Original Article

Fire-Arm Injury

Frequency of Diaphragmatic Trauma in Fire-Arm Injury of Abdominal Cases and Outcome of its Management

1. Shabab Hussain 2. Viqar Aslam 3. Muhammad Sherose Khan 4. Waheed Alam 5. Sajjad Muhammad Khan 6. Waqar Alam Jan

1. Registrar of General Surgery, 2. Asstt. Prof. of General Surgery, 3. House Surgeon of General Surgery, 4. PG Trainee, Deptt. of General Surgery 5. Prof, of General Surgery 6. Assoc. Prof. of General Surgery, Lady Reading Hospital, Peshawar

ABSTRACT

Objective: To determine frequency of diaphragmatic trauma in fire-arm injuries of abdomen and to determine outcome of its management.

Study Design: Retrospective study

Place and Duration of study: This study was conducted at Department of Surgery, Unit B, Lady Reading Hospital Peshawar over a period of one year from January 2014 to January 2015.

Patients and Methods: Record of all fire-arm injury cases, who presented during study period, was analyzed. Data were collected on pre-designed proforma from admitted patient record (patients charts) and operation theatre notes register. Demographic data, site and frequency of injury to diaphragm, operative findings, and outcome were the variables of study.

Results: Out of total 83 patients of fire-arm injuries, 14 (16.8%) patients had diaphragmatic trauma. Mean age of patient was 27.14 years. Male to female ratio was 4.9:1. Left dome of diaphragm was injured in 9 (64.28%) and right dome was involved in 4 (28.57%) of cases and in one patient (7.14%) patients central tendon of diaphragm was injured together with injury to pericardium that got expired.

Conclusion: Diaphragmatic injury though not as common in abdominal fire-arm injury. There should be however very low threshold for suspicion in cases of fire-arm injury of abdomen, where bullet trajectory or mechanism of injury is suggestive, because missing such injury is not devoid of complications. The patient should be thoroughly examined and investigated for exclusion of diaphragmatic injury.

Key Words: Fire-arm injury abdomen, Diaphragmatic injury

Citation of article: Hussain S, Aslam V, Khan MS, Alam W, Khan SM, Jan WA. Frequency of Diaphragmatic Trauma in Fire-Arm Injury of Abdominal Cases and Outcome of its Management. Med Forum 2015;26(7):

INTRODUCTION

The diaphragm is a flat musculomembranous partition between abdominal cavity and thorax.[1] Although blunt injury of diaphragm is relatively common but here we present its involvement in fire-arm injury cases because it is considered as a marker of severe trauma moreover its rupture or perforation leads to jeopardy of two systems. The incidence of diaphragmatic injury varies from 0.8-5% in various series.[2,3] Blunt thoracic and abdominal traumas are associated with an incidence of 5–7%, whereas diaphragmatic injuries are seen in 3–15% of penetrating trauma.[3]

Patients of diaphragmatic injury usually present with difficulty in breathing or shortness of breath and shoulder and chest pain but these are usually masked by the manifestations of other associated organs injury. Now with the recent spiral computed tomography (spiral CT) and magnetic resonance imaging (MRI) the diagnosis can be made early and with precision but in the early acute phase of injury the patient may not be haemodynamically stable to be shifted for any of the specialized investigations.[4]

An accurate diagnosis requires a high index of suspicion based on trajectory of fire-arm bullet and thorough inspection of all viscera during exploration. Missed diaphragmatic injury may result in herniation and strangulation of intra-abdominal viscera into the thoracic cavity.[1] Therefore, the early detection, and prompt management of diaphragmatic injury, particularly in severely injured or poly-traumatized patients is very important to decrease morbidity and mortility.[5,6]

Our hospital is the oldest and major trauma dealing hospital of the province also receiving injured patients from across the border from Afghanistan so the aim was to project this relatively rare but important injury

Correspondence: Dr. Shabab Hussain,
Registrar, Deptt. of General Surgery, Lady Reading Hospital, Peshawar
E-mail: shababdr@gmail.com
Cell No. 03339619411

associated with the compromise of physiology of two systems and to determine outcome of its management.

