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MALLORY-WEISS SYNDROME BASED ON OWN EXPERIENCE – DIAGNOSTICS AND MODERN PRINCIPLES OF MANAGEMENT

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Every gastrointestinal bleeding is an immediate threat to life, requiring close supervision in a hospital setting and making it mandatory to perform verification and endoscopic intervention. In some cases of a dynamic course, in order to make up deficiencies, it is necessary to use blood and blood products. One of the causes of bleeding located proximally to the ligament of Treitz is damage to the mucous membrane and deeper layers of the gastroesophageal junction, called Mallory-Weiss syndrome.

The aim of the study was retrospective analysis of a selected group of patients with symptomatic upper gastrointestinal bleeding in the course of Mallory-Weiss syndrome, identification of typical characteristics of this disease entity in the studied population as well as demonstration of the effectiveness of endoscopic treatment using argon plasma coagulation (APC).

Material and methods. The analysis included 2120 gastroscopy results, with 111 (5.24%) examinations conducted due to symptomatic gastrointestinal bleeding. In the studied group, endoscopic diagnosis of Mallory-Weiss syndrome was made in 22 patients (1.04%).

Results. The studied disease entity was the cause of upper gastrointestinal bleeding in 19.82% of cases. Although this condition is usually characterised by a mild and self-limiting course, 59.09% of patients in the studied group required therapeutic endoscopic intervention due to active bleeding. In 54.55%, argon plasma coagulation was successfully used to control the source of bleeding.

Conclusions. Early gastroscopy, which remains both a diagnostic and therapeutic intervention, guarantees effective control of the clinical course of Mallory-Weiss syndrome. Endoscopic argon plasma coagulation is an effective way to treat bleeding, used in endoscopic monotherapy or in combination with other procedures.

Key words: Mallory-Weiss syndrome, upper gastrointestinal bleeding, argon plasma coagulation (APC), endoscopic treatment

In 1929, Kenneth Mallory and Soma Weiss were the first to describe cases of upper gastrointestinal bleedings in the course of damage at the gastroesophageal junction level (1).

Mallory Weiss tear (MWT) involves tearing of the mucous membrane and submucous layer in the gastroesophageal junction area, usually induced by vomiting. It accounts for 5–15% of non-variceal upper gastrointestinal bleedings. In most cases it does not require urgent endoscopic or surgical intervention. It is a disease of a self-limiting course. Supervision and monitoring of the basic haemodynamic parameters is quite sufficient (2, 3, 4).

The most frequent cause of bleedings is complicated duodenal and gastric ulcer. Abuse of nonsteroidal anti-inflammatory drugs, broad-scale pharmacological prevention of cardiovascular events with acetylsalicylic acid, epidemic of Helicobacter pylori infections and alcohol-induced liver damage are the most common causes of mucous membrane damage in the upper gastrointestinal tract (5).

Upper gastrointestinal bleedings are associated with a mortality rate of 11–14% (6).

Muscle fibres departing from the left crus of the diaphragm and encircling the duodenojejunal flexure were described in 1853 by the Czech anatomist Václav Treitz. It is a reference point for determining the border between the upper and lower parts of the gastrointestinal tract.

Based on epidemiological data, the annual frequency of upper gastrointestinal bleeding is 50–150/100,000 (7).

The American Gastroenterological Association recommends performing urgent gastroscopy within 12 hours of admission (8).

MATERIAL AND METHODS

The present study involved retrospective analysis of a total of 2120 gastroscopies performed from 19 November 2008 to 28 March 2013 in the Endoscopy Laboratory of the Surgical Department in Grodzisk Wielkopolski. Out of available gastroscopy descriptions, examinations performed due to symptomatic upper gastrointestinal bleeding were selected.

In the available pool of 111 cases of bleeding, in 22 Mallory-Weiss syndrome was diagnosed.

All gastroscopies were performed using a reproducible schedule involving imaging of the oesophagus, z-line, cardia, floor, subcardial area, mucous lake, gastric angle, gastric body, antrum, pylorus, bulb and post-bulbar portion of the duodenum.

Based on the available data, the following parameters were assessed:
- age,
- gender,
- hospital stay time,
- bleeding type (active, recent),
- bleeding severity according to the Forrest classification (Ia, Ib, IIa, IIb, IIc, III),
- necessity of endoscopic intervention (APC, haemostatic intervention),
- coexistence of other endoscopic abnormalities,
- blood morphotic elements values (HGB, RBC, HCT, PLT), assessed at admission and discharge,
- necessity of transfusion and amount of transfused packed red blood cells (PRBC) and fresh frozen plasma (FFP).

