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MODERN MINIMALLY INVASIVE APPROACHES IN THE SURGICAL TREATMENT OF HEMORRHOIDS

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Abstract.
Chronic hemorrhoids are a widespread disease worldwide. In spite of improvement and development of conservative therapy and minimally invasive treatment methods some patients have indications for radical hemorrhoidectomy. The greatest difficulties in coloproctology are encountered in treatment of chronic hemorrhoids of III-IV stages. On the basis of literature data numerous modern approaches to surgical treatment of this pathology are presented. The multiplicity and variety of applied techniques can be explained by the surgeons' desire to achieve radical cure of patients combined with optimal functional results.
Keywords: chronic hemorrhoids, hemorrhoidectomy, hemorrhoidectomy with LigaSure, stapler hemorrhoidectomy, lifting desarterization of hemorrhoidal nodes

Hemorrhoids are one of the most common diseases in developed industrialized countries. Its prevalence reaches 120-140 cases per 1000 adult population [1,5,6,11]. In the structure of rectal and anal canal diseases hemorrhoids account for 34-41% [1,4,7,13,30]. The average age of patients suffering from haemorrhoids is 30-50 years [1,3,5,15,21,]. The prevalence of haemorrhoids among the working-age population, leading to temporary disability during exacerbations and reduced quality of life, make the treatment of haemorrhoids an important general medical and socio-economic issue.

Hemorrhoids are built from a special vascular structure of the submucosal layer of the rectum, the corpora cavernosa corpus cavernosum rectum. This is an embryonic norm, traceable in newborns and children [6,29,32]. A feature of these corpora cavernosa is that in the cavernous veins of these structures, the intracavitary arteries open directly into the lumen of these veins, these arteries have a convoluted spiral course, which gives grounds to refer them to the cochlear arteries (fig 1).

Two main factors underlie the disease: vascular - the imbalance between arterial blood flow through the cochlear arteries to the corpora cavernosa, and mechanical - its outflow through the corpora cavernosa veins; mechanical obstructions create blood stasis (constipation, lack of relaxation of the internal sphincter) [9,10,20,24]. This factor is exacerbated when the intra-abdominal pressure increases, leading to dystrophic changes in the fixation apparatus of the haemorrhoids - the Treitz muscle, interwoven into the tissue of the cavernous bodies, closely connected to the Parkes ligament fibres (together they create the framework of the haemorrhoidal node and fix it above the anorectal line).

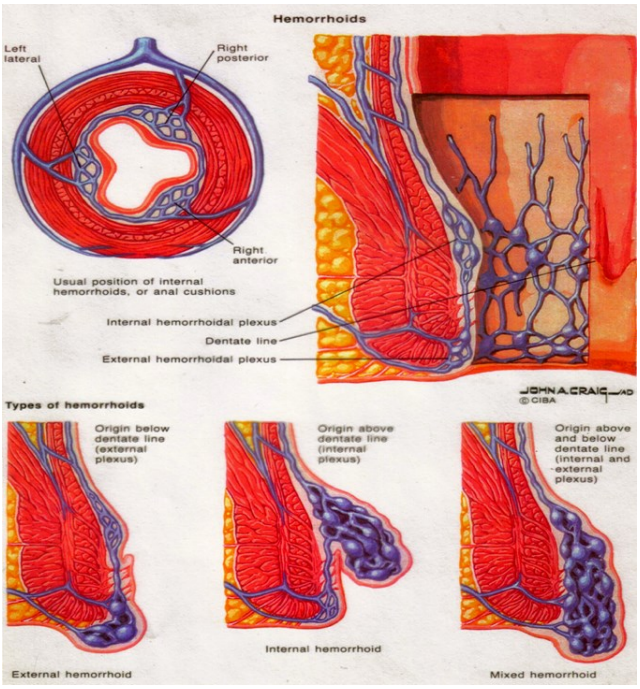

Figure 1: Anatomical location and structure of the vascular structure of the submucosal layer of the rectum - the cavernous corpora.

These factors increase the size of the haemorrhoids, move them distally, increase dystrophy in the retention apparatus, and the haemorrhoids begin to fall out of the anal canal. The development of dystrophic processes in the common longitudinal muscle of the submucosa of the rectum and in the Parkes ligament that holds the corpora

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cavernosa in the anal canal leads to a gradual but irreversible movement of the haemorrhoidsin the distal direction [12,18,26]. Acute haemorrhoids are a complication of a chronic course and are divided into three degrees according to the severity of thrombosis and inflammation: (Figure 2).

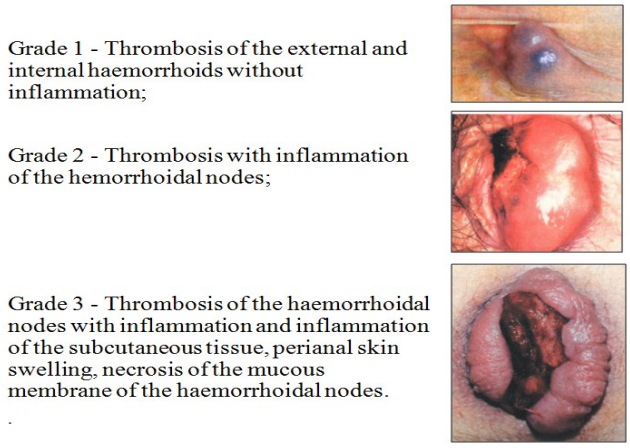

Figure 2: Classification of acute haemorrhoids

The code according to the International Classification of Diseases of the 10th revision [6].