PATIENTS AND METHODS

This was a retrospective analysis of consecutive 83 patients of fire-arm injuries admitted through Emergency Department to Surgical B Unit, Lady Reading Hospital Peshawar from January 2014 to January 2015. All cases above 14 years of age with fire-arm injuries presented during the study period were included in this study. Patients under 14 years or having other types of diaphragmatic injuries like stab and blunt trauma were excluded from this study. The data were collected on pre-designed proforma from admitted patients record (Patient's charts) and operation notes registers. Intra-operative diagnosis of diaphragmatic injury was made on abdominal exploration during emergency laparotomy. In all these patients repair of the defect was done by direct closure using monofilament polypropylene 1 suture and tube thoracostomy was performed. Concomitant procedures included repair of liver lacerations, splenorrhaphy, splenectomy, repair of gastric perforation, intestinal perforation, colostomies and nephrectomies or renal repairs were performed wherever required to deal associated organs injuries. Demographic data, site and frequency of injury to diaphragm, and other associated organs, and out come in terms of mortality, shifting to cardiothoracic unit for further intervention and routine discharge from our ward after recovery from associated organs injury were the variables of study. Data analysis was done through SPSS version 16.0.

RESULTS

Total number of patients having fire-arm injuries was 83. Mean age of the patient was 27.14 years with standard deviation of 8.82 and range of 15-55 years. Frequency of fire-arm injury was more in age range of 21-30 years that is 32 out of 83 constituting 38.6% (Fig. 1). The incidence of abdominal fire-arm injuries were more in males as compared to female (Table 1). Male to female ratio was 4.9:1. Out of total 83 patients, 14 (16.83%) patients had diaphragmatic trauma. Out of these 14 patients only one (7.2%) was female. In none of the patients there was isolated diaphragmatic injury (Table 2). Left dome of diaphragm was injured in 8 (57.1%) and right dome was involved in 5 (35.7%) of cases and in one patient (7.2%) have central tendon of diaphragm was injured together with injury to pericardium who got expired (Table 3).

Table No.1: Frequency and percentage of genders

Gender	No.	%
Male	69	83.1
Female	14	16.9
Total	83	100.0

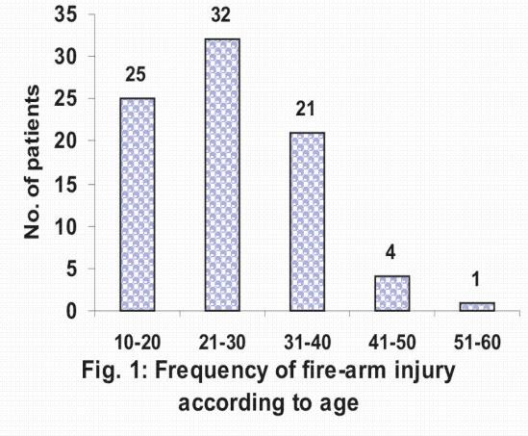

Fig. 1: Frequency of fire-arm injury according to age

Table No.2: Frequency of diaphragmatic and other associated organ injuries (n = 14)

Associated injury	No.	%
Liver + pancreaticobilliary + large bowel + diaphragm + pericardium (central tendon injured	1	7.2
Liver + stomach + diaphragm	2	14.2
Liver + diaphragm	3	21.4
Spleen + stomach + diaphragm	1	7.2
Spleen + stomach + diaphragm + liver	1	7.2
Spleen + kidney + stomach + diaphragm	1	7.2
Spleen + diaphragm	4	28.4
Diaphragm + spleen + large bowel	1	7.2

Table No.3: Frequency of part of diaphragm injured (n = 14)

Part of diaphragm injured	No.	%
Left dome	8	57.1
Right dome	5	35.7
Central tendon	1	7.2