Calculations were performed in IBM SPSS 23.0 software.

The relationship between the variables was assessed using Spearman's correlation coefficient with a significance test. Response distributions for nominal qualities were presented using frequency tables (number, percentage) and bar charts (percentage or number). The assessment of significance of qualitative variable changes was performed using t-tests for dependent samples (matched pairs).

Descriptive statistics were calculated for significant quantitative variables, such as arithmetic mean, standard deviation, median, minimum and maximum. The adopted significance threshold was of $p < 0.05$.

RESULTS

Out of available gastroscopy results (n = 2120), 5.24% of procedures (n = 111) were performed due to clinical sings of gastrointestinal bleeding (pitchy stool, black vomit).

Mallory-Weiss syndrome, diagnosed based on gastroscopy, accounted for 1.04% (n = 22) of all performed endoscopic examinations and was the cause of 19.82% of gastrointestinal bleeding cases (fig. 1, 2; chart 1).

Statistical characteristics of patients with endoscopic diagnosis of the syndrome was as follows:
- the oldest examined patient was aged 87, the youngest 22 (chart 2);

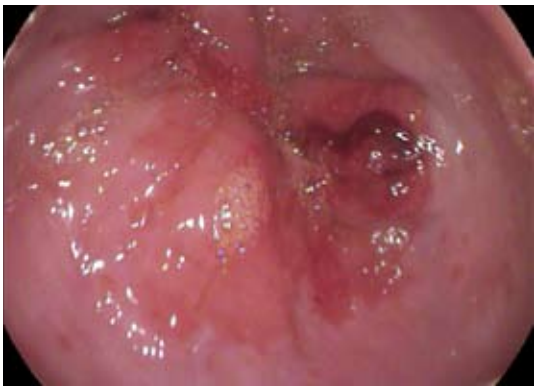

Fig. 1. Mallory-Weiss tear

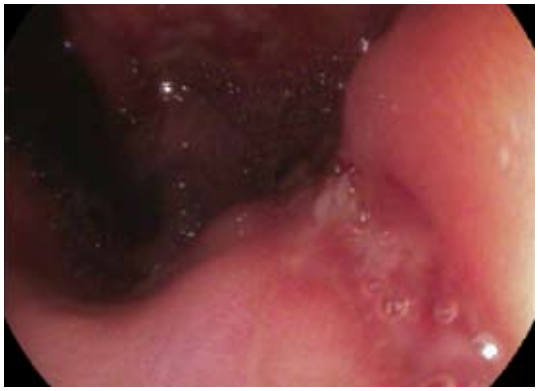

Fig. 2. Mallory-Weiss syndrome – inverted image

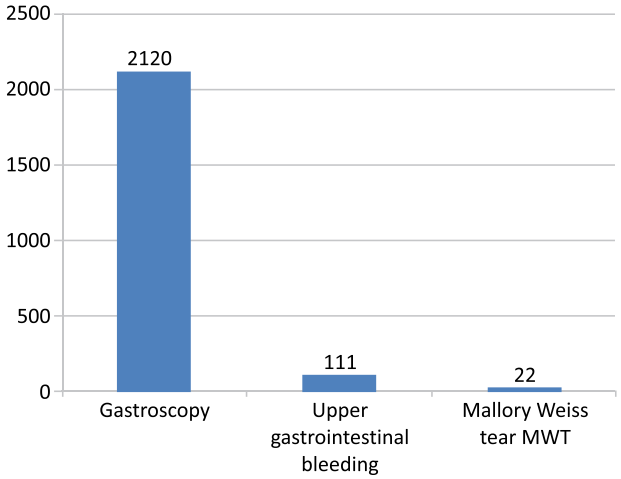

Chart 1. The frequency of endoscopic diagnosis of bleeding and Mallory-Weiss syndrome in the study group

