Case report - Thoracic non-oncologic

Minimum cause – maximum effect: the travelogue of a bullet

Marc Hartert⁎, Manfred Dahm⁎, Achim Neufang⁎, Christian-Friedrich Vahl⁎

⁎Department of Cardiothoracic and Vascular Surgery, University Medical Center, Johannes Gutenberg University, Langenbeckstrasse 1, 55131 Mainz, Germany

Received 6 June 2010; received in revised form 18 July 2010; accepted 21 July 2010

1. Introduction

As violence is not a part of everyday life in Europe, thoracic and/or abdominal gunshot wounds are rather exceptional. The extent of this problem is difficult to estimate as gunshot injuries are often linked with traumata from rifles or other large firearms. Due to their extreme variability, such wounds are counted among the most challenging surgical interventions related to penetrating traumata [1–3]. They are associated with a wide range of injuries varying from minor soft-tissue damages to deep wounds affecting multiple organ systems. This case report involves a 57-year-old male, accidentally shot in the chest with a small bore firearm. The bullet entered the left hemithorax, disrupting the left internal mammarian artery. It then penetrated the anterior wall of the right ventricle causing a pericardial tamponade. After leaving the base of the right heart it perforated the diaphragm, the liver, the spleen and the pancreas. Finally, it penetrated the abdominal aorta 3 cm proximally to the coeliac trunk and reached its final position paravertebrally. This case report illustrates that the management of even minimal gunshot wounds requires a maximum variety of surgical skills.

© 2010 Published by European Association for Cardio-Thoracic Surgery. All rights reserved.

Keywords: Thoracoabdominal injury; Shotgun wound; Surgical intervention

1. Introduction

As violence is not a part of everyday life in Europe, thoracic and/or abdominal gunshot wounds are rather exceptional. The extent of this problem is difficult to estimate as gunshot injuries are often linked with traumata from rifles or other large firearms. Due to their extreme variability, such wounds are counted among the most challenging surgical interventions related to penetrating traumata [1–3]. They are associated with a wide range of injuries varying from minor soft-tissue damages to deep wounds affecting multiple organ systems. This case report involves a 57-year-old male, accidentally shot in the chest with a small bore firearm. The bullet entered the left hemithorax, disrupting the left internal mammarian artery. It then penetrated the anterior wall of the right ventricle causing a pericardial tamponade. After leaving the base of the right heart it perforated the diaphragm, the liver, the spleen and the pancreas. Finally, it penetrated the abdominal aorta 3 cm proximally to the coeliac trunk and reached its final position paravertebrally. This case report illustrates that the management of even minimal gunshot wounds requires a maximum variety of surgical skills.

© 2010 Published by European Association for Cardio-Thoracic Surgery. All rights reserved.

Keywords: Thoracoabdominal injury; Shotgun wound; Surgical intervention
bleeding of the tail of pancreas was detected and overstitched on the first day postoperatively. At this, a bleeding via the abdominal drainage, re-laparotomy was performed. A progressive respiratory improvement allowed decoccic pneumonia, ultimately causing indispensable tracheotomy. An extended stay on the intensive care unit was inevitable due to respiratory insufficiency based on enterococcal pneumonia, ultimately causing indispensable tracheotomy. A progressive respiratory improvement allowed decannulation on the 21st postoperative day. Two days later, the patient was transferred to the general ward. A CT-scan confirmed a good operative result without indications of any relevant pathology. No indication of cardiac insufficiency or any other functional deficits led to the patient’s discharge on the 28th postoperative day. Follow-up after six and 12 months showed normal cardiac function at echocardiography and no surgically related pathology at CT-scan.

3. Discussion

This case report exemplifies the uniqueness of bullet wounds: minimum injuries that – at least at first sight – appear to be straightforwardly manageable may culminate in a maximum venture for all surgical disciplines. Particularly, thoracoabdominal gunshot injuries represent some of the most demanding injuries surgeons have to face due to the impending polytraumatic effect of the projectile [2]. The prognostic outcome is related to early diagnosis and operative repair.

Surgical care of gunshot wounds of the heart and the descending thoracic or abdominal aorta focuses on substantial and continuous blood loss [4]. Resuscitation management of these penetrating injuries involves massive volume replacement of colloid and crystalloid solutions as well as blood [5]. Associated injuries to liver, stomach and lungs may increase difficulties concerning resuscitation, the risk of infection and pulmonary complications. The aortic destruction path associated with gunshot wounds frequently induces significant damage to the vessel wall, necessitating temporary aortic occlusion and prosthetic graft repair [3]. Angiography, frequently necessary in blunt aortic lacerations, is not always possible due to the patient’s haemodynamic instability. Considering the progress of ultrasonography, it is strongly recommend as initial evaluation tool [6]. Early surgical intervention may be the only diagnostic procedure at hand, as rapid operative control of the haemorrhagic site is the most effective resuscitation manoeuvre [7]. Intraoperatively, the surgeon must be ready for every eventuality. The patient needs to be prepared from neck to mid-thigh in case another body cavity has to be accessed. The two most critical decisions to make during the management of thoracoabdominal gunshot wounds are timing and correct order of access to the body cavity affected. Overlooked injuries are generally the result of (1) the failure of an initially correct exploration of the proper body cavity due to unclear indications or (2) a subordination of an extensive examination of such patients as their critical condition requires the vital need for damage control [5]. Misdiagnosis of transdiaphragmatic injuries often occur, as these injuries vex even the most experienced trauma surgeon [3]. The major causes of inappropriate sequencing are: (1) persistently unexplained hypotension disregarded by the surgical findings in the initial cavity accessed, and (2) misleading chest tube output, both of which were considered to be indications of an incorrect access order to the respective body cavity [8]. The surgeon must attempt to follow injury trajectories and examine the diaphragm and pericardium for bulging or penetration. Chest tube output as well as peak airway pressures must be tracked intraoperatively. Transabdominal pericardial window, diagnostic peritoneal lavage, reinsertion of a new chest tube, and even intraoperative use of image converters are valuable tools for diagnosing an injury in an adjacent body cavity [9]. Intelligent use or a combination of these procedures may avoid an opening of another body cavity as the physiological implications can be devastating and may promote hypothermia and its sequelae (acidosis and coagulopathy).

Acknowledgements

We are very grateful to Katrin Pitzer-Hartert for writing assistance and schematic drawing. We thank the Forensic Department of the Police Headquarters Mainz and the State Department of the Police Headquarters Mainz and the State Department of the Police Headquarters Mainz and the State Department of the Police Headquarters Mainz and the State
Office of Criminal Investigation of Rhineland-Palatinate for appropriation of forensic details.

References