

Outcomes of Operative Management of 96 Cases with Traumatic Retroperitoneal Hematoma: A Single-Institution Experience

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Abstract

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AIM: To analyse our experiences in the management of traumatic retroperitoneal hematoma (RPH), highlighting the various challenges faced and to report on the outcome of these patients.

METHODS: From May 2014 to May 2017, all patients with traumatic RPH who underwent surgical treatment were retrospectively analysed. The kind of injury, intraoperative findings, sites of hematoma, postoperative morbidity and the overall outcomes were recorded.

RESULTS: Ninety-six patients; 53 with blunt trauma and 43 with penetrating injury, were included in this study. The centre-medial hematoma was observed in 24 (25%) patients, lateral hematoma in 46 (47.9%) patients, pelvic hematoma in 19 (19.8%) patients, and multiple zone hematomas in 7 (7.3%) patients. All cases were managed surgically. Exploration of the retroperitoneal space was done in 72 cases. Thirty-three patients died, and the overall death rate was 34.4%.

CONCLUSION: Surgical exploration should be done in RPH caused by penetrating injury, but the need for urgent exploration in blunt injury is not so high, and it depends on the anatomical site of hematoma, concomitant organ injury and the hemodynamic status of patients.

Introduction

Retroperitoneal hematoma (RPH) assigns to an aggregation of blood in the retroperitoneal space [1]. It is a life-threatening condition since they may cause a serious hypovolemic shock or severe ischemia in their end organ and require prompt diagnosis and treatment [2]. Traumatic RPH may be caused by blunt or penetrating injury to the abdomen or pelvis [3]. Injury to the bone, vascular structures, hollow viscera or solid organs may be responsible for the occurrence of RPH making the diagnosis and management of this serious condition more difficult [1] [4]. Vascular injury accounts for more than 90% of RPH presentation [5], [6]. The aorta, superior

mesenteric artery (SMA), iliac arteries, inferior vena cava (IVC), portal vein (PV), and iliac veins are the most frequently injured abdominal vessels. Though many advances have been made in overall management and care of the injured patient, traumatic RPH continue to result in significant morbidity and mortality. The mortality from traumatic RPH is reported in different modern series remains high at 14-50% [4], [7] with early deaths due to exsanguination and late deaths due to multisystem organ failure [8]. The surgeons involved in the care of these patients need to gain and maintain skills and knowledge related to these injuries if outcomes are going to be improved. Therefore, we reviewed retrospectively 96 patients with traumatic RPH in our institution.

This study aimed to analyse our experiences in the management of patients with traumatic RPH, highlighting the various challenges faced while managing this life-threatening injury and to specifically report on the peri-operative management and outcome of these patients.

Patients and Methods

From May 2014 to May 2017, all patients with RPH due to blunt or penetrating trauma who underwent surgical treatment were included in this retrospective study. Exclusion criteria included all cases of RPH resulting from reasons other than trauma such as complications of anticoagulant therapy, those with clotting disorders or those with aortic aneurysm rupture. Also, patients with extra-abdominal injury, head injury, major thoracic injury, peripheral orthopaedic injury were excluded from the study. The study was conducted in a tertiary hospital, and it was approved by the local Institutional Review Board with a protocol no.116/2014.

Data regarding patient's age, sex, mechanism of injury, type of injury, ultrasound (US) and computed tomography (CT) findings, intraoperative findings, and classification of the zone of the hematoma, type of operative procedure done, postoperative hospital stay, mortality, and morbidity were collected.

Diagnosis of RPH was made using US and CT. But on many occasions, no imaging procedures were done because of unstable hemodynamic state so that diagnosis was made clinically and confirmed in exploratory laparotomy. Surgical management was applied in all cases. The RPH were classified into three zones: centre-medial (zone I), lateral (zone II) and pelvic (zone III) hematomas according to Selivanov et al., classification [9].