– the condition was significantly more frequent in men (86.4%; n = 19) than in women (13.64%; n = 3) (chart 3);
– the longest hospital stay duration was 21 consecutive days, the shortest 2 days (chart 4);
– active bleeding was identified, and endoscopic intervention performed, in 59.09% of patients (n = 13) (chart 5; fig. 3, 4);
– as regards endoscopic techniques used to control bleeding, in 12 patients (54.55%) argon plasma coagulation (APC) was performed (fig. 5);
one patient received haemostatic injection (4.55%) (chart 6);
– in 36.36% (n =8) of patients bleeding severity of Ib and IIb Forrest classes was observed;
IIa class was seen in 9.09% (n = 2) of patients (chart 7);

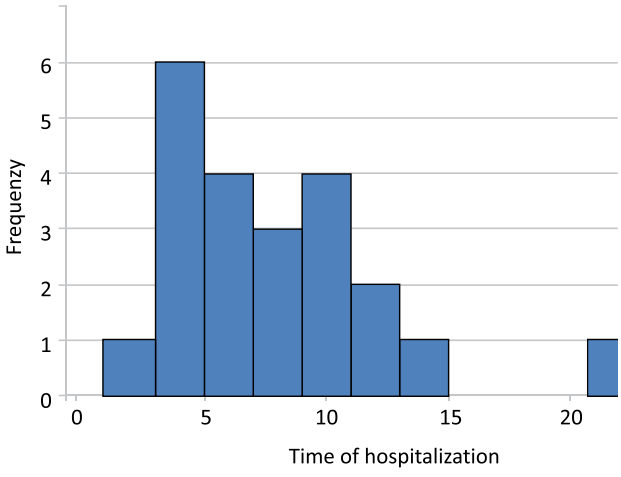

Chart 4. Duration of hospitalization

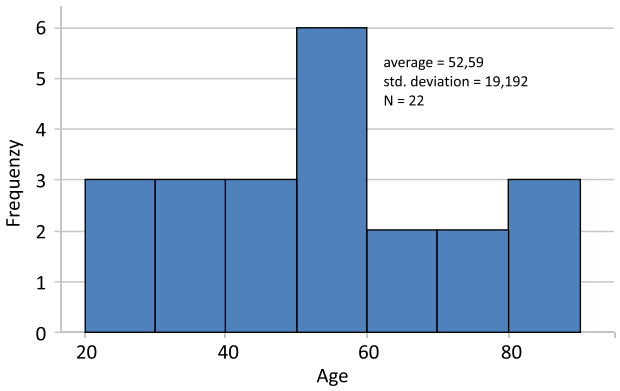

Chart 2. Age of patients in the study

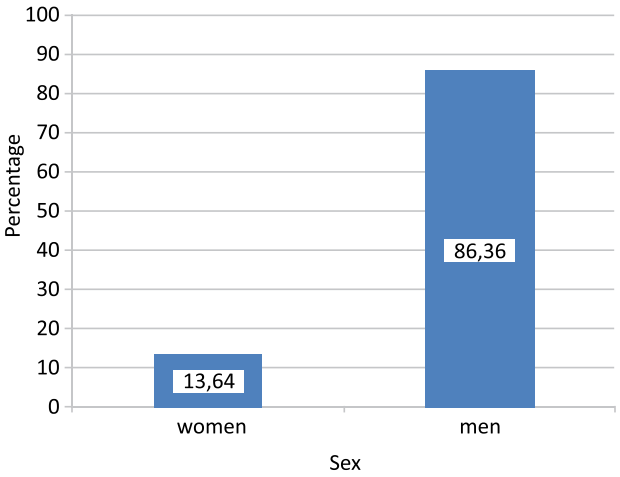

Chart 3. Distribution of patients by gender

– exactly in half of the patients (50%; n = 11) endoscopy revealed other upper gastrointestinal conditions in addition to Mallory-Weiss syndrome:
– gastritis was observed in 6 patients (27.27%; n = 6);

