

CASE REPORT

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Fatal blunt pancreatic trauma secondary to assault and battery: a case report

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Abstract The authors report on a fatal case of closed trauma of the pancreas in a context of violence. A 55-year-old man was found unconscious on the sidewalk and died a short time after being taken to the hospital. He had been hit with several punches to the face and abdomen 6 h before. The post-mortem examination showed numerous bruises over the whole body, a haemoperitoneum, a fissuration of the spleen and a massive peripancreatic haemorrhage associated with a complete dilaceration of the pancreas head. Histological examination of the pancreas revealed a massive necrosis associated with a subtotal disappearance of the acini, numerous sites of cytosteatonecrosis and a large haemorrhagic suffusion of the peripancreatic tissue. This case illustrates the possibilities of pancreatic injuries induced by blunt force aimed at the abdomen in a context of violence. Even if this occurs as an isolated injury it can result in rapid death because of the particular type of pancreatic fracture which is frequently involved. In post-mortem situations, the pancreas should be systematically checked at necropsy and a histological examination should be carried out at the slightest doubt of a pancreatic lesion or suspicion of blunt force abdominal injuries.

Keywords Blunt abdominal trauma · Pancreatic injury · Violence · Diagnosis

Introduction

Closed traumas of the pancreas are of relatively low prevalence [1], although they have become more frequent

in the last decade mainly due to traffic accidents [2] and, to a lesser extent, to workplace accidents and violence [3]. They have also been related to child abuse situations [4] and some authors consider that the occurrence in this context might be underestimated [5]. Like liver ruptures [6] these lesions usually result from direct abdominal trauma (e.g. punches or kicks). This possibility of pancreatic lesions induced by violence is worth underlining since these lesions are associated with a high death rate: 10% for isolated lesions and up to 20% in case of multiple injuries [7].

The severity of pancreatic lesions primarily results from the distinctive anatomical features of this organ as the retroperitoneal location induces difficulties in establishing the diagnosis and a delay in providing appropriate care [8]. Moreover, owing to close anatomical connections with the duodenum, stomach and spleen on the one hand and with the vascular network on the other hand, serious extrapancreatic lesions are often associated [9], worsening the prognosis and making an accurate estimation of the pancreatic lesions more difficult.

This paper aims to report a fatality resulting from major pancreatic trauma due to violence and to discuss it in the light of the existing literature.

Case study

In June 1995 at about 8.00 a.m. a 55-year-old Caucasian male was found unconscious on the footpath, in a dead-end located in the town centre. There were numerous bruises over the whole body, especially on the face and scalp. The blood ethanol concentration at admission was 1.23 mg/ml and the victim died a short time after being taken to the hospital.

The police inquiries allowed the sequence of events to be reconstructed as follows: the deceased who was known as a chronic alcoholic, had spent the evening in a bar and had quarreled with another individual during a game of cards. He had been hit by several punches to the face and abdomen, then left unconscious on the pavement outside the bar at about 2.00 a.m.

A post-mortem examination was ordered by the public prosecutor's office and carried out 3 days after death. The external examination primarily showed the presence of two wounds to the scalp and numerous bruises on the face and whole body. Dissection revealed a 1500-ml haemoperitoneum, a fissuration of the spleen on the diaphragm side, a haemorrhagic infiltration of the

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right renal sac and mesenteric and mesocolic ecchymoses. There was also a massive peripancreatic haemorrhage measuring 15 × 5 cm, associated with a complete destruction of the pancreas head. The inner side of scalp and the galea also showed several ecchymoses. There was a focal meningeal haemorrhage, without underlying encephalic lesions. The lungs were congestive and oedematous. Histological examination of the pancreas revealed a massive necrosis associated with a subtotal disappearance of the acini, numerous sites of cytosteatonecrosis and a large haemorrhagic suffusion of the peripancreatic tissue.

The cause of death was concluded to be the consequence of a destruction of the pancreas head and from numerous other lesions (cerebral and abdominal) resulting from violent and repeated blows.

Discussion

Although still relatively infrequent, closed traumatism of the pancreas are increasingly observed and represent 2–9.5% of abdominal traumatism [5, 10]. They mainly result from traffic accidents, however several authors point out that pancreatic lesions can be a consequence of physical violence [8, 11, 12, 13].

Touloukian reported three fatalities involving battered children, in which the post-mortem examination showed the presence of major pancreatic lesions [14]. Cooper et al. described a case of pancreatic haematoma observed in a child in the same context of violence [15] and Gonzales presented a fatality which occurred in a baseball player who had been hit by a ball in the abdominal area, resulting in a haematoma of the pancreas head [16].

