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CASE REPORT

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Fatal isolated ruptures of bladder following minor blunt trauma

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Abstract Traumatic bladder ruptures are generally secondary to severe trauma and associated with pelvic fractures. Conversely, isolated bladder ruptures following minor blunt trauma are rare and seldom fatal. We describe six fatal cases (five males, one female, 39–82 years old) of isolated bladder rupture subsequent to minor blunt trauma. Three cases were out-of-hospital deaths and among the three hospital cases, only one was diagnosed as bladder rupture ante-mortem. All victims had a history of chronic alcohol abuse. The differentiation between spontaneous and traumatic (accidental or purposely inflicted) bladder ruptures is crucial but may be difficult to assess, especially in cases involving alcohol abuse and occurring in a domestic setting.

Keywords Forensic pathology · Bladder rupture · Blunt trauma · Alcoholism · Alcohol intoxication

Introduction

Bladder rupture is a relatively common urological complication that occurs spontaneously [1, 2] or secondary to blunt trauma [3, 4, 5, 6], penetrating injury [5] or iatrogenic intervention [6]. Traumatic bladder ruptures are associated in 75–83% of the cases with fractures of the pelvis or other visceral injuries [3, 5, 6, 7]. The mortality ranges from 11% to 44% [5, 8]. Bladder ruptures without pelvic fracture are reported rarely and if diagnosed in time have a good prognosis [4, 6, 9, 10].

We report six fatal cases of isolated rupture of the urinary bladder caused by minor blunt trauma investigated at the Department of Forensic Medicine, University of Helsinki.

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Case descriptions

The autopsy records of the Department of Forensic Medicine, University of Helsinki, were searched for all cases between 1987 and 2000, where bladder rupture was the cause of death or a contributing factor. Of 32,143 deaths autopsied during this period, there were 18 cases where bladder rupture was the underlying or contributing cause of death. The six cases in which isolated bladder rupture was the underlying cause of death, are reported here.

Case 1

A 57-year-old single male was transported to a local health centre because of abdominal pain after his room-mate called an ambulance. During the transfer the patient had respiratory difficulties and bradycardia. Despite resuscitation attempts death occurred 15 min after patient admission to the health centre. The victim had a history of chronic alcohol abuse. No history of trauma was reported by the victim before death or by his room-mate during the police investigations. A medico-legal autopsy was performed 5 days post-mortem (PM). At external examination there were recent bruises on both sides of the lower abdomen, right hip, right hand dorsally and an older haematoma on the back. At internal examination there was 2 l of partially clotted blood in the peritoneal cavity and a 3-cm laceration on the bladder dome. In addition to a fatty liver, no other relevant changes was found by macro- and microscopic examination. The PM blood alcohol concentration (BAC) was 2.2‰. The manner of death was classified as undetermined.

Case 2

A 39-year-old single male was found dead at home in the evening lying on the floor. Two days previously he complained to his daughter of severe abdominal pain. The victim had a history of chronic alcohol abuse but no history of trauma was reported. A medico-legal autopsy was performed 2 days later. At external examination there were haematomas of different ages on the forearms, knees and the proximal part of the right femur. No injuries were found on the abdomen. At internal examination there was diffuse peritonitis and a laceration was found on the posterior region of the bladder. A discrete haemorrhage was detected on the lower abdominal muscles. In addition to a fatty liver, no other relevant changes was found at macro- and microscopic examination. The PM toxicology was negative for blood alcohol, while traces of tranquillizers (diazepam and temazepam) were found in the liver. The manner of death was classified as accidental.

Case 3

A 75-year-old married male fell on the dining room floor, and suddenly lost consciousness. The emergency doctor verified death on site. According to his wife the victim had heavily consumed alcohol during the past 2 weeks, until 2 days prior to death. During this period he fell several times hurting his pelvis and throughout the past 2 days he had complained of abdominal pain. The victim had a history of chronic alcohol abuse. A medico-legal autopsy was performed 4 days PM. At external examination there were haematomas of different ages on both forearms, right shoulder, chest, left hip, proximal third of the left femoral region femur anteriorly, and both knees. At internal examination there were recent fractures of the IV–VIII left ribs and retroperitoneal and intraperitoneal haemorrhages. A 1.5-cm laceration was found on the left side of the bladder and the bladder cavity contained partially clotted blood. In addition to coronary Atheroscienosis no other relevant macro- and microscopic findings were detected at autopsy. PM toxicology was negative. The manner of death was classified as accidental.