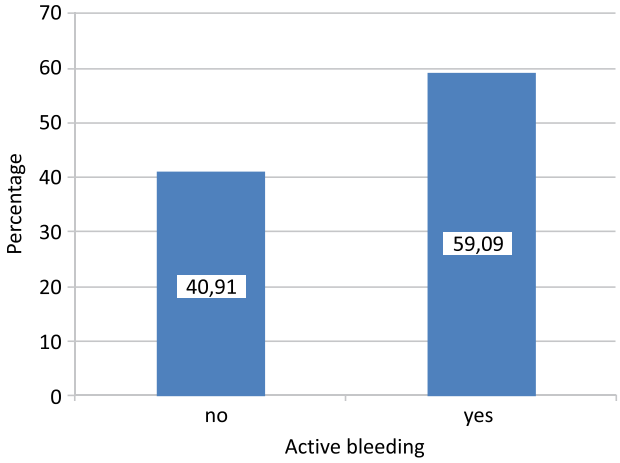

Chart 5. Active bleeding diagnosed during endoscopic examination

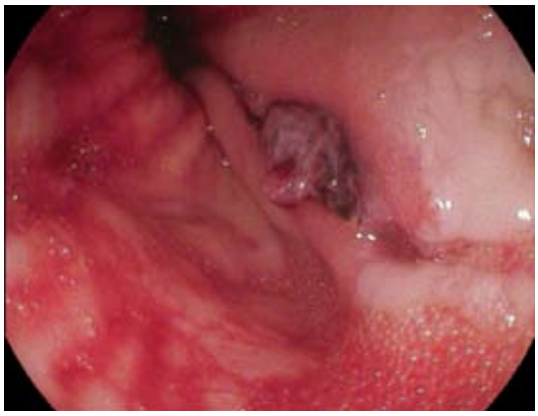

Fig. 4. Mallory-Weiss tear in the gastroesophageal junction area

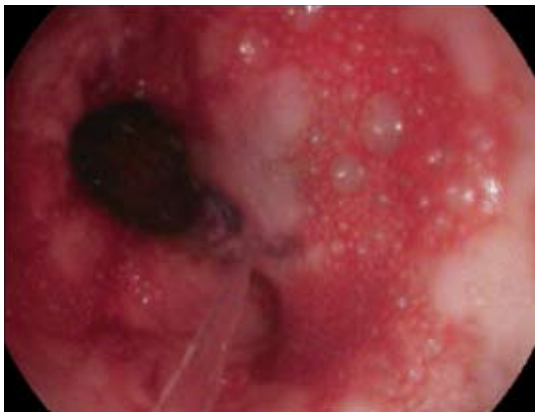

Fig. 3. Active bleeding in the course of Mallory-Weiss syndrome (Ia Forrest class)

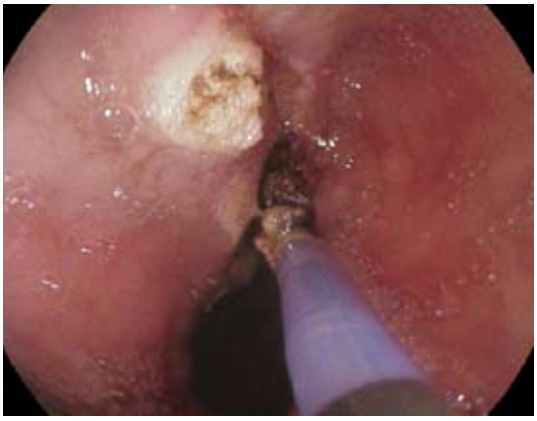

Fig. 5. Argon plasma coagulation (APC)

