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Ultrastructure of duodenal ulcers, their micro-collectors at hemorrhages and blood laser irradiation

Abstract: With the help of light and electronic microscopy duodenal ulcers morphology complicated by hemorrhage has been studied. The presence of micro-collectors (MC) and significant quantity of erythrocytes with the prevalence of their pathologic forms (EPF) in ulcers and in periulcerous zones has been shown. Ulcerous hemorrhages promote significant increase of EPF in peripheral blood and decrease of normal erythrocytes — discocytes (D). Intravascular laser irradiation of blood promotes normal ratio of D\EPF. The role of MC in ulcerous hemorrhages development is discussed.

Keywords: Ulcerous hemorrhage, micro-collector, erythrocytes, discocytes, intravascular laser irradiation of blood.

Ulcerous hemorrhages (UH) are the most dangerous complications of ulcerous disease. They are observed in 15–20 % patients with ulcerous disease [1; 9; 13].

Conducted morphologic investigations of chronic gastric and duodenal ulcers and peri-ulcerous zones with the use of light, electronic microscopy and special markers have proved an existence of so called micro-collectors (MC). They are the ways of aggression factors (AF) penetration into mucous membrane thickness. It is a basic cause of ulcers occurrence and persisting [11–13].

The concept has been accepted as discovery — «Infiltration of gastric juice occurrence through ulcerous defect in stomach and duodenum wall in patients with ulcerous disease». Priority dated by February, 6, 1991 № OT – 12119.

The role of MC in UH development has not been studied.

US promote significant shifts of discocytes (D) ratio in blood — normal erythrocytes and their pathologic forms (EPF) which is one of the main causes of micro-circulation abnormality.

Intro-vascular blood laser irradiation (IBLI) is widely used in complex treatment of various pathologic diseases [3; 14; 15]. It is the most effective method of erythrocytes forms correction. IBLI is effective at different types of hemorrhages [5–8].

Adoption into practice new generation of apparatus for IBLI allows to impact on blood and other organs by different ranges of waves from 0.36 to 0.9 micrometers and with power from 1 to

35 microwatt. The use of disposable fiberglass conductor with teflon coating allowed to increase significantly an efficiency and mainly to simplify carrying out this not easy procedure and to make it absolutely safe [7; 8].

But investigations of duodenal ulcers at bleeding from them with the presence of micro-collectors and influence on their pathomorphosis and peripheral blood erythrocytes with the use of IBLI, especially with the help of scanning electronic microscopy (SEM), have not been carried out.

Object

To show ultra-structural changes of bleeding ulcers of their micro-collectors and also erythrocytes after complex treatment with the use of IBLI.

Materials and methods

62 cases of bleedings from chronic duodenal ulcers in patients who were treated in RRCEM from 2008 to 2011 have been morphologically investigated. All 62 patients with acute duodenal ulcers hemorrhages have been performed operative interventions. Basic type of surgery at duodenal ulcers hemorrhages, complications at hospital were different ways of stomach resections. It has been performed in 61 (98.3 %) patients. Only in 1 case laparotomy by excision of duodenal ulcer with pyloroplasty by Judd.

For hemorrhage severity estimation we have used subjective data after patient's examination and anamnesis collection, receiv-

ing blood clinical analysis results and objective ones after receiving laboratory data. Hemorrhage severity estimation have been made by A. I. Gorbashko's classification [9]. Traditional medicamental therapy included antiulcer, hemostatic and infusion therapies.

Bleeding ulcers and peri-ulcerous zones biopsy materials and also peripheral blood erythrocytes got from patients' finger have been studied with the help of SEM before and after complex treatment with the use of IBLI (not less 5 sessions). IBLI has been performed with «matrix — IBLI» apparatus, radiation head KL-IBLI, λ — 0.63 micrometer, power at light guide outlet 1.5–2 microwatt, with special needles coated by teflon. The control group was consisted of 15 patients with UH who were underwent hemostatic therapy without IBLI.

Biopsy materials of bleeding ulcers received during diagnostic duodenoscopy before and after complex treatment have been morphologically investigated. Samples of tissues excised from ulcers' borders during operative interventions have also been studied.

Uncomplicated ulcers have been studied with the use of archive specimens of pathologic anatomy laboratory of RSCS named after acad. V. V. Vakhidov.

For light microscopy the tissue has been fixed in 10–12 % formaldehyde solution on phosphatic buffer by Lilly. Paraffin sections have been colored with hematoxylin – eosin.

For transmission electronic microscopy (TEM) tissue samples have been fixed in 2.5 % glutar aldehyde solution on phosphatic or cacodylic buffer, after dehydration in alcohol-acetone have been poured with epon-araldit mixture. Ultrathin sections received at «Ultracut» have been contracted in «Ultrastainer» apparatus and have been looked through in Hitachi H-600 microscope.

