

## INTRAOPERATIVE DEATH DURING LUMBAR DISCECTOMY

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### SUMMARY

*A patient suffered cardiovascular collapse and died during surgery for prolapsed intervertebral disc. At postmortem a tear was found in the abdominal aorta.*

### KEY WORDS

*Surgery: neurological. Complications: death, perforated aorta.*

### CASE REPORT

A 26-yr-old woman was referred for surgical treatment of a prolapsed lumbar intervertebral disc at L4-5, diagnosed by myelography. Her symptoms of unilateral leg pain with a mild L5 radiculopathy had failed to settle with 1 month bed rest at another hospital. She had otherwise good health and did not smoke, but was moderately obese and was receiving the contraceptive pill.

Premedication comprised papaveretum 15 mg and hyoscine 0.3 mg. Anaesthesia was induced with thiopentone followed by atracurium. The trachea was intubated and anaesthesia maintained with 1% isoflurane and 66% nitrous oxide in oxygen. Atracurium was infused at a rate of 20 mg h<sup>-1</sup>. A 14-gauge i.v. cannula was inserted in a forearm vein and a crystalloid infusion commenced. Monitoring included ECG, Sp<sub>O<sub>2</sub></sub> (Datex Satlite), end-tidal carbon dioxide concentration (Hewlett-Packard 47210A) and non-invasive measurement of arterial pressure (Accutor Data-scope 1A). Arterial pressure was measured and printed at 5-min intervals. The patient was placed prone, the tissues incised and the appropriate disc space identified by counting spines upwards from the sacrum. The disc appeared abnormal, in that the annulus was bulging, and a routine discectomy was performed with pituitary rongeurs. The surgeon had not noticed anything unusual during

discectomy, but felt that a radiograph should be obtained to check that the correct level had been operated upon. Whilst this was being obtained, some 5 min after the discectomy, the monitor alarms began almost simultaneously. Sp<sub>O<sub>2</sub></sub>, end-tidal carbon dioxide, heart rate and arterial pressure readings had been stable for the preceding 1 h. The oximeter alarm activated first, flashing "low quality signal" and providing no reading. This was followed almost immediately by the capnograph, which flashed a calibration code signal and absence of end-tidal carbon dioxide. The Accutor failed to record arterial pressure and flashed "no pulsation detected". The ECG complexes were normal, but the heart rate had increased from 90 to 110 beat min<sup>-1</sup>. There was no bleeding from the wound and the carotid pulse was not palpable.

The patient was turned supine, and ventilation continued with 100% oxygen. Her chest was auscultated and both heart and breath sounds were normal. External cardiac massage was commenced. Haemaccel 1 litre was infused rapidly and ephedrine, adrenaline and calcium chloride were given. No femoral pulse was palpable but needling produced pink blood, analysis of which showed pH 7.135, Pco<sub>2</sub> 2.9 kPa, Po<sub>2</sub> 66.7 kPa, HCO<sub>3</sub> 7.6 mmol litre<sup>-1</sup>, base excess -22 mmol litre<sup>-1</sup> and oxygen saturation 99%. Internal jugular vein cannulation was unsuccessful. The groin was incised and the femoral artery and vein cannulated. The artery was collapsed and no blood emerged from the cannula, whilst the vein was distended. The patient's abdomen was soft and did not seem distended. Resuscitation was continued with i.v. crystalloid, colloid and in-

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Accepted for Publication: January 15, 1991.

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tropes.  $Sp_{O_2}$  values in the range 70–79% were obtained, with end-tidal partial pressure of carbon dioxide in the range 1.3–2.6 kPa. A carotid pulse was palpable briefly, but after 40 min the ECG complexes became abnormal and cardiac arrest occurred.

At postmortem examination it was found that the L3–4 disc had been removed and that there was a 0.5-cm laceration in the aorta at that level. The retroperitoneal space was full of blood, which had also passed into the peritoneal cavity.

## DISCUSSION

Our patient presented with electromechanical dissociation (EMD). The causes of EMD include pulmonary embolism, severe hypovolaemia, myocardial infarction, cardiac tamponade and pneumothorax. Our initial diagnosis of pulmonary embolism was not supported by the results of blood-gas analysis. We considered the possibility of aortic damage, but did not make the correct diagnosis because: there was no bleeding from the wound; the surgeon did not believe he had perforated the anterior longitudinal ligament (ALL); circulatory collapse was sudden and severe; the abdomen appeared soft and not distended; surgery was being performed at L4–5, below the bifurcation of the aorta.

A review of the literature showed that bleeding from the wound has been seen from fewer than 50% of reported cases of vascular damage [1]. This is perhaps not surprising. Both the ALL and disc annulus are tough, elastic structures and thus effectively self-sealing. Blood leakage from the aorta or inferior vena cava (IVC) would be expected to take the line of least resistance into the retroperitoneal space. The literature suggests that surgeons are often unaware that they have perforated the ALL [1, 2], but reports emphasize the ease with which perforation can occur [3] because of the anatomical proximity of the lumbar disc space to the great vessels.

Circulatory collapse may be sudden and may be confused with cardiac arrest [3, 4]. It is conceivable that an expanding retroperitoneal haematoma might occlude the IVC, which would contribute to circulatory collapse. In our patient, the femoral vein was certainly distended. However, haemorrhage from a lacerated aorta is likely to be severe enough to produce "sudden" collapse unless the arterial pressure is recorded continuously. A continuous recording of arterial pressure

from an arterial catheter would have been helpful during resuscitation attempts, but we doubt if it would have affected the outcome. In view of the rarity of vascular damage during discectomy (see below), we doubt if invasive monitoring is justified.

The patient's abdomen must have become distended, but we did not recognize it, perhaps because of her obesity. Telephone consultation with a cardiovascular surgeon took place during the resuscitation: the lack of abdominal swelling and absence of bleeding from the wound was remarked upon and a diagnosis of aortic dissection suggested. Aortography was considered, but after discussion with a consultant radiologist we felt that it would be of little help, given the collapsed state of our patient.

It is not uncommon for surgeons to operate at a level different to that intended. It is surprisingly difficult to identify a particular intervertebral joint and if the disc appears abnormal, as it did in our patient, it is likely to be removed. Although the aorta usually bifurcates before L4–5, severe haemorrhage may occur from lacerated iliac vessels after perforation at this level. The possibility that the surgery has been performed at a level different from that intended must always be considered.

Vascular damage during discectomy is rare: Gurdjian and colleagues suggested an incidence of 5 cases in 10 000 discectomies [5]. Mortality is high after aortic perforation (78%) and greater after IVC perforation (89%), but considerably less after iliac vessel damage [1]. Perforation of the small and large bowel has occurred also [6]. Aortic damage was reported first in the U.S.A. in 1948 by Falconer, McGeorge and Begg [7], but a case has not been reported previously in the United Kingdom.

Mortality after perforation of the aorta is 100% unless rapid diagnosis, laparotomy and control of haemorrhage are achieved. Diagnosis rests largely on a knowledge of the condition. In particular, it must be appreciated that overt bleeding from the wound is not seen in the majority of cases. Any sudden collapse around the time of discectomy should be assumed to be caused by concealed haemorrhage until proved otherwise. Angiography or CT scanning may be helpful in less acute presentations [8, 9].

Laparotomy, exposure and possibly clamping of the aorta may be within the competence of most surgeons, but repair of the laceration is likely to be

difficult, especially if it is on the dorsal aspect of the aorta. Transluminal repair, transection, patching or grafting of the aorta may be necessary. Expert vascular surgical assistance will be required.

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