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CASE REPORT

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PRE-HOSPITAL MANAGEMENT OF PENETRATING PELVIC INJURIES — A CASE STUDY

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ABSTRACT

INTRODUCTION: Penetrating pelvic injuries and the complications caused by them are a global problem in the provision of services by emergency medical teams. They often pose a significant challenge for medical personnel, particularly in patient evacuation and stabilization during transport.

CASE REPORT: The emergency medical service (EMS) was dispatched to a traffic accident — the report contained information about one conscious victim with a foreign body within the patient's body. At the accident scene, a delivery truck crashed into the tow bar of a trailer standing on the road, and one person was seriously injured due to the impact. The preliminary assessment confirmed a foreign body penetrating the right thigh, deformation and enlargement of the thigh contour, pain in the thigh, pelvis, and tenderness in the thoracic-lumbar spine with the end part of the tow bar hook palpable under the skin. The victim was suspected of having a femur fracture, pelvic injuries, and damage to internal organs. On neurological examination, sensation and motor functions were preserved in all limbs. The evacuation procedure was established after the Fire Department (FD) rescuers arrived. The injured person was removed from the vehicle on an orthopedic board with the help of eight rescuers. The victim was placed on his left side with the right side elevated, with continuous manual stabilization supported by a blanket, pillows, and orthopedic boar straps.

CONCLUSIONS: Each traumatic injury event requires selecting and using the appropriate equipment. A good compromise between speed and precision of actions should not significantly contribute to the worsening of the injury. An increase in a rescuer's substantive knowledge on how to proceed in the case of this type of trauma and injuries, as well as close cooperation with the fire department, will undoubtedly result in more appropriate actions.

KEY WORDS: traumatology; pelvic injury; pelvic fractures; foreign body

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FIGURE 1. Act at the scene — destroyed car

INTRODUCTION

Penetrating pelvic injuries and complications caused by them are a global problem in providing services by emergency medical teams and often pose a significant challenge for medical personnel. According to the World Health Organization, five million people die annually from injuries worldwide. In Poland, body injuries are the third leading cause of death. Poland is amongst the countries with the highest death rate due to road traffic accidents. In the 15–24 age group, deaths from accidents reach 70% [1]. There are currently fifteen trauma centers (TC) in the country to which victims with the most severe injuries should be referred. The criteria for admission to the TC are regulated by the order of the Minister of Health contained in the Act on State Medical Rescue [2, 3]. Trauma severity scales have been developed in order to standardize the assessment of patients with multiple injuries. The scale most frequently used by Medical Rescue Teams is the Revised Trauma Score (RTS) [4]. In contrast, hospital Emergency Departments (ED) and trauma departments use the Trauma Revised Injury Severity Score (TRISS) prognostic for the survival of patients with multiple, blunt, and penetrating injuries [5, 6].

CASE REPORT

In Autumn, at 6:45 am, the Emergency Medical Service (EMS) was dispatched to a traffic accident — with the highest priority. The report contained information about one conscious victim with a foreign body within the patient's body. The primary EMS team, consisting of three rescuers, arrived at the accident scene first. A preliminary accident assessment was performed; at the accident scene, a delivery truck ran into the tow bar hook of a trailer parked on the road (Fig. 1). The impact seriously injured one person, a young male passenger. Due to the enormous energy accompanying the impact, the trailer tow bar hook hit by the delivery truck pierced the front wall of the engine and the cabin. It penetrated the man's right thigh, went through the pelvis, and stopped at the passenger's back.

ASSESSMENT OF THE VICTIM

The assessment of the patient's condition by the paramedic revealed: AVPU scale — A, A — airway patent, SpO2 — 98%, B–HR–26/min., C — palpable pulse in the radial artery, HR — 100/min. BP — 110/80 mmHg, GCS — 15 points, RTS — 12 points. The preliminary International Trauma Life Support (ITLS) assessment revealed a foreign body penetrating the right thigh, deformation and enlargement of the thigh contour, pain in the thigh and pelvis, and tenderness in the thoracic-lumbar spine, with the end part of the tow bar hook palpable under the skin [9]. Due to a foreign body in the pelvis, it was impossible to assess the iliac plates' stability. The victim was suspected of having a femur fracture, pelvic injuries, and damage to internal organs. On neurological examination, sensation and motor function were preserved in all limbs. A decision was made to stabilize the foreign body

initially, insert two intravenous lines (18G cannula), implement passive oxygen therapy 12 L/min, and manually stabilize the cervical spine with an orthopedic collar. Due to the high risk of bleeding into the thigh and pelvis, crystalloid — NaCl 0.9% 500 mL was pre-administered. In the Numerical Rating Scale (NRS), the result was 7–8 points, and the following drugs were administered: 10 mg of morphine sulfate and 2.5 g of metamizole *i.v.* After the next three minutes, the NRS was assessed as 5 points.