Preparations for SEM after above mentioned fixation were underwent dehydration in alcohol-acetone, then were dried out by critical point method in HCP-2 apparatus, were sprayed by gold in IB-2 apparatus and were investigated in JEOL JSM-6010LV and Hitachi-S405 microscopes. For percentage ratio estimation of D/EPF 2 drops of blood from finger is used. Blood is fixed in 1 ml of 2.5 % glutar aldehyde solution on phosphatic buffer.

Erythrocytes forms ratio count has been made at 10×40 zoom at selection not less 1000 erythrocytes for each stage and duration of investigation with the use of Biolam-I2 or "Axioscop 40 – ZEISS" microscopes. Light-optic micro-pictures were got by "Axioscop 40 – ZEISS" joined with digital camera and computer with following keeping of data in Pentium-IV with the help of applied programs. Statistic data handlings were underwent by Pentium-IV with the help of BS — Statistica, «Excel – Office» Microsoft- «Windows-Professional» programs.

Results

SEM showed that there are numerous erythrocytes together with detritus on the surface of bleeding ulcers among which EPF are dominated: echinocytes, stomacytes, erythrocytes with crest and irreversible forms.

Clusters of erythrocytes with EPF prevalence filled wide fissures on ulcers surface, so called micro-collectors (MC) (fig. 1, 2). They are the ways of AF penetration into ulcers thickness and they are structural base of chronization and persistence of ulcers [3].

There is significant decrease of B and increase of EPF in peripheral blood at ulcerous bleeding (UB) (fig. 3, 4).

Medicamental hemostatic therapy led to increase of D share. The use of IBLI in complex treatment of UB promoted more evident normalization of D/EPF ratio. Study of tissue samplings from ulcers borders at UB showed presence of micro-trombus in vessels of different size (fig. 5).

TEM detected the presence of EPF and vascular wall integrity disturbances in vessels lumen (fig. 6). Dominance of EPF in vessels lumen of ulcers borders besides microcirculation's disturbance leads to vessels thrombosis and necrosis occurrence. Direct impact of aggression factors on vessels walls through micro-collectors may be a basic cause of their perforation and hemorrhage development.

Carried out treatment with the use of IBLI promoted evident normalization of D/EPF ratio in peripheral blood (fig. 7).

According to our data, D share in the norm makes 89 %. EPF share in the norm — up to 11 %. D/EPF ratio is 8. At duodenal ulcerous bleedings D share is decreased up to 58 % and EPF share is increased up to 42 %. D/EPF ratio is 1.4 %. IBLI leads to the rise of D share up to 85 % and EPF share is decreased up to 15 %. D/EPF ratio is increased up to 5.7. Free erythrocytes are not defined on the surface of ulcers borders, micro-collectors orifices are got narrow and they become less, erythrocytes do not occur in their lumens (fig. 8).

Discussion

Morphologic investigations have shown that at introduction of marker (active carbon) into stomach or duodenum lumen 30 minutes before surgery subject to ulcerous disease (complicated or non-complicated) pieces of carbon are determined in micro-collectors lumen [11; 12]. It has been also shown that comparative volumetric share of micro-collectors at bleeding ulcers in compare with non-complicated ones increases in 1.7 times. It is followed by multiple (almost in 7.8 times) increase of comparative volumetric share of blood vessels in ulcers wall and peri-ulcerous zones. Mentioned changes are rated as structural bases of bleedings occurrence [11; 12].

Our investigations have shown that at ulcerous bleedings on ulcers surface, firstly in micro-collectors lumens, erythrocytes quantity is increased, especially their pathologic forms. It is followed by essential increase of EPF in peripheral blood. D/EPF ratio is decreased in 5.7 times [11]. TEM investigation showed that the share of EPF significantly has been increased in vessels lumen and in perivascular areas and ultra-structural manifestations of vessels' walls lesion has been observed. It is known that the form of normal erythrocytes in the shape of biconcave disk allows it, due to deformation, to pass through capillaries diameter of which is less than erythrocyte's diameter, and then to recover its form. EPF lose this capacity and it leads to micro-circulation disorder. Besides, EPF promotes micro-thrombus formation and it is also the cause of micro-circulation disorder [2; 6; 11].

These changes serves as structural base of blood vessels walls integrity disorder and development of capillary bleedings which are the most dangerous ones. Effusing blood from micro-vessels penetrates on ulcer's surface and then into organ's cavity through micro-collectors.

Conclusions

1. There is an increase of erythrocytes on ulcers' surface and their accumulation in micro-collectors and it points their role in vessels walls lesion and hemorrhage development.
2. Ulcerous bleedings are followed by appearance of micro-thrombus, EPF in vessels lumen and vessels walls integrity disorder.
3. Ulcerous bleedings promote shifts in D/EPF ratio in peripheral blood.
4. IBLI promotes normalization of D/EPF ratio in peripheral blood.