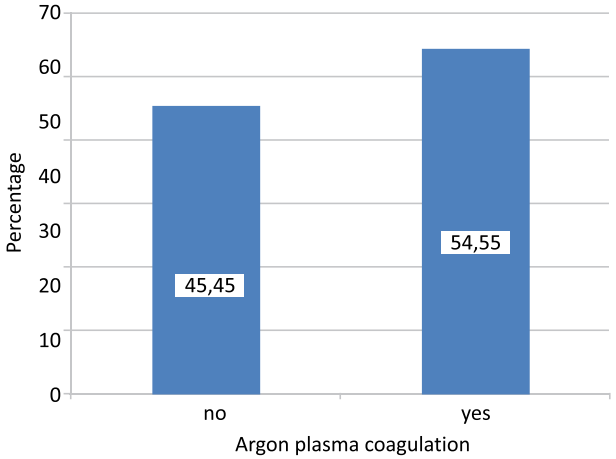

Chart 6. Endoscopic therapy

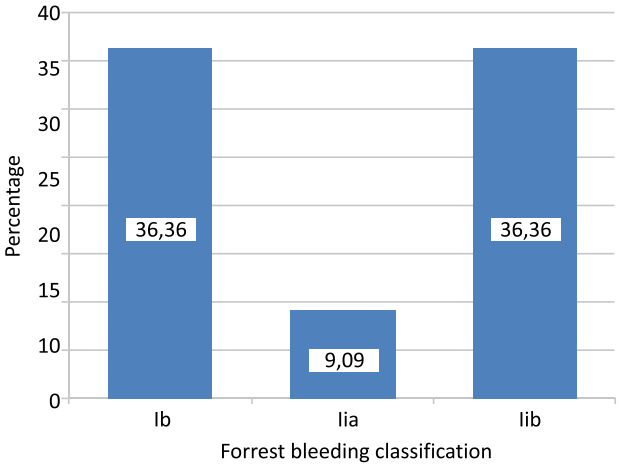

Chart 7. Upper gastrointestinal bleeding intensity according to Forrest classification

– two patients suffered from cardia insufficiency (9.09%; n = 2);
– fungal lesions of the oesophagus were identified in one patient (4.55%; n = 1);
– atrophic lesions of the gastric mucous membrane were observed in one patient (4.55%; n =1);
– duodenal ulceration affected two patients (9.09%; n =2);
– macroscopically exophytic tumour of the gastric body was diagnosed during one examination (4.55%; n = 1);
– oesophageal varices were observed in two patients (9.09%; n = 2);
– portal hypertensive gastropathy affected one patient (4.55%; n = 1).

The available blood morphology laboratory tests at admission revealed the following:

– the lowest HGB concentration was 7.16 g/dl, with the highest value of 16.4 g/dl; HGB reference values, 14-18 g/dl (chart 8);
– the lowest RBC count was 2.29 M/µl, with the highest value of 5.74 M/µl; RBC reference values, 4.5–5.9 M/µl;
– the lowest HCT value was 19.60%, with the highest value of 48%; HCT reference values, 40–50%;
– the lowest PLT count was 34 K/µl, with the highest value of 407 K/µl; PLT reference values, 140–440 K/µl.

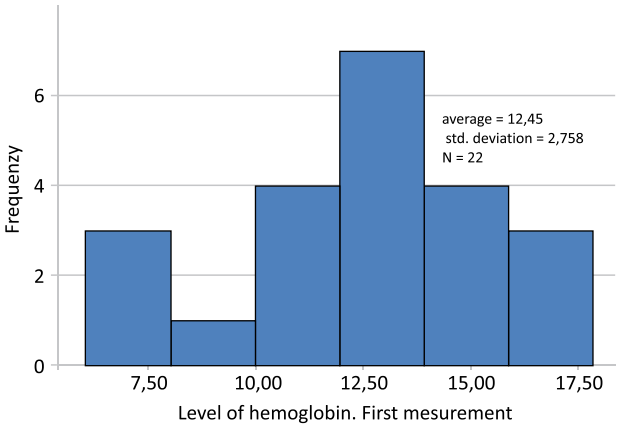

Chart 8. Measurement of haemoglobin concentration at the time of admission to hospital

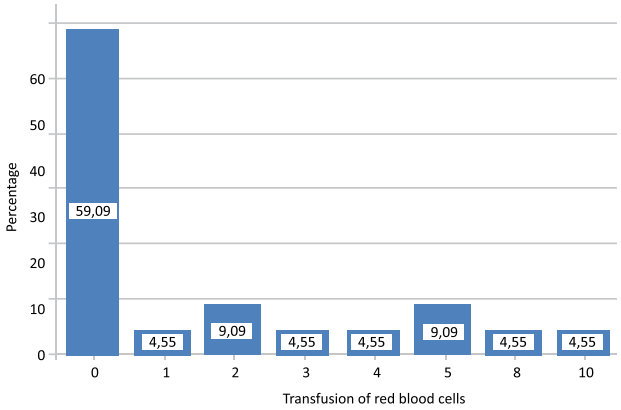

Chart 9. The need to transfuse packed red blood cells PRBCs in the study group

During hospital stay, 40.9% (n = 9) of patients required PRBC (packed red blood cells) transfusions. One patient required the use of as many as 10 PRBC units during hospitalisation (tab. 1; chart 9).

36.36% (n = 8) of patients required fresh frozen plasma (FFP) transfusions (tab. 2, chart 10).

Based on comparison of groups and correlations, the following were observed:

– a statistically significantly positive relationship between hospital stay duration and the number of PRBC and FFP units transfused,
– a statistically significantly negative relationship between HGB concentration assessed at admission and the age as well as the number PRBC units transfused,
– a statistically significantly negative relationship between RBC count, HCT assessed at admission and the number PRBC units transfused,
– a statistically significantly negative relationship between HGB concentration, RBC count, HCT assessed at admission and the hospital stay duration.