The evacuation procedure was established after the FD rescuers arrived. A circular saw for cutting hardened steel was used. Previously fentanyl in a dose of 0.01 g and another 500 mL NaCl 0.9% were administrated. The pain reassessment was 5 points on the NRS. A rescuer achieved foreign body stabilization on the injured person with a blanket, a pillow, several gauze pads, and continuous manual stabilization. Due to his large body weight and the need for solid stabilization of the heavy foreign body, the injured person was removed from the vehicle with the help of eight rescuers. An orthopedic board was used at the height of the delivery truck seat for safe evacuation. The victim was placed on his left side with the right side elevated, with continuous manual stabilization supported by a blanket, pillows, and orthopedic board straps (Fig. 2) [12, 13]. After securing the patient, vital parameters were re-assessed: SpO2 — 97%, RR — 14/min, HR — 100/min, BP — 100/80 mmHg, GCS — 15 points, RTS — 12 points, assessment of bleeding intensity from the wound, PMS test (pulse, motor, sensorial) of the damaged limb. During the 5-minute transport to the hospital Trauma Center, the patient's condition did not deteriorate.

DISCUSSION

The speed of a victim's evacuation, and attention to avoiding worsening his condition, may significantly influence the subsequent treatment of injuries. It may also affect the chances of survival or severity of future disability for the accident victim. It is essential to consult between the EMS and FD rescuers to select an appropriate evacuation method [7–15].

Evacuation from the vehicle was a significant challenge. FD rescuers had to cut the side pillar and the wall separating the passenger compartment from the cargo compartment.

The critical moment in the presented case was the execution of the final cut of the steel hook, which, due to its internal and external stresses, could rapidly dislocate. The final cut could intensify the bleeding in the thigh and pelvis. The steel towbar connected both vehicles and therefore significant stresses appeared. This made it difficult to decide to cut the hook. Traditional hydraulic equipment used by FD rescuers, even high-powered equipment, did not meet expectations. The only optimal and accessible way was to use a circular saw for cutting hardened steel. Unfortunately, this solution carried the risk of vibrations transmitting through the metal rail to the inside of the wound, and because of the intense heating of the metal could lead to burns. Enabling access by cutting the steel towbar required

FIGURE 2. Trailer hook penetrating the man's right thigh, through pelvis, stopping at the back of the passenger's back — pictures after evacuation

intensive cooling. The situation was challenging and required the rescuers to cooperate closely to avoid aggravating the injuries. The precise approach to cutting off the hook caused the entire rescue to lengthen in time, which could have worsened the patient's condition.

The method of patient transportation on his left side was the only possibility. The metal hook could have moved inside the thigh and pelvis during transport, damaging its internal structures. Careful attachment with straps held the victim and foreign body stable, which provided a safe method of transporting the patient on his side to the hospital. There was a high risk of developing shock and cardiovascular decompensation despite the patient's vital signs being normal. In pelvic injuries, shock may be difficult to detect in the first phase, obscuring the destabilization of vital signs and leading to shock being overlooked. In this case, attention should be paid to the administration of fluids and possible shock development. Due to the increased body weight of the patient, there was a need for an increased administration of analgesics [16]. Because of the injury and the probable damage to at least two anatomical areas, i.e., the femur, pelvis, internal organs, and the spine, the patient was transported to the Trauma Center (Fig. 3A, 3B).