Case 4

An 82-year-old male was admitted to the local hospital for abdominal pain. The patient reported that 2 days earlier he had injured his lower abdomen and left flank on the corner of the kitchen freezer. On admission the Hb level was 137 g/l, serum creatinine 245 mmol/l and BAC 1.5‰. The following day the patient had anuria and, after catheterisation, hematuria. He was transferred to a regional hospital with a suspicion of kidney trauma. Laboratory values were now Hb 96 g/l, creatinine 184 µmol/l, K 5.6 mmol/l, CRP 46 mg/l. The patient had acidosis (BE –29.4) and four RBC units and bicarbonate were administered. One day later the patient suddenly had breathing difficulties and asystole and died despite resuscitation attempts. The medical history was conspicuous for alcoholism and cardiac insufficiency. A medico-legal autopsy was performed 5 days PM. At external examination there were signs of the recent treatment, recent haematomas on the left costal arch, left anterior iliac crest region and right costal arch and bruises on the right knee. At internal examination the peritoneal cavity contained 250 g of clotted blood and a 7-cm laceration was found on the upper posterior part of bladder. In addition there was nodular hyperplasia of the prostate. Other findings included a fatty liver with fibrosis, chronic pancreatitis, chronic lung emphysema and bronchitis, cardiac hypertrophy, myocardial fibrosis and nephrosclerosis. PM toxicology was negative for alcohol in the blood clot from the bladder. The manner of death was classified as accidental.

Case 5

A 50-year-old single male with a history of chronic alcohol abuse, was found dead on the floor of his dining room by the house caretaker. The body showed initial stages of putrefactive changes and blood spots were found on the floor. In addition to alcoholism, the medical history was relevant for a bladder contusion of uncertain etiology under acute alcohol intoxication (2.6‰) 15 months before death. A medico-legal autopsy was required and performed 1 day later. The time of death was estimated to be 7 days before discovery of the body. At external examination there was a small laceration on the frontal region, recent haematomas in the right clavicular region, right flank under the costal arch, inferior abdominal region, right hip and dorsal region. At internal examination there was 1.5 l of muddy liquid in the peritoneal cavity, peritonitis, and a 2-cm laceration of the bladder dome. In addition there was a fatty liver, cardiac hypertrophy, slight myocardial fibrosis and a small ulceration of gastric wall. PM BAC was 0.29‰. The manner of death was classified as accidental.

Case 6

A 47-year-old female with a history of chronic alcohol abuse, mental disorder and previous suicide attempts was admitted to a regional hospital in the evening. Her boyfriend alerted an ambulance because of her abdominal pain and a worsening of the general condition. The victim's friend told police that they had been drinking for about 3 weeks during which time the victim fell on the floor several times. At admission the patient was confused and had hypotension and tachycardia and the BAK was <0.2‰. The following morning the Hb level was 102 g/l, creatinine 292 µmol/l, urea 31.8 mmol/l, CRP 345 mg/l, P-K 4.0 mmol/l, P-Na 132 mmol/l and BE –4.3. Laparatomy performed the day after admission revealed a bladder rupture at the dome that was sutured. Postoperative complications included septic shock, with leucopenia, disseminated intravascular coagulation (DIC) and severe multiorgan failure. Despite emergency re-laparotomy the patient died 3 days after admission. A medico-legal autopsy was performed 6 days PM. At external examination there were signs of medical and surgical treatment, bruises on both the upper arms but no signs of trauma were found in the abdominal region. At internal examination there was a 5-cm laceration of the bladder dome, a fatty liver and slight atherosclerosis. PM toxicology was not performed. The manner of death was classified as undetermined.

In all cases histological examination of the bladder at the site of rupture showed acute or subacute laceration with no sign of pathological processes.

Discussion

The adult bladder is located well protected from injuries, deep in the pelvis above and behind the pubic symphysis. Because the bladder is covered by the peritoneum only in the postero-superior aspect, rupture of this organ can occur either intraperitoneally or extraperitoneally.

The more frequent type of bladder rupture is the extraperitoneal type [5, 7, 11], which is associated with pelvic fractures in 95% of the cases [7, 12]. These ruptures may occur directly by perforation from bone fragments, traction of the ligaments between bladder and pelvis or by a bursting mechanism [7, 9, 13]. The mortality associated with this type of injury depends on the associated injuries rather than on the direct consequences of the bladder rupture [9].

Intraperitoneal ruptures are less common and usually have a good prognosis. They are generally isolated ruptures (i.e. with no pelvic fractures or other severe trauma associated) and generally result from blunt trauma with deceleration and/or compression of the bladder that generates an intravesical pressure, which is transmitted equally in all directions. When this pressure is higher than 300 cm/H_20, the wall stretches, generally at its weakest and more mobile part, i.e. the dome, and can rupture [11, 12]. The mortality usually depends on complications arising from delayed diagnosis such as multiple organ failure, peritonitis and septic shock [12].

