Symptomatic hemidiaphragm paralysis after uncomplicated laparoscopic cholecystectomy

Introduction

Unexplained dyspnoea is a common reason for patients to seek medical advice after surgery. The reasons can be non-specific such as general physical deconditioning, or specific and life-threatening such as pulmonary embolus. Occasionally the cause is unknown or a more complex and specialist opinion is needed.

Neuralgic amyotrophy classically follows neck pain and is seen in conjunction with a characteristic pattern of upper limb weakness and muscle atrophy. The combination of upper limb and phrenic nerve involvement is well known. However, isolated diaphragm paralysis as a result of phrenic nerve involvement alone is well reported and exertional dyspnoea can be the presenting symptom. Neuralgic amyotrophy has an unknown aetiology and has been reported after a multitude of insults including anatomically distant open surgery.

Case Report

A 55-year-old man was referred to the outpatients clinic for investigation of unexplained exertional dyspnoea. The condition had progressed over 3 months and resulted in a markedly reduced exercise capacity. Before admission the patient reported to be fit and well with no significant medical history. He took no medications and was a non-smoker.

Five months previously he had undergone an uncomplicated laparoscopic cholecystectomy. His preoperative chest radiograph was normal (*Figure 1*). In the months that followed he had multiple episodes of transient breathlessness and was investigated by his surgical team. No pulmonary embolus was seen on computed tomography pulmonary angiography and the mediastinum was normal. Ultrasound and computed tomography imaging of the upper abdomen did not demonstrate a subphrenic collection. Routine blood tests and electrocardiogram were also normal. His breathlessness continued and he was started empirically on warfarin therapy and referred for respiratory opinion.

In clinic he was comfortable at rest with a normal temperature, heart and respiratory rate and an oxygen saturation of 97% breathing room air. Cardiovascular and abdominal examinations were unremarkable. The respiratory system revealed decreased breath sounds on auscultation and dullness to percussion at the right base posteriorly. An arterial blood gas breathing room air had normal range partial pressures of oxygen and carbon dioxide and the A-a gradient was 2.3 kPa.

A repeat radiograph (*Figure 2*) showed a grossly elevated right hemidiaphragm when compared to *Figure 1*. Pulmonary function tests showed a forced expiratory volume in 1 second =1.81 (55% predicted), standing vital capacity (VC) =2.31 (56% predicted), lying VC 1.71 (a fall of 26% compared to the standing VC), total lung capacity =4.71 (70% predicted), residual volume =2.31 (101% predicted), the transfer factor for carbon monoxide was 73% predicted which corrected to 125% when alveolar volume was allowed for. Maximal inspiratory pressure was reduced at 54 cmH_2O (normal >80). A diagnosis of hemidiaphragm paralysis resulting in exertional dyspnoea was made. Unilateral diaphragm paralysis was confirmed by twitch transdiaphragmatic pressure measurement, right =0 cmH_2O and left =7.3 cmH_2O (normal >7 cmH_2O).

Further questioning did not elicit a history of orthopnoea although the patient was breathless on bending over. Sleep was undisturbed without the daytime symptoms of nocturnal hypoventilation. There was no evidence of paradoxical abdominal movement on inspiration. He had not suffered neck, arm or shoulder pain, or trauma. Neurological examination of the upper limbs was normal. After discussion with the surgical consultant who performed the laparoscopic procedure, injury during surgery to the diaphragm or the phrenic nerve supplying it was ruled out. The patient had no evidence of intra-abdominal post surgical complications. His anaesthetic and postoperative recovery were uncomplicated, no central venous catheter was inserted and his electrolytes were always appropriate. The above are all recognized as causes of diaphragm or phrenic nerve injury, none of them were thought to be causative for this patient.

When seen in the clinic 1 year later he was less limited by exertional dyspnoea. The standing VC had risen to 2.91 indicating partial recovery of inspiratory muscle strength. Given the absence of an alternative cause and evidence of spirometric resolution with time, the diaphragm paralysis was felt to be caused by neuralgic amyotrophy preferentially affecting the phrenic nerve triggered by recent laparoscopic surgery.

Discussion

Diaphragm weakness is a recognized source of postoperative dyspnoea. Diagnosis requires clinical suspicion and can be supported by chest radiography and simple spirometry with reduced vital capacity and fall of more than 20% on lying supine. It has many causes and the opinion of a respiratory physician is required as further testing or ventilatory support may be indicated.

Figure 1. Normal preoperative chest radiograph.

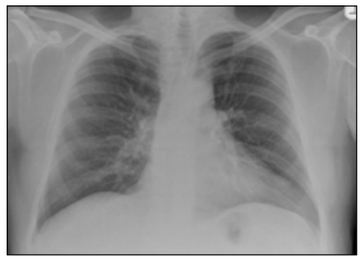
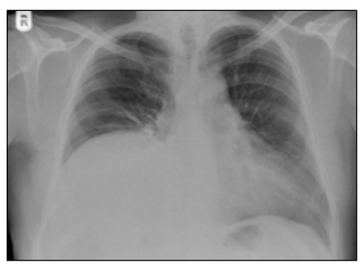


Figure 2. Chest radiograph when seen in clinic. Note the grossly elevated right hemidiaphragm when compared to the preoperative radiograph.