Although Mallory-Weiss tear is usually a disease entity of a self-limiting course, in some cases it requires urgent life-saving endoscopic intervention and additional supplementation of lost blood.

In the presented study, the diagnosis was much more frequent in men (86.36% vs 13.64%).

The main diagnostic and therapeutic method is gastroscopic examination.

59.09% of patients experienced signs of active bleeding, thus requiring endoscopic therapeutic intervention.

The use of argon plasma coagulation as the only form of treatment allowed for achieving effective haemostasis (54.55%; n =12). One patient was successfully treated with endoscopic haemostatic injection with 0.9% NaCl solution and 1:10,000 adrenalin solution.

The dynamic of the condition is exemplified by the fact that 40.9% of patients required packed red blood cells transfusions, with

Table 1. The necessity of transfusion and the number of transfused packed red blood cells units

	PRBC	Frequency	Percent	Percent valid	Cumulated percent
Valid	0	13	59,1	59,1	59,1
	1	1	4,5	4,5	63,6
	2	2	9,1	9,1	72,7
	3	1	4,5	4,5	77,3
	4	1	4,5	4,5	81,8
	5	2	9,1	9,1	90,9
	8	1	4,5	4,5	95,5
	10	1	4,5	4,5	100
	Total	22	100	100	

Table 2. The necessity of transfusion and the number of transfused fresh frozen plasma units

	FFP	Frequency	Percent	Percent valid	Cumulated percent
Valid	0	14	63,6	63,6	63,6
	1	1	4,5	4,5	68,2
	2	2	9,1	9,1	77,3
	3	1	4,5	4,5	81,8
	4	2	9,1	9,1	90,9
	5	1	4,5	4,5	95,5
	6	1	4,5	4,5	100
	Total	22	100	100	

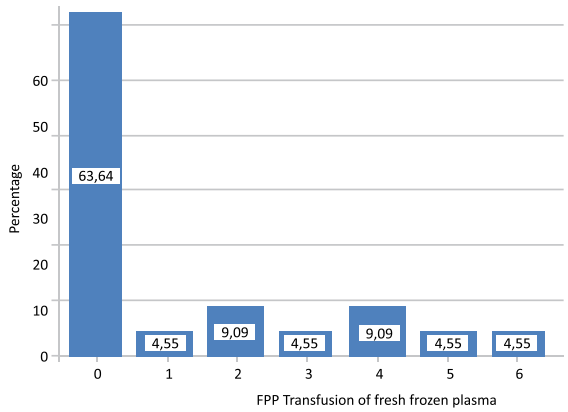

Chart 10. The need to transfuse fresh frozen plasma FFP in the study group

36.36% needing transfusions of fresh frozen plasma.

In the study, the threshold of haemoglobin (HGB) concentration of 10 g/dl was used to decide when treatment with blood should be implemented.

Mean hospital stay duration required to provide safe control of the bleeding source and supervision was more than 7 days (minimum, 2; maximum, 21; mean, 7.32 days of hospitalisation).

In the treatment of Mallory-Weiss syndrome, transfusion of PRBC and FFP statistically increased hospital stay duration.

Low values of HGB, RBC and HCT at admission were associated with the necessity of treatment with blood and blood products, thus significantly prolonging the remaining hospital stay. Older patients were more susceptible to such procedures.

In half of cases, endoscopic examinations revealed additional pathologies that could also cause upper gastrointestinal bleedings (gastritis, duodenal bulb ulceration, oesophageal varices, portal hypertensive gastropathy and even exophytic gastric tumour).

In the studied group, no relapses of gastrointestinal bleeding were observed during hospital stay.

DISCUSSION

Mallory-Weiss syndrome, first described in 1929, is defined as damage to the mucous membrane involving the submucous layer, which runs longitudinally along the long axis of the oesophagus. The anatomical location of the lesion is usually in the gastroesophageal junction and cardia. The damage may also affect the distal oesophageal segment, curvatures and gastric body. Very rarely, these characteristic lesions affect the duodenum. The pathology of most cases is associated with intensive nausea and vomiting (1, 9, 10).

