

Types of Stomach Damage in Multiple and Combined Injuries

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Abstract:

Post-traumatic ruptures of the stomach account for 1% of injuries to the abdominal organs in isolated abdominal trauma and up to 6% in combined trauma. These injuries are classified as severe, as they are accompanied by a mortality rate of up to 72%. High mortality is due mainly to the multiplicity and severity of damage to the abdominal organs, as well as other anatomical areas. According to data from S.3. Gorshkova et al. (1978), 4 out of 11 victims died, but it should be taken into account that in their observations the lumen of the stomach was opened in only 4 people, and the rest had a stomach injury that could not be the cause of death (subserous hematoma or serous rupture). Injuries to the stomach are not uncommon; according to the literature, they account for 6-12% of all injuries to the abdominal organs. The stomach is one of the most frequently damaged organs in left-sided thoracoabdominal injuries [1, 5, 9, 15].

A complete rupture of the stomach clinically resembles a perforated ulcer of the stomach or duodenum, but is much more severe. Characteristically, there is an admixture of blood in the gastric contents, which is ejected with vomit or removed through a gastric tube. However, this symptom is relatively rare. L.N. Ankin (2004) notes it in only 11% of patients. In addition, vomiting mixed with blood can also occur with trauma to the pharynx, esophagus, or duodenum. Symptoms such as abdominal pain, tension and tenderness of the anterior abdominal wall, Blumberg-Shchetkin symptom, shortening of hepatic dullness occur with the same frequency in intestinal trauma [3, 6, 8, 10, 13].

There is a real danger of not recognizing a gastric injury or underestimating the severity of organ damage even during an abdominal exploration. Particular care should be taken to examine the lesser and greater curvature of the stomach. A subserosal hematoma in any part of the stomach must be carefully opened and emptied to ensure that there is no damage to the muscle layer and even the mucous membrane, followed by the application of gray-serous sutures. Such hematomas are often

found with ball wounds to the abdomen and wounds from small fragments. Identification of a wound on the anterior wall of the stomach, penetrating into its lumen, requires a wide dissection of the gastrocolic ligament to exclude the through nature of the wound [2, 4, 7, 11].

An adequate amount of surgical intervention for a rupture or injury to the stomach is suturing the wound with a double-row suture; in conditions of peritonitis, the edges of the defect are preliminarily excised. A fresh incised wound is sutured without excision, but with mandatory ligation of bleeding vessels. To prevent suture failure, peritonization with an omentum on the pedicle is additionally used; gastric decompression using a nasogastric tube is mandatory [12, 14, 17].

Gunshot wounds can be accompanied by significant destruction of the organ, forcing the surgical treatment to excise the wall of the stomach over a significant extent; in such situations, even gastrectomy may be required. However, it should be taken into account that the mortality rate with this volume of intervention reaches 100%. When the stomach is separated from the duodenum, some surgeons prefer resection of the organ, while others prefer gastroduodenoanastomosis.

Closed injuries of the stomach are rare types of damage to the abdominal organs and with combined trauma account for 0.5-2.4%. Somewhat more often (4%) gastric injuries occur with stab and gunshot wounds. In our clinical material, gastric injuries amounted to 2.09%, of which 3.47% were closed, stab wounds - 2.28%, gunshot wounds - 0.05%. The nature of the damage is varied and depends on the type, strength and direction of the damaging agent, as well as on the filling of the stomach. When the stomach is full, more extensive damage occurs due to the development of strong hydrostatic pressure.

With bruises of the stomach wall, only hemorrhages appear in the mucous membrane, under the serosa or isolated hematomas in the submucosal layer. In case of incomplete rupture, there is damage only to the serous or muscular membranes while maintaining the integrity of the mucous membrane; in the future, necrosis of the entire wall of the stomach may occur, followed by perforation. With complete ruptures, the anterior wall of the stomach along the lesser curvature and in the area of the pylorus is most often damaged. Rarely, damage to the posterior wall, avulsion of the cardia, or avulsion of the stomach from the duodenum are observed. With stab and gunshot wounds, as a rule, there are through wounds of the stomach.

The clinical picture varies depending on the degree of gastric damage and associated injuries. Vomiting mixed with blood, the presence of symptoms identical to a perforated ulcer, and the determination of free gas and fluid in the abdominal cavity on ultrasound suggest gastric rupture. Contrast examination of the stomach in case of combined abdominal trauma, as a rule, is not performed. Verification of gastric injury is greatly helped by laparoscopy, although if the posterior wall is damaged, only indirect signs can be identified - hematoma of the lesser omentum, bulging of the omental bursa.

The outcome of gastric damage depends on the degree of damage, their combination and the timing of surgery. Patients, as a rule, do not die from stab wounds of the stomach, mortality with full gastric ruptures against the background of combined injuries reaches 21.0-42.8%, if the operation was performed after 6 or more hours.

Purpose of the study— analyze the results of surgical treatment of gastric injuries due to combined trauma.

Material and methods. For 2018-2021 We analyzed 57 cases of isolated (12) and combined (45) gastric injuries (Table 1).

Table 1. Nature of stomach damage

Nature of injury	Number of victims		Of these died
	Isolated	Combined	
Closed injury	1	33	1
Stab wounds	eleven	10	-
Gunshot wounds	-	2	-
Total:	12	45	1 (1.75%)

Damage to the anterior wall of the stomach was found in 42 patients, to the posterior wall - in 4 people with thoracoabdominal wounds, to both walls of the organ - in 11 victims. Damage to the posterior wall of the stomach could be detected only if the algorithm for examining the abdominal cavity was followed, which recommended opening the omental bursa and examining the posterior wall of the stomach, pancreas, and retroperitoneal space.