Results

Ninety-six patients enrolled in this study composed of 82 (85.42%) men and 14 (14.58%) women with a mean age of 38.3 years (range from 16 to 62 years). Fifty-three (55.21%) patients sustained blunt trauma and 43 (44.79%) patients sustained penetrating injury. The cause of trauma was an automobile (Motorcycle road traffic accident and vehicular road traffic accident) in 38 (39.58%) cases, fall from height in 11 (11.46%) cases, strikes injuries in 4 (4.17%) cases, stab wound to the abdomen in 6

(6.25%) cases, gunshot injury in 4 (4.17%) cases and shell injury in 23 (23.96%) cases (Table 1).

Table 1: Characteristics of the study sample

Character	Number (%)
Age group	
< 20 years	3 (3.13)
20-29 yrs	38 (39.58)
30-39 yrs	31 (32.29)
40-49 yrs	17 (17.71)
50-59 yrs	5 (5.21)
> 60 yrs	2 (2.08)
Total	96 (100)
Sex	
Male	82 (85.42)
Female	14 (14.58)
Mechanism of injury	
Blunt injury	53 (55.21)
RTA	38 (39.58)
Fall from height	11 (11.46)
Strike	4 (4.17)
Penetrating injury	43 (44.79)
Stab Wound	6 (6.25)
Gunshot	14 (14.58)
Shells (blast)	23 (23.96)

The initial US was performed in 36 patients; 24 (66%) of them were diagnosed with RPH. CT was done in 32 patients and the diagnosis of RPH was established in 28 (87.5%) of them. For 44 patients, neither initial preoperative US nor CT scanning was done because of severing hemodynamic instability they presented with and the urgent surgical intervention which was undertaken.

For 96 cases, all were managed surgically. Ten (10.42%) patients were found to had single site injury (pure RPH) while 86 (89.58%) patients were had multiple injuries. Features of intraabdominal organ damage linked to RPH with subsequent mortality were exhibited in Table 2.

Table 2: Associated intra-abdominal organ injury

Associated intra-abdominal injury	Number of patients (%)	Number of death (%)
Splenic rupture	5 (5.21)	1 (1.04)
Duodenal injury	5 (5.21)	2 (2.08)
Gastric& Small bowel injury	12 (12.50)	2 (2.08)
Large bowel injury	8 (8.33)	1 (1.04)
Bladder rupture and posterior urethral disruption	3 (3.13)	1 (1.04)
Hepatic laceration	7 (7.29)	2 (2.08)
Diaphragmatic laceration	3 (3.13)	2 (2.08)
Pancreatic injury	4 (4.17)	2 (2.08)
Renal injury	10 (10.42)	2 (2.08)
Multiple organ injury	29 (30.21)	16 (16.67)
Pure RPH	10 (10.42)	2 (2.08)
Total	96 (100)	33 (34.38)

Different procedures were performed for the management of RPH included ligation or repair of major blood vessels and repairing or resection of retroperitoneal organs (duodenum, colon, kidney, pancreas, e.t.c.). Exploration of the retroperitoneal space was made in 72 (75%) cases. The kind of surgical work in 96 patients was displayed in Table 3.

The surgical findings were as follow: Centro-medial hematoma (zone I) was detected in 24 (25%) patients, lateral hematoma (zone II) in 46 (47.9%) patients, pelvic hematoma (zone III) in 19 (19.8%), multiple zone RPH in 7 (7.3%).

The overall mortality in this study sample was 33 patients (34.4%). Half of them died during the

operation due to continues uncontrolled bleeding, hypovolemic shock and multi-organ failure. The others died were due to septicemia, respiratory failure, myocardial infarction, pulmonary embolism and acute renal failure few days postoperatively.

Table 3: Operations performed in 96 patients

Operations performed to control RPH	Number of patients (%)
Packing only	16 (16.67)
IVC repair	7 (7.29)
Abdominal aorta repair	2 (2.08)
Ligation or repair of the internal iliac artery	7 (7.29)
Repair of common iliac vessels	2 (2.08)
Repair of lumbar vessels	4 (4.17)
Associated operations performed	
Splenectomy	5 (5.21)
Colostomy with colonic repair	8 (8.33)
Gastric repair	2 (2.08)
Small bowel repair	4 (4.17)
Small bowel resection with end to end anastomosis	3 (3.13)
Drainage or repair of the pancreas	4 (4.17)
Pelvic fixation	2 (2.08)
Repair or partial resection of liver	7 (7.29)
Repair of duodenum	8 (8.33)
Repair of diaphragm	3 (3.13)
Repair of mesentery	1 (1.04)
Repair of kidney or nephrectomy	10 (10.42)
Repair of urinary bladder	3 (3.13)

Postoperatively, wound infection, pancreatic and duodenum fistula, chest infection were noted (Table 4).