The preliminary ITLS examination may give incorrect information regarding the injury due to the substantial adipose tissue present. Therefore, it is vital to always pay attention to the mechanism of injury and the forces causing it. According to Tile's classification, the pelvic fracture is a type B "open book injury" considered rotationally unstable [4, 7]. This fracture risks blood loss into the peritoneal cavity or retroperitoneal space from one liter to even the total volume of the vascular bed. Large blood vessels, intestines, ureters, and urinary bladder can be damaged in such situations. Damage to the femur may lead to the rupture of blood vessels, which may hemorrhage one to two liters of blood [7, 12, 13]. Hypovolemic shock may occur in both cases, leading to sudden cardiac arrest (SCA). The inclusion of Tile's classification is essential for injury interpretation. It is helpful for initial stabilization, the next step of emergency examination, potential comorbid injuries, and planning for further surgical treatment.

CONCLUSIONS

The described case presents a serious challenge to medical personnel (EMS) and all services cooperating at the accident scene. Each event requires the ability to select and use the appropriate equipment. A good compromise between speed and precision of actions should not significantly contribute to the worsening of the injury. An increase in a rescuer's substantive knowledge on how to proceed in the case of this type of trauma and injuries, as well as close cooperation with the fire department, will undoubtedly result in more appropriate actions.

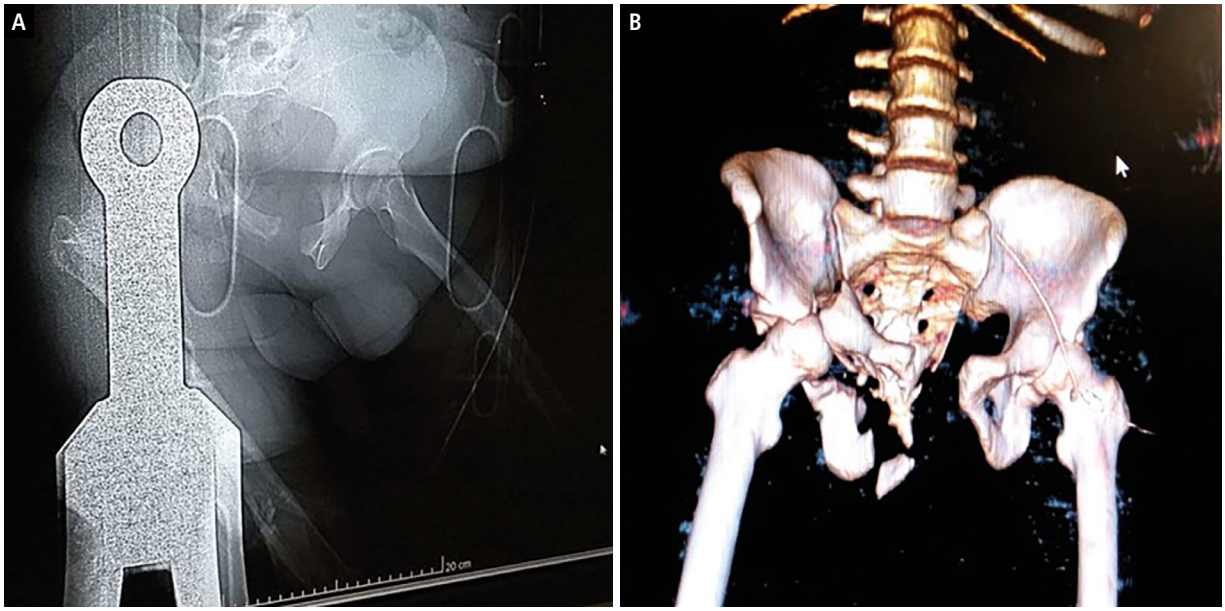

FIGURE 3. **A.** X-ray of victim pelvis with foreign body; **B.** 3D computed tomography reconstruction of patient's femur and pelvis

The take-home message from this case is to pay attention to the mechanism of the injury and select appropriate measures and treatment methods. The vital parameters of the injured person will not always go hand in hand with the injuries, which may be masked in the initial stage. The blunt end of a foreign body can damage the bones in its path, causing them to break. In the case described, there was a high-energy injury and a piercing towbar with a circular-shaped hook that caused fractures of numerous pelvic bone structures, including the pelvic ring, damage to the hip joint, and other organs in the path of the penetrating beam. Injuries with suspected severe damage to numerous intra-pelvic structures should be referred for interdisciplinary treatment at a trauma center.

Article information and declarations

Conflict of interest

The authors declare that they have no conflicts of interests.

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