Dr Robert J Parker *is Specialist Registrar and* **Dr Christopher G Wathen** *is Consultant Physician in the Department of Thoracic Medicine, Wycombe Hospital, High Wycombe HP11 2TT*

Correspondence to: Dr RJ Parker

The clinical significance of unilateral hemidiaphragm weakness is debated (Gibson, 1989). This is not borne out by objective testing and accounts for this patient's dyspnoea (Hart et al, 2002).

Neuralgic amyotrophy is a self limiting condition and its aetiology remains unknown (Parsonage and Turner, 1948). It usually presents after an episode of shoulder pain as a 'brachial neuritis' with weakness and muscle atrophy in the distribution of the brachial plexus affecting deltoid, serratus anterior, biceps, triceps, wrist and finger extensor muscles (Tsairis et al, 1972). It is well recognized that the phrenic nerve can be involved resulting in diaphragm paresis (Hughes et al, 1999). This is commonly in conjunction with the pattern of upper limb weakness, but can also be in isolation (Nardone et al, 2000). The recurrent laryngeal nerves have also been reported to be involved resulting in vocal cord paralysis (To and Traquina, 1999).

There is no specific treatment, however, most patients improve with time over several years.

Conclusions

Diaphragm paralysis as a result of neuralgic amyotrophy isolated to the phrenic nerve has been reported after anatomically distinct open surgery (Moore et al, 2005). This report is the first time it has been identified after laparoscopic surgery. BJHM

Gibson GJ (1989) Diaphragmatic paresis: pathophysiology, clinical features, and investigation. *Thorax* **44:** 960–70

Hart N, Nickol AH, Cramer D et al (2002) Effect of severe isolated unilateral and bilateral diaphragm weakness on exercise performance. *Am J Respir Crit Care Med* **165:** 1265–70

Hughes PD, Polkey MI, Moxham J, Green M (1999) Long-term recovery of diaphragm strength in neuralgic amyotrophy. *Eur Respir J* **13:** 379–84

Moore AJ, Moxham J, Polkey MI (2005) Diaphragm weakness as a cause of breathlessness after anatomically distinct surgery. *Thorax* **60**(9): 786–7

Nardone R, Bernhart H, Pozzera A, Taddei M, Tezzon F (2000) Respiratory weakness in neuralgic amyotrophy: report of two cases with phrenic nerve involvement. *Neurol Sci* **21:** 177–81

Parsonage MJ, Turner JW (1948) Neuralgic amyotrophy, the shoulder girdle syndrome. *Lancet* **i:** 973–8

To WC, Traquina DN (1999) Neuralgic amyotrophy presenting with bilateral vocal cord paralysis in a child: a case report. *Int J Pediatr Otorhinolaryngol* **48:** 251–4

Tsairis P, Dyck PJ, Mulder DW (1972) Natural history of brachial plexus neuropathy. *Arch Neurol* **27:** 109–17

Don't believe the hype

Six months on from bird flu first appearing in this column, all we've had is a dead swan in Fife, which may not have been Scottish at all but washed in on the tide, and some chicken in Norfolk with an entirely different strain from the feared H5N1. There have been a million more column inches. Nothing new is being said, but it fills those awkward spaces and stops editors having to think.

In the broadcast media, the usual suspects are wheeled out to utter their dire warnings or soothing reassurances. The current scare must have lasted a couple of years now and there has still been no human-to-human transmission. Whatever happens eventually, the government of the day cannot win. Whatever preparations are made, they will either be too little and a scandal of wasted lives or too much and a scandal of wasted money.

Nonetheless, my intensive care colleagues are watching anxiously, knowing that they will be depending on masks and alcohol gel to keep them safe. If you want, the internet will supply these for you. Put 'bird flu' into Google, and just follow the sponsored links. There are 1 250 000 English pages with 'bird flu' in the title, which is twice as many as have 'aliens' in the title, although still far short of 'breast cancer' (3.5 million), or 'sex' (22 million).

Patricia Hewitt survived the May reshuffle as Secretary of State for Health. Her nickname on one of the doctors' internet forums provides me with some comfort whenever she makes any public statement: she is know as Patsy. Whatever talent politicians have, you would think they would have a better sense of public feeling than to tell the Royal College of Nursing, as Patsy did, that the NHS is having its best year.

In some ways it may be true, but her timing was terrible. Not least because the cuts and redundancies that should have stopped her saying what she did are likely to ensure that 2007 is not as good as 2006. Her boss has made it clear that he is going to press on with his NHS reforms. I've lost track completely of what reforms he is now talking about, but encourage everyone who thinks as I do to send something to Keep Our NHS Public or we won't have an NHS at all – especially if the Conservatives should ever advance on their recent local gains and make it into government.

Green Wing (Fridays, Channel 4) is back (In the Public's View November 2004). The surreal hospital comedy is even more off the wall than the first series. It's always difficult recommending a second series to people who may not have seen the first. The characters now have history.

I shall have to keep watching to find out if Sue White, the staff liaison officer, is carrying surgeon Mac's baby. She impregnated herself while Mac was in a coma on the intensive care unit (don't ask). Meanwhile, mad radiologist Alan Statham has won a caption competition run by Consultant Radiologists International (membership 108), attracting 100% of the vote (which totalled 7). It makes a lot more sense than Choose and Book. BJHM

Dr Neville Goodman *is Consultant Anaesthetist at Southmead Hospital, Bristol*