According to our observations, the most common combinations of gastric damage in closed trauma were: injuries to the skull (77.8% of the musculoskeletal system (68.9%), chest (33.3%), other abdominal organs (89.1%) , less than 8% - pelvic bones (Table 2).

Table 2. Gastric injuries due to closed combined trauma

Closed injury	Number of damage	IN %
Isolated damage	12	21.0
Combined with other organs:	45	89.0
Duodenum	8	17.8
Pancreas	5	11.1
Liver	18	40.0
Spleen	eleven	24.4
Intestines	20	44.4
Mesentery	18	40.0
Bile ducts	3	6.7
Scull	35	77.8
Musculoskeletal system	31	68.9
Rib cage	15	33.3

♦The total number of detected injuries exceeds the absolute number of victims, since the same patient had combined and multiple injuries. There was damage to one organ in 12 cases, two - in 18 cases, three or more - in 27 cases.

Results and its discussion. Preoperative diagnosis of gastric injuries in closed trauma was possible in 25.6% of cases. The majority of victims (77.4%) were operated on for other emergency indications: profuse intra-abdominal bleeding from wounds of the liver, spleen, mesentery of the small intestine, or generalized peritonitis. It becomes obvious that the diagnostic algorithm for closed gastric injuries, in addition to ultrasound and laparoscopy, must necessarily include x-ray and endoscopic examinations. It is quite clear that these studies cannot be carried out on all victims, but where they are performed, the quality of diagnosis of gastric injuries in closed combined abdominal trauma will improve.

Treatment of stomach injuries has its own characteristics.

When inspecting the stomach, its anterior wall is examined, the nature of the wounds and the presence of subserous hematomas are determined. Damage to both walls of the stomach due to penetrating wounds occurs in 1/3 of victims. This fact is extremely important for a surgeon undergoing laparotomy for a penetrating abdominal wound. If the anterior wall of the stomach is damaged, one should ensure that there are no wounds on its posterior wall and, especially, in the

cardiac region, for which the gastrocolic ligament is widely dissected. The walls of the stomach should be carefully examined at the places where the curvature is attached, where adipose tissue can mask small penetrating defects in the wall. In most cases, gastric wounds have a characteristic appearance with inverted edges and often crushed mucous membranes. Hematomas are most often localized in the area of the lesser curvature and omentum.

Small single wounds can be closed with purse-string or U-shaped sutures; most often, surgeons use standard double-row sutures. In cases of gunshot wounds, especially with high-velocity bullets, tissue should be excised within the boundaries of visible changes. In this case, the first row of sutures is hemostatic in nature and is applied through all layers with continuously absorbable threads. The second row consists of separate seromuscular sutures with non-absorbable materials.

When treating large wounds of the stomach, their edges with the mucous membrane are excised and a two-story suture is applied in the transverse direction, which is especially important in the pyloric region. Indications for gastrectomy are extremely rare; even with significant damage, it is possible to close wound defects by suturing the anterior and posterior walls. In case of extensive damage to the organ, when there is still a need to remove large areas devoid of viability, a typical resection of the stomach is indicated on a scale determined by the boundaries of the damage. Segmental resections should not take place here. Of all the possible options for organ resection in emergency situations, preference should be given to the simplest and most easily implemented modifications of the Billroth-II operation (Hofmeister-Finsterer, Roux).

Detected subserous hematomas should be opened, ruptures of the muscular and mucous membranes should be sutured with gray-serous sutures.

We performed the following surgical interventions in case of gastric injury (Table 3).

Table 3. Types of surgical interventions

Type of operation	Qty	IN %
Suturing a gastric wound	27	37.5
Suturing the wound of the posterior wall (two walls)	15	20.8
Pyloroplasty	3	4.2
Gastroenteroanastomosis	8	11.1
Gastric resection	1	1.4
Opening and suturing hematomas	15	20.8
Gastrostomy	1	1.4
Laparoscopic operations	2	2.8
TOTAL	72	100.0

*** The total number of operations exceeds the number of victims, so several surgical techniques were performed on the same patient (for example, suturing a gastric wound + opening and suturing hematomas + pyloroplasty or gastroenteroanastomosis, etc.).**

As can be seen from the table, the majority of victims underwent suturing of gastric wounds (75%). In second place in frequency was Elimination of hematomas due to organ contusion (20.8%). Performing drainage operations in 8.8% of cases was a forced action when there was a suspicion of the possibility of disruption of food passage after suturing gastric wounds located in the pyloric region; anthrumection or resection of 1/2 of the body of the stomach took place in 1.4% of cases with massive ruptures as a result of catatrauma. In one case, a temporary decompressive gastrostomy was placed using a Foley catheter after suturing a rupture in the cardiac part of the stomach. Endoscopic suturing of gastric wounds using a manual endosuture or using a stapler was possible in two victims.

This observation of gastric damage with combined trauma is typical. In not a single case from the observations we analyzed was gastric damage the cause of death. There were no complications after gastric surgery in the form of suture failure or disturbances in food passage.

Complications in the postoperative period occurred in 9 (15.8%) patients with rupture of all layers of the stomach. The need for relaparotomy arose in 5 people for the following indications: intestinal obstruction (2), pancreatitis (1), bleeding into the lumen of the stomach (1), failure of the sutures of a sutured gastric wound (1). 3 out of 5 reoperated patients died, all of them had concomitant trauma; 2 died from shock and blood loss, 1 from pancreatitis and peritonitis.

Conclusions. An adequate amount of intervention for gastric injuries is suturing the wound (rupture) with a double-row suture with preliminary ligation of the bleeding vessel and subsequent decompression of the organ through a nasogastric tube.

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