Posterior spinal ligament rupture associated with laryngeal mask insertion in a patient with undisclosed unstable cervical spine

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A case of posterior spinal ligament rupture associated with a general anaesthetic for a laparoscopic cholecystectomy is reported. The role of the general anaesthetic in this case is discussed and a review of the literature is presented.

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Airway management may cause problems in patients with cervical spine pathology. According to prevailing dogma, direct laryngoscopy is hazardous in the presence of cervical instability. Direct laryngoscopy causes superior rotation of the occiput and C1 in the sagittal plane and mild inferior rotation of C3–C5,1 2 while tracheal intubation causes slight additional superior rotation at the occiput and C1. There is minimal movement below C3 during direct laryngoscopy.1 3 However, the amount of movement in the cervical spine from C3 to C7 remains difficult to determine. One study4 examined the movements of the C5–C6 joint before and after surgical destabilization in cadavers and showed a difference of less than 2 mm translation and 4° of angulation between the stable and unstable specimens at direct laryngoscopy. Another radiographic study5 of unstable spines showed that other airway manoeuvres, such as jaw thrust, caused similar degrees of movement. Several authors have therefore advocated alternative methods of airway management in cases of potential cervical spine instability,6–15 all of which may be associated with technical or operator complications.

The laryngeal mask airway (LMA®) has been advocated ‘to fill the gap between the tracheal tube and the face mask’. Brimacombe and colleagues16 reviewed the advantages and disadvantages of the LMA and found that the LMA is, in general, easier to place and better tolerated than the tracheal

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A 64-yr-old man was admitted for elective laparoscopic cholecystectomy for gallstones, having had the operation postponed on two previous occasions for non-medical reasons. He noted a history of pain in the region of his right shoulder, which his general practitioner had ascribed to referred pain from his gall bladder exacerbated by stress. He admitted to occasional pain in his neck, which he said caused him no problems. His medical history included an appendicectomy complicated by peritonitis, diet-controlled diabetes mellitus, and osteoarthritis for which he had undergone knee arthroscopy. He denied any other medical problems.

At induction he was given midazolam, propofol, fentanyl and atracurium and a size 5 LMA was inserted. The insertion of the LMA was described as straightforward by the anaesthetist and did not involve any untoward movements of the neck or jaw thrust. The ultimately successful surgery was complicated by the presence of adhesions and lasted for 75 min. The lowest non-invasive systolic blood pressure recorded during the anaesthetic was 100 mm Hg. The LMA was removed with jaw opening but without head movement in recovery. The patient complained of abdominal pain, for which he was treated with opiate and a non-steroidal anti-inflammatory drug. He was transferred to the ward after 30 min. At no time during or after the operation was the patient's neck flexed or extended.

Approximately 1 h after the patient had been returned to the ward it was noted that he had difficulty in moving his legs and there was no sensation to pain or touch in his abdomen. A weak cough was noted but there was good air entry into the lungs bilaterally. Shortly thereafter he was seen by a consultant neurologist, who noted no movement of the legs and weakness of elbow extension together with weakness of the left little finger. The level of sensation to pinprick was C5/6 on both sides with poor joint position sense in his left little finger. Joint position and vibration sense was absent in both legs. The patient was managed with a cervical collar and urinary catheterization, and an MRI scan was performed. A consultant neuroradiologist reported these images as showing a rupture of the posterior spinal ligament with haematoma cord compression. The disc was not protruding. The patient was admitted to ITU where methylprednisolone 3 g was given over 15 min. He was then transferred to the regional neurological centre, where he underwent C5/6 discectomy with insertion of a wedge of bone. At operation, a completely ruptured and very oedematous posterior spinal ligament was found at the site. Since that time the patient has made little recovery and he remains effectively tetraplegic. He has undergone further uncomplicated surgery for small bowel obstruction due to herniation of bowel through a hole in the mesentery.

After the laparoscopic cholecystectomy, the patient’s wife admitted that the patient had visited his general practitioner on the day before surgery as he was experiencing weakness in his legs and had had some difficulty in walking. He was also suffering from severe neck pain, necessitating him sleeping upright on the night before surgery in a chair. However, there was no history of trauma to the neck. He had failed to inform the anaesthetist of these facts, as he was worried that his surgery would again be cancelled.

**Discussion**

A combination of mechanical deformation and vascular compromise of the cervical spine is thought to be necessary for the development of myelopathy. It is believed that the duration of these unfavourable conditions is a crucial factor. Animal models indicate that &ge;6 h of constriction of dogs’ spinal cords leads to permanent loss of function, whilst after constriction for &le;1 h there is nearly complete recovery. In our case, the time from induction to waking was of the order of 90 min in total but, from the history obtained after cholecystectomy, some compromise of the cervical spinal cord had occurred before the operation. There is evidence that cord injury can occur in cases in which the malposition of the spine is very slight. In our case, neck manipulation as a result of direct laryngoscopy or insertion of the LMA cannot be blamed. The insertion of the LMA would have caused very little movement of the neck, as it did not require jaw thrust or hyperflexion or extension of the neck to position the LMA satisfactorily. Loss of muscle tone owing to administration of muscle relaxant would, however, have increased the likelihood of further damage to an already abnormal cervical spine.