The patient with an intraperitoneal bladder injury presents with symptoms and signs of peritoneal irritation, oliguria or anuria [14]. Urine specimens obtained by catheterisation reveal hematuria [14], although this finding can be misinterpreted as being of iatrogenic origin. Later developments include the diffusion of urea and electrolytes across the peritoneum to the blood which in-

creases serum urea, creatinine and potassium concentrations, with metabolic acidosis and hyponatraemia that mimics the biochemical changes of acute renal insufficiency [4, 15]. The definitive diagnosis is made by radiocontrast voiding cystourography or CT cystography [16, 17].

Our series, which represent all fatal isolated bladder ruptures investigated at the Department of Forensic Medicine, University of Helsinki from 1987 to 2000, demonstrates the role of alcohol abuse and shows some of the clinical difficulties and medico-legal problems connected with these cases.

The association of bladder rupture with minor trauma and alcohol intoxication has been sporadically reported in clinical journals [4, 6, 9, 18]. To the best of our knowledge no series including out-of-hospital deaths has been published. In our series all victims had a history of chronic alcohol abuse and acute intoxication was likely at the time of the putative trauma. Alcohol abuse increases the risk of bladder rupture and hampers its diagnosis for several reasons. The volume and diuretic effects of alcohol may increase bladder filling to the point of massive over-distension [18] and decreases the behavioural response to it [15, 18]. Alcohol increases the risk of sustaining trauma. Persons under the influence of alcohol may delay seeking medical advice and, once admitted to hospital, they may not recall relevant trauma or overlook minor trauma without connecting them with the current symptoms [18]. As a result, bladder rupture, that has an insidious clinical presentation, can be initially misdiagnosed, causing further delay in its management.

The difficulties related to prompt diagnosis and management were evident in our series. In three cases death occurred at home, and in one case 15 min after admission to a health centre. Among in-hospital deaths, the patient in case 4 was transferred to a regional hospital with suspicion of kidney trauma in spite of symptoms suggestive of bladder rupture and laboratory values indicating a peritoneal reabsorption of urine into blood and died before a correct diagnosis was achieved. The patient in case 6 arrived at hospital with laboratory values suggestive of reabsorption of urine in blood, but despite prompt diagnosis developed postoperative sepsis and DIC and died 2 days after diagnosis.

Isolated bladder ruptures raise important medico-legal issues. The differential diagnosis between spontaneous rupture, rupture from minor accidental blunt trauma and injuries inflicted deliberately (e.g. by kicking or punching) is of utmost importance, as for other abdominal injuries [19, 20, 21]. Spontaneous rupture has been described in the setting of pre-existing pathology of the bladder (e.g. tumour, inflammation, infiltrative disease or puerperal and postoperative patient) [22]. In the absence of pathological disease the occurrence of spontaneous rupture is debatable. Some authorities doubt such a possibility [18], while few cases of putative non-traumatic bladder rupture associated with alcohol or other substance abuse have been recently published [23, 24]. In all our cases the victim had a history of abdominal trauma, or injuries to the lower abdomen were found at autopsy. On this basis we believe that all ruptures of the bladder without pre-existing pathology should be considered traumatic and only when a negative history for trauma is undoubtedly documented can a "spontaneous" rupture be postulated.

The differential diagnosis between bladder rupture from minor accidental blunt trauma and injury inflicted deliberately may be difficult, especially for cases involving alcohol and occurring in a domestic setting. Among alcoholics, accidental falls, assault and battery are not rare and this may impede the assessment of the causal connection between traumatic rupture and putative injuries, even if events are witnessed. Moreover alcoholics and victims of domestic violence may, for a variety of reasons, be reluctant to seek medical attention and/or inform police authorities. The BAC at the time of causative trauma may also be difficult to determine. The interval between trauma(s) and hospital admission or death is often so prolonged that in vivo or PM alcohol determination may not provide adequate information, e.g. because the victim consumed alcohol after the trauma(s).

In conclusion, the diagnosis of traumatic bladder rupture should be considered in all patients with non-specific lower abdominal pain, especially when there is a history of alcohol abuse and/or trivial abdominal trauma. At hospital admission, medical doctors should promptly collect information about trauma and investigators verify the possibility of deliberately inflicted injuries. Forensic pathologists should be aware that in the absence of primary bladder pathology, isolated bladder ruptures are likely to be traumatic and can be caused by minor blunt trauma, either accidentally or deliberately inflicted.

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