Wound infection was treated by daily dressings under broad spectrum antibiotics. Pancreatic or duodenum fistula was treated conservatively; both fistulae were closed within few weeks. The cases with chest infections were treated with a suitable antibiotic combined with chest physiotherapy. The mean hospital stays were 8.4 days (range from 4 to 14 days). The mean follow-up was 2 months, ranging from one month to 3 months.

Table 4: Postoperative morbidity

Postoperative Complication	Number of patients (%)
Surgical site infection	7 (7.29)
Cardiovascular complications: MI, pulmonary embolism, DIC	4 (4.17)
Respiratory complications: Lobar pneumonia, atelectasis, ARDS	5 (5.21)
Re-exploration for continuous bleeding	3 (3.13)
Pancreatic fistula	1 (1.04)
Duodenal fistula	1 (1.04)
Multiple organ dysfunction syndromes	12 (12.50)
Acute renal failure	6 (6.25)
Septic shock	6 (6.25)
Nil postoperative complication	58 (60.42)

Discussion

The traumatic RPH is a common, life-threatening condition resulting from abdominal or pelvic injuries. To decrease the morbidity and mortality of this potentially fatal condition, urgent diagnosis and immediate operational interference are of high significance [10]. In this study, 43 out of 96 RPH arising from penetrating abdominal injury, most of them (23 out of 43) sustained in blast injury. This is in contrast to findings in other studies of RPH [11], [12] and this can be explained by the engagement of our county in sustained terrorist events during the period of study.

Regarding the diagnosis of RPH, the clinical presentation are usually nonspecific with abdominal pain, abdominal distension, severe back pain or abdominal mass making the clinical diagnosis of this serious condition very difficult [13]. Furthermore, large amounts of blood can accumulate in the abdominal cavity without significant changes in physical examination [14]. Trauma patients manifesting with hemorrhagic shock and an unknown origin of bleeding should undergo promote further evaluation according to the European guidelines by the Multidisciplinary Task Force for Advanced Bleeding Care [15].

For patients with abdominal trauma, an imaging study such as CT and US play an important role in the diagnosis of RPH, and to rule out a concomitant occult abdominal injury helping surgeons make treatment decision [16], [17]. Unlike CT, US is not precise and can't certainly identify the correct site or amount of hematoma, furthermore, its sensitivity for direct demonstration of abdominal organ injury is relatively low [18], [19]. In the current study, 24 patients were diagnosed with RPH out of 36 patients who underwent US examination. Although CT scan is a more advanced tool, its diagnostic accuracy may affect by some determinants such as the position and extent of hematoma, expertise of radiologists and resolution of CT machine. To achieve reliable decisions, CT scan needs both oral and IV contrast [19]. In the current study, a native CT examination was done for 32 patients, and 28 were diagnosed with RPH. The CT scan we carried was done without contrast because the patient was in an unstable hemodynamic state and without actually having the time for a complete radiological study. Consequently, the exploratory laparotomy was firmly advised as the secured choice to diagnose this fatal lesion, particularly in a hemodynamically unstable patient.

Many classifications of RPH have been done according to the site of hematomas. In this study, we adapted the Selivanov et al. classification (1984) [9]. In this classification, centromedial localisation was described as zone I, lateral localisation as zone II, and pelvic localisation as zone III.

The RPH in the centre-medial zone is often the result of duodenum, pancreas or great vessels damage. The appearance of rising sign and symptoms, increased serum or urinary amylase, the free gas inside the peritoneal cavity and effusion nearby duodenum or pancreas indicate duodenal or pancreatic injury and exploratory laparotomy must be done. Furthermore, even in the setting of a stable centre-medial hematoma, we suggest exploration of the hematoma to avoid possible fatal sequel of missed pancreatic or duodenal injury. In the present study, pancreas damage was established in four patients, and the pancreatic repair and drainage were performed immediately, two patients died, and the other 2 patients improved and were discharged. Injury to the abdominal aorta is correlated with high morbidity and death rates varying from 50% to 78% in

several studies [20], [21], [22], [23], [24]. We encountered two patients with aortic injury, one of them died from multiple organ failures while the other patient who sustained a stab wound to the back was survived. Seven patients with IVC injury were found, and primary repair of IVC was done for them, 2 of those patients died during the early postoperative period.