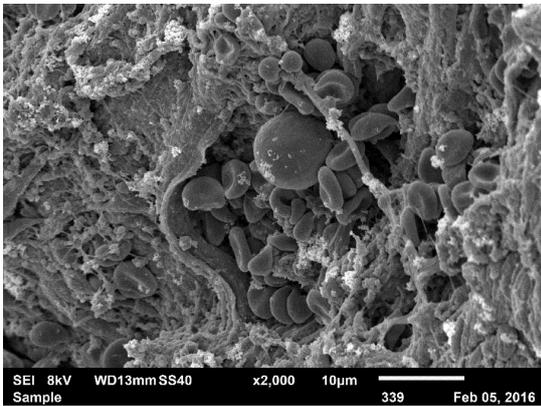


Fig. 1. Dilated orifices of micro-collectors with erythrocytes in the lumen of ulcer's bottom. SEM × 2000

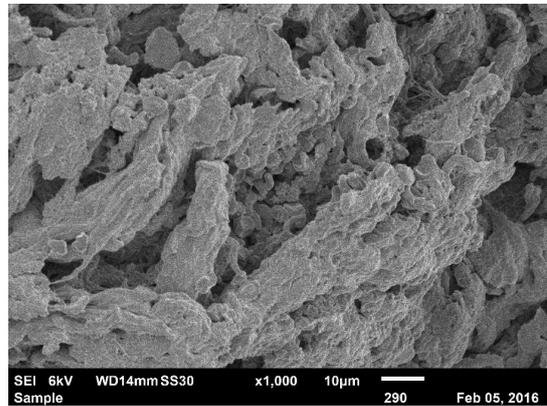


Fig. 2. Micro-collectors between fringe, ulcer's border with erythrocytes in the lumen. SEM × 1000

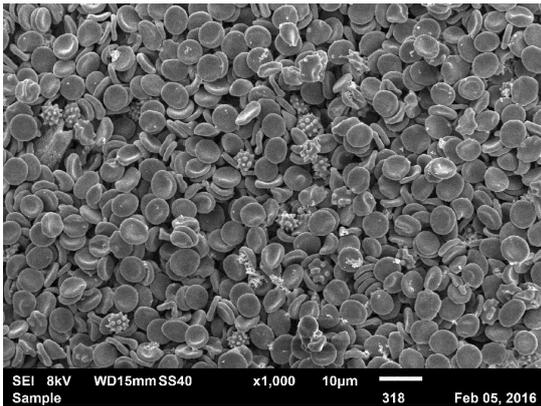


Fig. 3. Erythrocytes pathologic forms dominance in blood at ulcerous hemorrhage. SEM × 1000

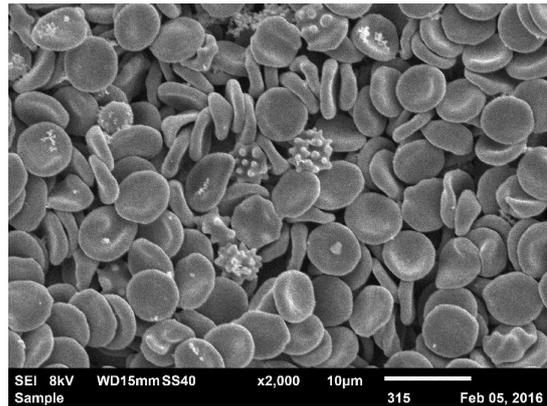


Fig. 4. Erythrocytes pathologic forms in blood at ulcerous hemorrhage. SEM × 2000

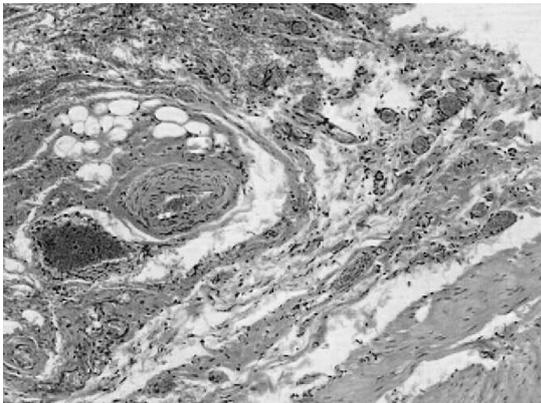


Fig. 5. Erythrocytes pathologic forms in vessel's lumen and around, vessel wall structure's disorder at ulcerous hemorrhage. TEM × 10000

