavian vein and both long saphenous veins. An oral endotracheal tube was inserted and artificial ventilation commenced with 100% oxygen. He was transfused with 6 units of whole blood, 1.5 l of dextran and 1 l of normal saline. Four of the units of blood and the 1 l of saline were transfused through the subclavian vein cannula. All the transfusions were assisted by Martin's pumps.

Throughout the resuscitation he continued to have severe haematemesis with little improvement in his clinical state. It was decided that emergency laparotomy was necessary.

On arrival in the operating theatre he had a blood pressure of 80/40 mmHg and the subclavian cannula recorded a pressure of + 2 cm H₂O with good respiratory fluctuation. Laparotomy revealed pyloric stenosis with a pre-pyloric ulcer 5 cm in diameter. Control of the haemorrhage was achieved and a Polya partial gastrectomy done.

During the anaesthetic it was noticed that respiratory movement was reduced on the left side of the chest. Auscultation revealed reduced air entry on that side. The endotracheal tube was withdrawn to its limit in case of right bronchial intubation. Endotracheal suction and hyperventilation was carried out with no improvement. As the patient's colour was good and as there had been no deterioration during the anaesthetic it was decided to complete the operation and assess the chest fully afterwards. During the operation a further 8 units of blood were given into the saphenous vein cannulae. The left subclavian vein cannula was used for monitoring venous pressure.

Throughout it showed a good respiratory swing and recorded pressures varying from 0 to + 6 cm H₂O.

After operation, a chest X-ray taken on the table showed a large left pleural effusion (Fig. 1). A diagnostic tap showed this to be blood. A size 20 Argyle chest drain was inserted into the second intercostal space in the mid clavicular line of the front of the left chest. Four litres of blood were removed from the chest. The chest movements improved and air entry became normal.

Fifteen millilitres of 40% Hypaque were injected down the subclavian cannula and a further chest X-ray taken (Fig. 2). This showed the cannula lying freely in the pleural cavity with overspill of the dye. The cannula was withdrawn and a compression dressing put on the neck.

FIG. 1. Chest X-ray showing haemothorax before aspiration.

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FIG. 2. Chest X-ray after aspiration of haemothorax.

The patient was ventilated for a further 12 hr then extubated. The chest drain was removed 24 hr later and the patient made an uneventful recovery. He was discharged from hospital 12 days later.

Discussion

The case reported illustrates several points. Good respiratory fluctuation is usually accepted as an indication of correct placement of a central venous manometer, but a cannula in the pleural cavity will also transmit good respiratory fluctuations. It is imperative to ensure that blood can be aspirated from the cannula before using the cannula for infusion.

Pneumothorax and hydrothorax are two of the most serious complications of subclavian vein cannulation. Early diagnosis of these complications is easy in the conscious patient, but in the unconscious and ventilated patient, the diagnosis may be delayed with serious consequences.

Subclavian vein cannulation has become increasingly popular in this country. A review of the complications and their presentations would seem warranted at this stage.

The technique was first described by Aubaic (1952). He used an infraclavicular route. Yoffa

(1965) described a supraclavicular approach with a low incidence of complications.

Defalque (1968) describes several complications of subclavian puncture. Infection, thrombosis, catheter sequestration and haematomas are common to all intravenous cannulae. Specific complications are pneumothorax, hydrothorax, haemothorax, subclavian artery puncture, brachial plexus injury, air embolus and puncture of the thymus, trachea and thyroid. Pneumothorax, haemothorax and air embolism are the most dangerous but can be avoided by careful technique.

The patient should be placed in a 20° head down position. This minimizes the dangers of air embolism, especially in the hypocalaemic spontaneously breathing patient. The only reported fatality from air embolism (Flanagan *et al.*, 1969) occurred in the head up position. The supraclavicular approach as described by Yoffa (1965) is probably the safest, with the needle angled 15° forward relative to the coronal plane. This directs the point of the needle away from the pleural dome and reduces the risk of pneumothorax. The right side of the neck is safest as the pleural dome is lower and is less easily damaged. The course of the great veins from subclavian to right atrium is almost straight which simplifies cannulation. Bilateral punctures should be avoided because of the dangers of bilateral pneumothoraces. The cannula should be aspirated and blood seen to flow freely before transfusion is begun. Finally, a chest X-ray should be taken as soon as possible after cannulation.

Published reports are sharply polarized between those who consider the subclavian cannula to be the most satisfactory route for central venous monitoring (Longesbeam *et al.*, 1965; Yoffa, 1965; Defalque, 1968; Craig *et al.*, 1968) and those who feel that the serious complications warrant the abandonment of the technique (Smith *et al.*, 1965; Matz, 1965; Schapira & Stern, 1967). A compromise is probably the correct view. Subclavian venepuncture is a useful route for venous infusion and pressure monitoring in patients with no available peripheral veins. However, of all routes, it has the highest incidence of serious complications with the probable exception of inferior vena caval cannulation. For routine venous cannulation it would seem safer to use the internal or external jugular veins. In those patients where these are impracticable or where no peripheral veins are available, subclavian venepuncture offers a valuable alternative. Any choice of complications can be reduced by careful technique.

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Rheumatoid arthritis and prednisone-induced scurvy

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A MASSIVE gastrointestinal haemorrhage occurred as a complication of scurvy which developed 8 days after prednisone therapy for rheumatoid arthritis. A dramatic response to vitamin C was seen.

Case report

A 43-year-old female was admitted to hospital on 15 July 1969 with an exacerbation of joint pains of rheumatoid arthritis from which she had been suffering for 8 years. For 3 months prior to admission she was bedridden and anorectic and had been treated at home with betamethazone 0.5 mg b.d. and indomethacin 25 mg t.i.d.

On admission her Hb was 10.0 g/100 ml, WBC 9000/mm³, neutrophils 60%, lymphocytes 39%, monocytes 1%. A latex fixation test was strongly positive. LE cell tests were negative on three occasions. Serum iron was 71 µg/100 ml. She had a smooth thyroid swelling but her PBI was 7.5 µg/100 ml and T₄, 7.7 µg/100 ml. During her stay in hospital prednisone 10 mg t.i.d. was substituted for betamethazone with improvement in her joint symptoms but 8 days later she complained of bleeding gums, a subconjunctival haemorrhage in the left eye and haemorrhagic skin lesions. These were petechiae and ecchymoses of varying sizes, predominantly on the limbs. She had a positive Rumpel-Leede test with over twenty petechial lesions in a 2-cm circle. On 12 August she began to pass frequent melaena stools and her Hb fell to 6.9 g/100 ml. An emergency barium meal was normal. Her clotting time was 5

min 8 sec; bleeding time 4 min 44 sec; prothrombin time 14 sec (control 13 sec); platelet count 138,000. She continued to bleed profusely per rectum and was transfused with 9 pints of blood over 5 days. By 17 August the swelling of the gums were most marked on the interdental papillae as seen in scurvy—the so-called scurvy buds (Fig. 1). Prednisone was then immediately stopped and vitamin C 500 mg was given intramuscularly followed by 500 mg on the next day. There was then a prompt cessation of bleeding and the swollen haemorrhagic gums began to subside rapidly. No new crops of

FIG. 1. Swollen, congested, bleeding gums.