DISCUSSION

Penetrating injuries constitute a significant percentage of cases seen at accident and emergency department of most hospitals and include both stab injuries and firearm injuries.[7-9] In this current study the no of admissions due to fire injuries were 83 (5.9%) of the total 1387 patients admitted through emergency in the year 2014. Out of total 83 patients, 14 (16.8%) patients had diaphragmatic trauma which falls within the same range as mentioned in literature.[3,10-15]

Our results indicate that most victims of firearm injuries were young males Frequency of fire arm injury was more in age range of 21-30 years that is 32 out of 83 constituting 38.6% so this young males preponderance corresponds to different other studies,[16-18] mentioning that aggressive, emotional behaviour and socio-economic circumstances expose males of young age more to trauma and violence.

The majority of patients sustaining diaphragmatic lesions have additional associated injuries the same is the case in this current study, there was no isolated

diaphragmatic injury it could be because of the fact that in our patients we made the diagnosis on abdominal exploration already indicated because of hemodynamic instability due to abdominal organs injury, moreover isolated thoracic trauma patients are dealt by cardiothoracic unit of our hospital. This is also mentioned in literature that Diaphragmatic rupture should be suspected in patients with other organ injuries because there are no specific symptoms or diagnostic methods.[19,20]

The incidence of isolated diaphragmatic injuries ranges from 2 to 12%.[21,22] In our study the most frequently injured associated organs were liver and spleen which is according to that mentioned in literature.[23]

In our study left dome was the commonly injured part of diaphragm, it is mentioned that this part is least supported and is more susceptible to injury [24] but this is true in cases of blunt diaphragmatic trauma. Penetrating injuries can affect any part of body depending upon mechanism of injury, the increased frequency of injury to the left dome of diaphragm could be because of the fact that left side thoracic or thoracoabdominal trauma is considered more fatal due to presence of vital organs hence this is commonly targeted . We encounter single mortality that was because of injury to central tendon together with pericardium which is relatively rare injury in this context.[25,26]

Except for two cases which were shifted to thoracic unit for the management of clotted haemothorax rest were managed through tube thoracostomy along with laparotomy and repair of the diaphragm. Hence chest intubation remained a vital intervention.[27-29]

CONCLUSION

Diaphragmatic injury though not as common in abdominal fire-arm injury. There should be however very low threshold for suspicion in cases of fire-arm injury of abdomen, where bullet trajectory or mechanism of injury is suggestive, because missing such injury is not devoid of complications. The patient should be thoroughly examined and investigated for exclusion of diaphragmatic injury.