This type of diagnosis accounts for 3–11% of upper gastrointestinal bleedings (11).

The mechanism of development of the damage is associated with an increased pressure gradient between the stomach and the mediastinum. A force vector acting from the lumen towards the gastrointestinal wall during vomiting is responsible for the specific nature of the lesions (12).

During vomiting, longitudinal muscle fibres running from the cardia area towards both the oesophagus and pylorus become contracted. This increases the pressure in the gastrointestinal tract lumen. Experimental studies indicate that intra-abdominal pressure of approx. 140 mm Hg present during forceful vomiting may lead to small intestinal perforation (13).

Risk factors for Mallory-Weiss syndrome (14, 15):

– alcohol abuse,
– using nonsteroidal anti-inflammatory drugs,

– increased intra-abdominal pressure during coughing, nausea or vomiting,
– pregnancy,
– increased faecal and urinary urgency,
– lifting of heavy objects,
– convulsive seizure,
– hiccup,
– blunt abdominal injury,
– preparation of the large intestine for colonoscopy using polyethylene glycol (PEG),
– cardiopulmonary resuscitation,
– gastroscopy complication.

Bleeding in the upper gastrointestinal tract, with the source of the pathology source located above the ligament of Treitz, is the main cause of emergency endoscopic interventions (16).

It is estimated that 80% of bleedings resolve spontaneously, requiring no procedural intervention (17).

Mortality rate in the case of upper gastrointestinal bleedings fails to reach even 10% (18).

In case of intensive bleeding symptoms, in addition to classic management aimed at protecting the basic vital functions, it is necessary to perform urgent intervention using pharmacological treatment or endoscopic procedures.

In clinical practice, the most often used system of scoring gastrointestinal bleeding severity is the Forrest classification of 1974 (19) (tab. 3).

Therapeutic endoscopic intervention is recommended in class Ia, Ib, IIa and IIb bleedings.

Therapeutic options for upper gastrointestinal bleedings are as follows:

Pharmacotherapy

Vasoactive treatment, i.e. pharmacotherapy of the visceral bed (20, 21).

Table 3. The Forrest classification of gastrointestinal bleeding severity

Ia	active arterial bleeding (spurting, light blood)
Ib	active venous bleeding (oozing blood)
IIa	visible vessel in ulcer base
IIb	clot in ulcer base
IIc	pigmented ulcer base (haematin)
III	white ulcer base

– Somatostatin administered intravenously at a dose of 250 µg in a bolus; continuation of pharmacotherapy in continuous infusion at a dose of 250–500 µg/h.
– Terlipressin administered intravenously at a dose of 2 mg every 4 h for the initial 48 h; dose reduction to 1 mg every 4 h for the following 3 days.
– Octreotide at a dose of 50 µg in an intravenous bolus; continuation of treatment with continuous infusion at a dose of 50 µg/h.
– Vapreotide at a dose of 50 µg, followed by continuous infusion at a dose of 50 µg/h.
– Recombinant factor VIIa (rVIIa) (Novo Seven) (22).

Endoscopic treatment

Sustained bleeding requires preliminary assessment and gastroscopic treatment. The options of endoscopic treatment of bleeding include injection treatment, thermal coagulation, argon plasma coagulation (APC) as well as endoscopic clips and ligation.

Injection treatment

Injecting the lesion with adrenalin usually remains a first-line treatment option. The mechanism of action involves mechanical compression of the bleeding source, constriction of blood vessels and activation of the platelet aggregation cascade.

Implementation of this technique reduces bleeding relapse rate, decreases hospital stay duration and limits the necessity of blood product transfusion (23).

Unfortunately, in addition to topical action, epinephrine has potent systemic effects. The agent may cause sinus tachycardia and supraventricular arrhythmias. It is not recommended for patients with cardiological burden.

The use of injection treatment in Mallory-Weiss syndrome as monotherapy is controversial. While the effectiveness of haemostasis is 100%, bleeding relapses occur in 5.5–44% of cases (24).

The technique of endoscopic injection should be combined with other procedures.

Endoscopic electrocoagulation

The use of thermal haemostasis during endoscopy is of limited value. The damp environment of the gastrointestinal tract quickly disperses thermal energy. Correct positioning of the electrocoagulation probe is extremely important in lesions located in the area of the cardia, floor or lesser curvature.