Hypotension can cause cervical cord damage even in normal patients. In our patient, the use of the laparoscope and carbon dioxide for insufflation of the abdomen would reduce venous return and hence cardiac output, although there is evidence that blood pressure increases during laparoscopic cholecystectomy. Additionally, an increase in the spinal and epidural venous pressure would increase the cerebrospinal fluid pressure, causing a decrease in the spinal arterial perfusion pressure. No periods of hypotension were observed throughout the course of the operation, but in the case of this patient the blood flow to the cervical spine might have been compromised as a result of the surgical technique. Some workers believe that an element of induced hypertension may be beneficial but this
view must be tempered as animal work has indicated that increased oedema and haemorrhage of the cord are a possibility.32

Rupture of the posterior longitudinal ligament (PLL) in the cervical spine is also reported as a consequence of accidental trauma to the neck. Hyperflexion of the cervical spine can cause injury to the middle column of the spine (consisting of the posterior vertebral body, the posterior longitudinal ligament and the posterior annulus fibrosus) together with the posterior column of the spine (consisting of the posterior elements of the spine, the ligamentum flavum, the interspinous ligaments, the supraspinous liga-

ment and the facet joint capsules). Hyperextension causes injury to the anterior column of the spine (consisting of the anterior vertebral body, the anterior longitudinal ligament and the anterior annulus fibrosus) and the middle column.33 However, another process by which rupture of the PLL may occur is in conjunction with hypertrophy and ossification of the PLL.34 Interestingly, glucose intolerance is a risk factor for ossification of the PLL in Japanese men35 and our patient had diet-controlled diabetes mellitus.

This case serves to highlight the fact that any degree of neck manipulation in a patient with an unstable cervical spine may be hazardous.

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Complete airway obstruction in a ventilated patient after oesophageal dilatation

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A case of instrumental perforation of the oesophagus is presented. This caused systemic sepsis, requiring tracheal intubation and positive pressure ventilation. Sudden unexpected life-threatening airway obstruction was caused by distal tracheal compression by a peritracheal abscess. The aetiology and management of distal tracheal obstruction is discussed.

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Circumferential compression of the trachea is very unusual, having been reported previously in the presence of mediastinal tumours. It can cause complete lower airway obstruction and is usually insidious in onset. Tracheal compression by mediastinitis has not to our knowledge been described. This case report describes this condition and illustrates the rapid onset.

Case report

A 68-yr-old female presented with dysphagia and an enlarged submandibular lymph node. She underwent oesophagoscopy, pharyngoscopy and laryngoscopy, and excision biopsy of the lymph node. The procedure was uneventful, but the next day she developed surgical emphysema involving the upper chest and neck. A gastrograffin swallow showed a leak of radiographic contrast from the upper oesophagus but the exact location was unclear. A nasogastric tube was passed. She was not given any oral intake and the nasogastric tube was used for free drainage. Treatment with cefuroxime and metronidazole was started. She was not hypoxic and her ventilatory frequency was 20–25 min⁻¹ and an FIO₂ of 0.5 was required to maintain a SaO₂ greater than 90%. Chest x-ray showed bilateral basal lung collapse and consolidation.

Her respiratory function deteriorated (Pao₂, 9.6 kPa, FIO₂, 1.0) and she was transferred to the intensive care unit for tracheal intubation and artificial ventilation. She developed systemic sepsis, which was considered to be caused by a hospital-acquired pneumonia. Epinephrine and dobutamine were started to maintain her arterial pressure and urine output. A pulmonary artery flotation catheter was sited, and the initial measurements were: cardiac output was 5.8 litre min⁻¹, systemic vascular resistance was 797 dyne s⁻¹ cm⁻⁵, pulmonary artery capillary wedge pressure was 20 mm Hg, and central venous pressure was 10 mm Hg.

She received artificial ventilation with BIPAP (bilevel positive airway pressure) with an inspiratory pressure (Pinsp) of 24 cm H₂O and PEEP (positive end expiratory pressure) of 5 cm H₂O. Therapy with ciprofloxacin was commenced in addition to cefuroxime and metronidazole. Daily chest x-rays revealed persistent changes in both bases, but no suggestion of mediastinal collection.

On the tenth postoperative day a sudden decrease in minute volume with reduced delivered tidal volume was noted. Initially it was thought that the tracheal tube might have been dislodged or displaced against the tracheal wall or...