Papers

Traumatic rupture of the right diaphragm

J.M. Thillois 1, B. Tremblay 2, E. Cerceau 2, B. Dehaye 3, F. Gigou 2, M.D. Destable 1 and J.F. Azorin 1

1 Vascular and Thoracic Surgical Service, Hôpital Avicenne, Bobigny, France
2 Vascular Service, Meaux Hospital, Meaux, France
3 Gastrointestinal Surgical Service, Centre Hospitalier de Meaux, Meaux, France

Summary: The diagnosis and management of diaphragmatic injuries still presents a problem. In a recently published series the proportion of these injuries which is initially overlooked remains at between 20% and 40%, and the post-operative mortality at 21%. Based on two personal cases of rupture of the right diaphragm and on an analysis of published series, we endeavour to lay down some guidelines for the diagnosis and treatment of this injury. Appropriate radiological investigations include chest x-ray (which should be repeated), abdominal ultrasound and thoraco-abdominal tomodensitometry. The treatment is surgical. The preferred route of access in the elective case is via the thorax, but in emergency, in the absence of a pre-operative diagnosis, an abdominal route may be indicated.

Key words: Rupture of the right diaphragm — Closed trauma — Surgery — Thoracoscopy

The diagnosis and management of diaphragmatic injuries continues to be a problem, since in recently published series the number of these injuries which is initially overlooked is still of the order of 20% - 40%, and the operative mortality 21% [Azorin 1987, Boulanger 1993]. Based on two cases of traumatic rupture of the right diaphragm, one diagnosed late and the other diagnosed at the start, we compare our experience with the published series in order to determine the frequency of such injuries, the incidence of those which are initially overlooked, and the role of radiological investigations, thoracoscopy and surgery, in the diagnosis and management of this type of injury.

Case 1

M. T., 46 years old, suffered a road traffic accident in which he was imprisoned by his seat belt in a light car, which was in collision with a similar vehicle. Initially the patient was conscious and hemodynamically stable. The anteroposterior chest x-ray (Fig. 1) showed an extensive right pleural effusion, involving the mediastinum, together with multiple rib fractures, but no free segment. Abdominal ultrasound was normal. The right chest drain produced 1200 ml. The post-drainage x-ray (Fig. 2) showed a raised right diaphragmatic dome, with no reaccumulation of the fluid. Thoraco-abdominal tomodensitometry revealed bilateral bruising in the thorax (Fig. 3), no mediastinal injury and a strong suspicion of a ruptured right diaphragm. The abdomino-pelvic cuts showed a retroperitoneal hematoma, a localised pneumo-peritoneum and a right-sided pelvic hematoma suggesting an injury to the right external iliac vein. Additionally, there was a fracture of the pelvic ring, distraction of the symphysis pubis and fractures of the sacrum, the
Fig. 1  
Initial chest x-ray showing massive right hemothorax

Fig. 2  
Chest x-ray following drainage, showing a raised right diaphragm

wrist, the upper third of the femur and the sternum. The first stage of the operation consisted in hemostasis of the right-sided venous injury via a subperi toneal approach, and the second stage comprised direct suture of the right diaphragmatic defect through a thoracotomy. With hemodynamic stability restored, the possibility of intra-abdominal injury was excluded by an exploratory laparoscopy, which revealed nothing more than a contusion of the bladder.

Case 2.

Mrs F., 72 years old, was seen in a pre-operative anesthetic consultation, preparatory to a cataract operation. Clinical examination was unremarkable, but the chest x-ray showed a right-sided basal opacity, with an air fluid level. Thoracic tomodensitometry (TDM) and magnetic resonance imaging (MRI) (Fig. 4) were carried out, and revealed a right-sided diaphragmatic hernia. The liver, the hepatic flexure of the colon, the gall bladder and the stomach lay within the thorax. The right lung appeared normal and there was no pleural effusion. Going back over the past history, the patient remembered a road traffic accident which had occurred three years previously, involving a collision between two light vehicles, with the patient bel ted but not trapped. There was an impacted fracture of the right femoral neck, but the ruptured diaphragm had been overlooked. The patient was operated upon via a postero-lateral thoracotomy, through the seventh interspace. This revealed a radial rupture of the diaphragm extending over the dome as far as the origin of the inferior vena cava. The reconstruction required enlargement of the diaphragmatic origin followed by an overlapping closure of the two edges using interrupted mattress stitches of non-absorbable material. The post-operative course was uneventful, complicated only by the appearance of a pleural effusion, which responded well to physiotherapy.

Discussion

Diaphragmatic rupture is present in 1 to 3% of major thoracic injuries, usually following road traffic accidents. The incidence has markedly diminished over the last ten years, due to the improvement in traffic conditions, but the subject is still of importance, because in spite of the initial investigations the proportion of injuries which are initially overlooked remains of the order of 20-40% [Azorin 1987, Boulanger 1993, Mansour 1997, Shah 1995]. As regards ancillary investigations, a plain chest x-ray immediately after the accident leads one to suspect the diagnosis of a ruptured right diaphragm in some 20% of cases [Gelman 1995], but to obtain these figures it is necessary to repeat the examination. There is no radiographic difference between intubated and non-intubated patients, which explains why in our case no. 2 the diagnosis remained unsuspected because of prolonged mechanical ventilation. Numerous other investigations are available such as abdominal ultrasound, thoraco-abdominal tomodensitometry, oesophago gastroduodenal contrast studies, abdominal x-ray which may be either plain or with an induced pneumoperitoneum, and magnetic resonance imaging. In the emergency situation, only abdominal ultrasound and thoraco-abdominal tomodensitometry are easy to carry out and make a useful contribution to the schedule of injuries and the diagnosis of cases, the left in 70-80%, and 5-8% are bilateral. These figures match our experience, apart from bilateral rupture, which we have never encountered. The right side is usually injured as one of a number of severe multiple injuries. According to the literature there is no particular difference in early diagnosis between right and left-sided lesions [Boulanger 1993, Gelman 1991, Mansour 1997, Shah 1995].