These lesions are mainly explained by the anatomical characteristics of the pancreas. Owing to its retroperitoneal location, it is in direct contact with the vertebral bodies. Following a direct abdominal blow, the pancreas is prone to percuss the rachidian relief. Since it is closely connected with adjoining organs it is relatively fixed, thus it does not benefit from any shock-absorber effect and may be severely injured and even ruptured by being forced against the vertebral column. Pancreatic lesions are classically quoted in accordance with Hervé and Arrighi's classification:

- Grade I: contusion/haematoma with integrity of the duct system
- Grade II: distal rupture of the gland
- Grade III: proximal rupture of the gland with duct lesions or cross cutting without blow on the duodenum
- Grade IV: laceration of the cephalic part of the pancreas.

The anatomical relationships of the gland also explain the multiplicity of the lesions which may be associated (e.g. duodenum, liver, spleen, stomach). The injury of the large vessels of the retroperitoneal cavity (inferior vena cava, aorta), the crossing of numerous vascular arches (depending on mesenteric vessels) are responsible for the severity of the haemorrhagic lesions [17].

The diagnosis of pancreatic lesions is often delayed. In addition to the deep location of the organ, the typically delayed release of pancreatic enzymes also explains a late symptomatology [18]. Moreover, as neighbouring structures are frequently injured, the pancreatic symptomatology

is often concealed by that resulting from the associated lesions. These delays in establishing the diagnosis are responsible for the number and seriousness of the complications [19, 20].

The occurrence of rapid deaths is generally ascribed to the associated lesions by haemorrhagic shock or peritonitis [21]. Such complications would be responsible for a death rate of more than 20% [22]. On the contrary, according to several authors an isolated trauma of the pancreas cannot be responsible for a rapid death [12, 22, 23], but can result in numerous complications (19–25% of cases) [11, 13], mainly fistular and also acute pancreatitis and abscesses, with a rate of delayed death estimated at 9% [19, 23]. These complications can be explained by the occurrence of a necrosis of the gland by its own enzymes, linked to a parenchymatous rupture affecting the acini, or to a rupture of a duct. This phenomenon may be delayed for 12 days up to 6 months [11, 22, 23] and is classically not involved in premature deaths.

Pancreatic lesions induced by blows to the abdomen are peculiar, as they do not completely match these statements. On the one hand, according to Northrup and Simmons [1] or Prévot et al. [24], traumatism by kicks or punches as well as by steering wheels mainly cause a direct shock to the median region of the abdomen, thus rather result in Herve's type 3 lesions (i.e. rupture of the isthmus, often isolated). The particular seriousness of such injuries is due to the duct lesions which are responsible for a massive necrosis. For Gianello et al. one in seven cases of pancreatic traumatism involved a fracture of the isthmus related to violence [5].

On the other hand, blows aimed at the abdomen would have to be particularly violent to induce pancreatic lesions as the gland is relatively well-protected by the deep anatomical position. Finally, according to Craig et al. [8], the type of lesion may primarily depend on the impact angle: lateral lesions will affect either the pancreas head (right trauma) or the body (left trauma), whereas direct blows (e.g. assault and battery) will rather result in median, type 3 injuries. As an example, Gianello et al. reported a case of acute necrotico-haemorrhagic pancreatitis observed in the first post-traumatic hours, resulting in recovery. The lesion was a fracture of the isthmus caused by an abdominal kick [5].

In a series of 22 cases of abdominal trauma, Cooper et al. observed that the death rate following assault and battery was much higher (50%) than in other situations [15]. Those cases concerned children hit by kicks and punches on the abdomen with a mechanism of direct, median shock.

In our case, there was a complete destruction of the pancreas head with massive necrosis of the gland, resulting in death which occurred 6–8 h after the victim had been hit. Some points have to be highlighted in this situation: first, the severity and rapidity of the pancreatic necrosis may confirm the conclusion of Karl and Chandler that the anatomical position of the gland abutting the spine may explain severe injuries even if the energy of the blows is not very important [10]. The necrosis developed

early which is not in accordance with data in the literature where usually delays of some days are reported, but may rather indicate that following an assault and battery, pancreatic lesions can occur rapidly due to the type of rupture frequently associated with this aetiology. The associated lesions (e.g. splenic fissures, mesenteric and mesocolic ecchymoses, cutaneous bruises) were considered not to be responsible for death, which was primarily due to the pancreatic lesions alone. Finally this observation confirms that pancreatic lesions caused by direct traumatism (especially blows in a context of violence) may be quickly fatal even if isolated, because of the high severity of the necrosis that they induce [1, 10].