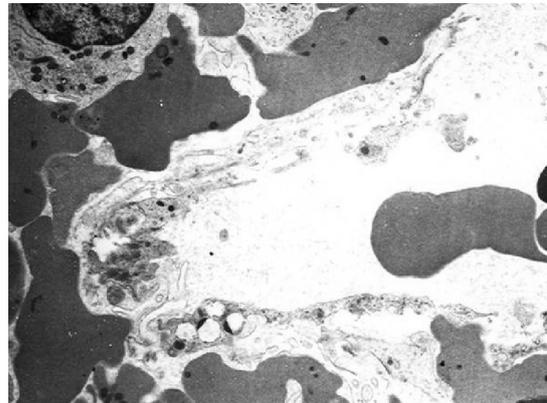


Fig. 6. Micro-thrombus in vessels of different size, ulcer's borders at hemorrhage. H-E 10 × 10

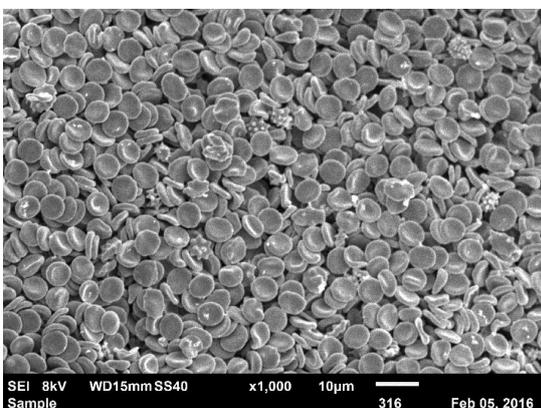


Fig. 7. Blood discocytes dominance after IBLI course. SEM × 1000

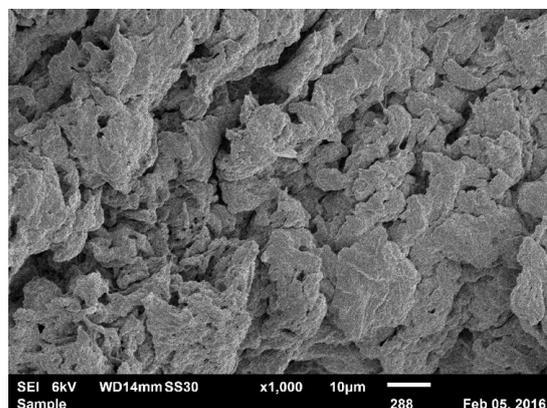


Fig. 8. Decrease of quantity and size of micro-collectors orifices, ulcer's borders after IBLI. SEM × 1000

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The investigation of biophysical profile of the fetus in pregnant women with herpes infection

Abstract: In recent years there has been a tendency to a predominantly asymptomatic flow of herpesvirus diseases. Therefore application of biophysical profiling in fetus condition evaluation, and development of prognostic criteria of perinatal outcomes, with herpes infection can help in differential diagnosis of placental insufficiency prior to childbirth.

Keywords: herpes, pregnancy, fetoplacental insufficiency, fetus, placenta.

Currently, there is a significant increase in the population incidence of viral infections, including those of women during pregnancy. Separate delivery of women with herpesvirus infection complicates the postnatal adaptation of the newborns and their state, which suffered during childbirth additional burden by transvaginal infection, with long process of childbirth. The risk of death or serious neurologic consequences among infected infants, given birth by mothers with primary form of genital herpes (HSV2), is estimated to 51 %. The growing role of intrauterine infections among the causes of adverse perinatal outcomes determine the relevance of a comprehensive study of the problem.

Objective: The abovementioned defined the following objective of the current study: to develop prognostic criteria of perinatal outcomes, with herpes infection in mother, to reduce perinatal complications and perinatal losses.

Materials and methods

Fetal biophysical profile in 131 pregnant women with a core group of recurrent herpes infection was studied in order to perform

functional fetal assessment. The comparison group consisted of 126 pregnant women with herpes infection in remission, the control group consisted of 60 pregnant women with full-term uncomplicated pregnancy.

In normal and satisfactory BFN study was conducted only once, when doubtful and pathological — doubly at intervals of 24 hours. The study of fetal biophysical profile began by holding a general ultrasound. In all cases the fetal position was longitudinal.

These ultrasound showed the accordance of fetus biometric indicators to gestational age in the main group 72.5%, in the control group 89.3%, and all pregnant women in the control group (Table 1).

Biparietal head size (BHS) of the fetus at 35–38 weeks in the comparison groups averaged 89.9 ± 0.07 mm. The stomach diameter (SD) on the measurement level of the standard section plane averaged 102.4 ± 0.73 mm. Femur length (FL) of the longitudinal section averaged 68.44 ± 0.2 mm. BHS of the fetus at 39–41 weeks in the comparison group averaged 95.1 ± 0.2 mm., SD averaged 106.3 ± 0.4 mm. and FL averaged 76.63 ± 0.4 mm.