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Petrone P, Leppaniemi A, Inaba K, Soreid EK, Asensio JA. Diaphragmatic injuries: challenges in the diagnosis and management. Trauma 2007;9:227–36.
2. Rossetti G, Brusciano L, Maffettone V, et al. Giant right posttraumatic diaphragmatic hernia: laparoscopic repair without a mesh. Chir Ital 2005; 57(2): 243-6.
3. Yang GP, Tang CN, Siu WT, Ha JP, Tai YP, Li MK. Diaphragmatic hernia: an uncommon cause of dyspepsia. JSLS 2005;9:352-5.
4. Chandra A, Samantaray A, Balasubramani G, Sonawane R. Surgical management of diaphragmatic injuries. IJTCVS 2007; 23: 202–7.
5. Meyers BF, McCabe CJ. Traumatic diaphragmatic hernia. Occult marker of serious injury. Ann Surg 1993;218:783–90.
6. Yilmaz M, Isik B, Ara C, Yilmaz S, Kutlu R, Kocak O, et al. Gastric perforation during chest tube placement for acute diaphragmatic rupture and review of the literature. Injury Extra 2006;37:71–5.
7. Thomas MO. Thoracic gun-shot injuries in Lagos, Nigeria. Nig J Surg 2002; 8:49-51.
8. Mandal AK, Sanusi M. Penetrating chest wounds:24 years experience. World J Surg 2001; 25:1145-9.
9. Mong SJ, Lyle JA, Balck M. A review of gunshot deaths in Strathclyde – 1989 to 1998. Med Sci Law 2001; 41:260-5.
10. Madden MR, Paull DE, Finkelstein JL, Goodwin CW, Marzulli V, Yurt RW et al. Occult diaphragmatic injuries from stab wounds to the lower chest and abdomen. J Trauma 1989;29: 292-8.
11. Solda S, Rasslan S, Rodrigues FCM. Video laparoscopia diagnóstica nos ferimentos da transição tóraco-abdominal. Rev Col Bras Cir 1996;307-11.
12. Powell BS, Magnotti LJ, Schroeppel TJ, Finnell CW, Savage AS, Fischer PE, et al. Diagnostic laparoscopy for the evaluation of occult diaphragmatic injury following penetrating thoraco abdominal trauma. Injury 2008; 39(5): 530-4.
13. Friese RS, Coln CE, Gentilello LM. Laparoscopy is sufficient to exclude occult diaphragm injury after penetrating abdominal trauma. J Trauma 2005; 58: 789-92.
14. Hanna WC, Ferri LE, Fata P, Razek T, Mulder DS. The current status of traumatic diaphragmatic injuriesÇ lessons learned from 105 patients over 13 years. Ann Thorac Surg 2008;85:1044-8.
15. Murray JA, Demetriades D, Cornwell III EE, Asensio JA, Velmahos G, Belzberg H, et al. Penetrating left thoracoabdominal trauma: The incidence and clinical presentation of diaphragmatic injuries. J Trauma 1997; 43:624-6.
16. Bashir Z, Rana PA, Malik SA, Shaheen A. Pattern of deaths due to firearm in Lahore – a twelve years study. Pakistan Postgrad Med J 2000; 11:109-14.
17. Chaudhry TH, Tajammul N, Bhatti MA, Hanif S. Firearm injuries - a study of 110 cases. Ann King Edward Med J 2005; 11(4):499-502.
18. Kohli A, Agarwal NK. Firearm fatalities in Delhi, India. Legal Med 2006; 8(5):264-8.

19. Memon AA, Bhutto AA, Shaikh GS, Jokhio A, Soomro Q. Pattern of Firearm Injury and Outcome. JLUMHS 2009; 8 (2):143-5.
20. Hwang, SW, Kim HY, Byun JH. Management of Patients with Traumatic Rupture of the Diaphragm. Korean J Thorac Cardiovasc Surg 2011;44:348-54.
21. Pagliarelo G, Cartr J. Traumatic injury to the diaphragm: timely diagnosis and treatment. J Trauma 1992;33:194-7.
22. Borlase BC, Metcalf RK, Moore EE, Manart FD. Penetrating wounds to the anterior chest. Analysis of thoracotomy and laparotomy. Am J Surg 1986; 152:649-52.
23. Athanassiadi K, Kalavrouzotis G, Athanassiou M, et al. Blunt diaphrarmatic rupture. Eur J Cardio-thorac Surg 1995; 15:469-74.
24. Lone RA, Akbar BM, Sharma ML, Lateef WM, Ahangar AG, Lone GN, et al. Missile Diaphragmatic Injuries: Kashmir Experience. Int J Health Sci 2009;3(1):19-21.
25. Madiba TE, Thomson SR, Mdlalose N: Penetrating chest injuries in the firearm era. Injury 2001;32: 13-16.
26. Campbell NC, Thomson SR, Muckart DJ, Meumann CM, Van MI, Botha JB Review of 1198 cases of penetrating cardiac trauma. Br J Surg 1997;84:1737-40.
27. Asensio JA, Arroyo H Jr, Veloz W, et al.: Penetrating thoracoabdominal injuries: ongoing dilemma-which cavity and when? World J Surg 2002;26:539-543.
28. Bastos R, Baisden CE, Harker L, Calhoon JH: Penetrating thoracic trauma Semin Thorac Cardiovasc Surg 2008;20:19-25.
29. Meyer DM: Hemothorax related to trauma.Thorac Surg Clin 2007;17:47-55.