The conclusion is that general practitioners should be aware of the possibility of pancreatic injuries induced by blunt force aimed at the abdomen in a context of violence, although these lesions occur with a low frequency. Even if isolated they can result in rapid death because of the particular type of pancreatic rupture which is frequently involved. This should be kept in mind because early diagnosis could improve the survival rate. In post-mortem situations, the pancreas should be systematically checked at necropsy and a histological examination should be carried out at the slightest doubt of a pancreatic lesion and/or suspicion of blunt abdominal injuries.

References

- Northrup WF, Simmons RL (1972) Pancreatic trauma: a review. *Surgery* 71:27–43
- Karger B, Teige K, Bühren W, Du Chesne A (2000) Relationship between impact velocity and injuries in fatal pedestrian-car collisions. *Int J Legal Med* 113:84–88
- Higashitani K, Kondo T, Sato Y, Takayasu T, Mori R, Ohshima T (2001) Complete transection of the pancreas due to a single stamping injury – A case report. *Int J Legal Med* (in press)
- Tolia V, Patel SP, Amundson GM (1990) Pancreatic fracture secondary to child abuse : the role of computed tomography in its diagnosis. *Clin Pediatr (Phila)* 29:667–668
- Gianello P, Lerut J, Otte B, et al, (1984) Les traumatismes du pancréas. *Acta Chir Belg* 84:170–179
- Vock R (2001) Liver rupture caused by isolated blunt force impact: the result of a blow, a kick or a fall? *Int J Legal Med* 114:244–247
- Timberlake GA (1997) Blunt pancreatic trauma: experience at a rural referral center. *Am Surg* 63:282–286
- Craig MH, Talton DS, Hauser CJ, et al, (1995) Pancreatic injuries from blunt trauma. *Am Surg* 61:125–128
- Smego DR, Richardson JD, Flint LM (1985) Determinants of outcome in pancreatic trauma. *J Trauma* 125:771–776
- Karl HW, Chandler JG (1977) Mortality and morbidity of pancreatic injury. *Am J Surg* 134:549–554
- Carrel T, Lerut J, Niederhauser U, et al, (1990) Diagnostic et traitement des lésions traumatiques du duodénum et du pancréas. *J Chir (Paris)* 127:438–444
- Davis J, Cohn I, Nance FC (1976) Diagnosis and management of blunt abdominal trauma. *Ann Surg* 181:672–678
- Goins WA, Rodriguez A, Joshi M, et al, (1990) Intra abdominal abscess after blunt abdominal trauma. *Ann Surg* 212:60–65
- Touloukian J (1968) Adominal visceral injuries in battered children. *Pediatrics* 42:642–646
- Cooper A, Floyd T, Barlow B (1988) Major blunt abdominal trauma due to child abuse. *J Trauma* 28:1483–1487
- Gonzales TA (1951) Fatal injuries in competitive sports. *JAMA* 146:1506–1511
- Asensio JA, Demetriades D, Berne JD, et al, (1997) A unified approach to the surgical exposure of pancreatic and duodenal injuries. *Am J Surg* 174:54–60
- Smith SD, Nakayama DK, Gantt N, Lloyd D, Rowe MI (1988) Pancreatic injuries in childhood due to blunt trauma. *J Pediatr Surg* 123:610–614
- Wisner DH, Wold RL, Frey CH (1990) Diagnosis and treatment of pancreatic injuries. *Arch Surg* 125:1109–1113
- Fabian TC, Kudsk KA, Croce MA, et al, (1990) Superiority of closed suction drainage for pancreatic trauma. *Ann Surg* 211:724–730
- Errougani A, Ameur A, Chkoff R, et al, (1997) Les traumatismes duodéno-pancréatiques. *J Chir (Paris)* 134:9–13
- Sims EH, Mandal AK, Schlater T, et al, (1984) Factors affecting outcome in pancreatic trauma. *J Trauma* 24:125–128
- Graham JM, Mattox KL, Jordan GL (1978) Traumatic injuries of the pancreas. *Am J Surg* 136:744–748
- Prévot J, Miscalut G de, Schmitt M (1993) Chirurgie conservatrice du pancréas dans les sections traumatiques complètes du canal de Wirsung chez l'enfant. *Chirurgie* 119:469–472