The need for urgent surgery is not necessary for all patients with an RPH in the lateral zone. Here, we observed most of the RPH were co-occurred with other organic injuries such as kidney and less commonly colon. The perirenal RPH followed a blunt trauma can be managed conservatively, and most patients improved [3], [4], [5]. But, the decision for emergency laparotomy should be applied when the hematoma is becoming expanded, pulsatile, or ruptured. We encountered 46 cases with zone II hematoma, in those with penetrating injury (most of them was shell injuries from explosive terrorist events), the hematoma was explored and dealt with in the majority of the patients but 5 of them were not explored because it was not expanding, not pulsatile and away from vital structures. Ten hematomas in those with blunt trauma were left undisturbed because it doesn't fulfil the criteria of exploration.

Most of the patients with zone III hematoma were due to blunt injury (14 out of 19), most of them were due to RTA, 4 of them were not explored and only preperitoneal packing was applied because they were of small size, not expanding and not pulsatile after assuring no rectal injury and intact femoral artery pulsation. Those with penetrating injury all are explored. Preperitoneal packing has also shown value in stopping bleeding in blunt pelvic trauma as an optional extra to angioembolization and pelvic fixation [25], [26]. It has been proposed that hematoma in the retroperitoneal space can be stopped by using direct pressure on the bleeding site, while exploration of hematoma may lead to severe bleeding resulting in a patient's death. We support this viewpoint in our study where 4 patients with pelvic zone RPH were not explored. Yet, the surgical exploration becomes necessary when the RPH were associated with a simultaneous injury of the rectum, bladder or other organs.

Although traumatic rupture of a lumbar artery is an unusual complication of a blunt abdominal trauma that can lead to a potentially massive RPH, lateral and pelvic RPH secondary to injury of lumbar and pelvic blood vessels are the most common cause of hemorrhagic shock from vertical deceleration injuries [22]. In this study, RPH secondary to injury of the lumbar vessels was noted in four patients. In two patients, the hematoma was explored on assumption of renal and colonic injury respectively, but no such injuries nor active bleeder was found on exploration and hematomas in both patients were evacuated and packed pressures were applied. In the other two patients, the hematomas were not interfered with.

As an operational plan, exploring an RPH should be the latest option because the opening of this closed space may result in marked and fatal bleeding once the pressure on the bleeding tissues is taken-off. All areas of the retroperitoneal space are supplied by several collateral vessels. This can tell why once a bleeding artery is under control, collateral supply to the same area can produce further bleeding. This is one of the main causes why the surgeons avoid exploration of the retroperitoneum in the context of trauma. As damage control surgery was applied in our cases, we did not risk further exploration of the hematoma as saving the patient was more critical to us than controlling the hematoma.

The overall mortality rate in the current study sample was 34.4%. Several other studies reported a wide range of mortality rate between 18% and 60% [10], [11], [12], [13]. One of the challenges we encountered in the management of those patients that may raise the death rate was the delayed surgery. This can be attributed to deficient sterile operations bundles, limited and busy surgical theatre places, wait in receiving blood for transfusion, and also delay in handing out laboratory results.

The treatment of RPH due to blunt trauma is still difficult for the surgeons as there is invariably a large chance of converting it into an uncontrollable haemorrhage. In general, we propose that the management plan which decided by the surgeon should respect the patient's ages, kind of injury, associated organ damages and the hemodynamic status of the patients.

In conclusion, the traumatic RPH is a serious, life-threatening condition, rapid diagnosis and immediate treatment are of great concern. We suggest that surgical exploration should be performed in RPH caused by penetrating injury, but the need for urgent exploration in blunt injury is not so high and it depends on the anatomical site of hematoma, concomitant organ injury and the hemodynamic status of patients.

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