The use of the electrocoagulation technique enables stopping of bleeding, reducing the necessity of surgical intervention. Disadvantages of this method include risk of full-thickness damage to the oesophageal wall, which in the course of Mallory-Weiss syndrome is already devoid of the mucous and submucous layers.

APC (argon plasma coagulation)

In the case of using argon plasma coagulation, high-frequency electric energy moves along a stream of gas, namely argon. The argon probe does not need to be in direct contact with the lesion site. The haemostatic action is limited to damaged vessels with simultaneous protection of the surrounding healthy tissues. The depth of penetration of the energy is much lower than in electric coagulation. The elasticity of the argon probe makes it possible to treat bleeding in places which are difficult to reach using gastroscopy. It is possible to use argon plasma coagulation with the endoscope's camera working in the inversion mode.

Endoscopic clips

The use of metal clips is effective in the treatment of bleeding in Mallory-Weiss syndrome. The location of the lesion in the gastroesophageal junction renders intervention technically challenging.

Endoscopic use of clips is successfully combined with injection techniques.

Administration of adrenalin solution causes local oedema of tissues, hindering placement of a metal clip. The effectiveness of this method is 100% with a low bleeding relapse rate of up to 5% (25).

Endoscopic ligation

In the EBL (endoscopic band ligation) technique, rubber rings are used to close the lesion. Damaged tissue, by means of suction of the device, is introduced into a clear, cylindrical tip of the endoscope, and a rubber band is slid off it under visual control. The bleeding site is immobilised in the cylinder and does not move during peristaltic movements or belching occurring while the examination is performed.

EBL is safe and highly effective in the treatment of bleeding in Mallory-Weiss syndrome. Recurrent bleeding is observed much less frequently than in the case of clipping combined with adrenalin injection (26).

The effectiveness of individual techniques in stopping bleeding in Mallory-Weiss syndrome is as follows (27):
– endoscopic clipping, 94–100%,
– EBL, 100%,
– adrenalin injection, 93–100%,
– electrocoagulation, 77%.

The use of various endoscopic techniques reduces the risk of recurrent bleeding, mortality and necessity of surgical intervention (28).

In most cases, bleeding associated with Mallory-Weiss syndrome has no turbulent haemodynamic sequelae and has a self-limiting nature.

General medical management is usually sufficient to control the source of bleeding.

It is quite rare that bleeding severity requires urgent endoscopic intervention; such cases are associated with an increased risk of death. This is especially true with concomitant diseases such as cirrhosis or diabetes. Endoscopic sings of recurrent bleeding include a visualised vessel and free-floating clot. In such a case, the endoscopic image is equivalent to the IIa and IIb Forrest classes (29).

Hiatal hernia, atrophic lesions of the gastric mucous membrane, advanced age, portal hypertension, coagulopathy and regular alcohol abuse promote mucosal damage. Certain literature data indicates co-existence of hiatal hernia in 40–100% of cases of Mallory-Weiss tear (30).

Mallory-Weiss tear may also be an adverse sequela of esophagogastroduodenoscopy. The frequency of iatrogenic damage is 0.07–0.45% (31).

SUMMARY

The optimum way to control and treat bleeding in the course of Mallory-Weiss tear is to perform an urgent endoscopic examination of the upper gastrointestinal tract. The gastroscopic examination, in addition to its unrivalled diagnostic role, has the additional benefit of enabling therapeutic intervention.

Mallory-Weiss syndrome, although usually not associated with turbulent haemodynamic sequelae, in many cases requires a challenging therapeutic process. In addition to using the gastroscopic procedure, it is extremely important that the patient's basic vital signs are secured. Successful gastroscopy requires manual preparation as well as appropriate endoscopic instrumentation. Early examination allows full control over the course of the disease.

CONCLUSIONS

The use of argon plasma coagulation (APC) facilitates work in the limited and damp space of the gastrointestinal lumen. Penetration of energy necessary for stopping of the bleeding source acts superficially and, due to its affinity to haemoglobin, also at the site of damage, protecting the surrounding tissues.

The use of the elastic argon plasma coagulation probe makes it possible for the camera to work in the inversion mode. Visualisation of lesions in the gastroesophageal junction in this gastroscope configuration is optimum in many cases. While safe to use, it also provides effective treatment of bleeding.

Endoscopic argon plasma coagulation is an effective way of stopping bleeding, used in endoscopic monotherapy or in combination with other procedures.

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