K64.0 Grade 1 haemorrhoids.
K64.1 Grade 2 haemorrhoids
C64.2 Grade 3 haemorrhoids.
C64.3 Grade 4 haemorrhoids.
K64.4 Residual haemorrhoid skin fimbriae
K64.5 Perianal venous thrombosis
K64.8 Other specifiedhaemorrhoids
K64.9 Unspecified haemorrhoids

Classification

By form:
-internal;
- external;
- combined.
By course:
-chronic;
- acute

Complications of haemorrhoids:

- thrombosis of the haemorrhoids;
- non-removability of prolapsed haemorrhoids;
- impingement of prolapsed haemorrhoids;
- superficial and deep necrosis of impinged haemorrhoids;
- paraproctitis;
- pelvic phlegmon;
- sepsis;
- faecal and gas incontinence;
- bleeding and consequent anaemia,
- in some cases malignisation.

The main methods of treatment.

1. Conservative treatment: management of symptoms of acute haemorrhoids, prevention of complications, prevention of exacerbations in the chronic course, preparation for surgery, postoperative rehabilitation.

2. Minimally invasive surgical treatment: aimed at reduction of blood flow in the hemorrhoids, reducing the volume of the nodes and their fixation to the intestinal wall.

3. Surgical treatment: recommended for patients at 3-4 stages of the disease with prominent external hemorrhoids, when minimally invasive surgical techniques are ineffective or cannot be applied.

4. Dynamic follow-up with comprehensive conservative therapy and surgical correction: in acute hemorrhoids [27,28,31].

The surgical treatment of chronic haemorrhoids remains a difficult and unresolved problem. The ongoing interest is due to the unsatisfactory results of surgical treatment. Various early and late complications after hemorrhoidectomy still remain rather frequent reaching 20-34% [1,2,5,14,16]. In recent decades, surgical treatment using the latest medical technology has been widely accepted in the world.Increasingly, a variety of instruments are used for surgical intervention: electron knives, radio-wave and ultrasonic scalpels, and stapling machines. Minimally invasive treatment methods are widely used. At least 30% of haemorrhoid patients have indications for radical haemorrhoidectomy [8,17,19,22]. As a rule, this is a group of patients with stages III-IV of chronic combined hemorrhoids. According to G.I. Vorobyov et al. [5,23,35] and V.L. Rivkin [19.25,34] there are about 300 methods of surgical treatment of hemorrhoids. However, only a few of them are widely used in practice.

Hemorrhoidectomy remains one of the most effective treatments for haemorrhoids. However, a long period of rehabilitation is required after the operation and there is a relatively high rate of complica-

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tions, which is almost uncommon after other techniques. The most commonly used techniques are open and closed haemorrhoidectomy, which can be performed with a surgical scalpel, diathermic coagulation, laser or ultrasonic scissors.

Closed haemorrhoidectomy (with restoration of the anal mucosa). A closed haemorrhoidectomy is used when there are no clear boundaries between the external and internal haemorrhoids.

Technique. A Bilroth clamp is placed at the base of the internal haemorrhoidal node, above the dentate line. Hemorrhoidal node is dissected up to the vascular pedicle, which is sutured and ligated. The node is severed distal to the ligation of the vascular pedicle. The wound is sutured by taking the edges and fundus with separate knotty sutures or continuous sutures with absorbable thread (Vicryl Rapid 3-0, Sofil 3-0, Catgut 3-0). The external haemorrhoidal node is dissected out in one piece with the internal node or separately. The wound is also sutured with separate sutures with absorbable thread.

Open haemorrhoidectomy. Open haemorrhoidectomy is used as a separate procedure in patients with stage 3-4 diseases or in cases of a combination of haemorrhoids and inflammatory diseases of the anal canal (anal fissure, rectal fistula). The most common complications are anal incontinence (8%), acute urinary retention (1%) and bleeding in the early postoperative period (2%).

Technique. The internal haemorrhoidal node is severed up to the vascular pedicle, which is sutured and ligated. The node is severed distal to the ligation of the vascular pedicle. Thorough hemostasis is achieved. The wound is not sutured. The external haemorrhoidal node is dissected out in one piece with the internal node or separately (Figure 3).

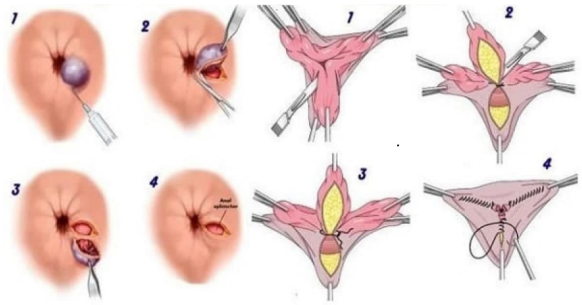

Figure 3: Hemorrhoidectomy

Submucosal haemorrhoidectomy. The technique allows the mucosa of the anal canal and rectum with the submucosal stump to be completely repaired without deformity or tension.

Technique. 2 to 3 ml of 0.25% procaine solution is injected into the submucosal layer in the area of the internal haemorrhoidal node, creating a hydraulic cushion. Two arched incisions dissect the mucosa over the node and then expose it from the surrounding tissues to the vascular pedicel. The stalk is then stitched and the node is severed. The anal mucosa is repaired with individual nodal sutures (Vicryl Rapid 3-0, Sofil 3-0, Catgut 3-0), immersing the stump of the haemorrhoidal node in the submucosa.

Minimally invasive techniques. Infrared photocoagulation of haemorrhoidal nodes: a light guide is brought to the haemorrhoidal node before contact with it. The heat energy is applied to the hemorrhoidal node, causing the vessels to collapse and stick together. The handpiece is applied to the base of the node 2-6 times in one treatment.

Latex plating of internal haemorrhoidal nodes. The principle of latex plating is to place a latex (made of rubber) ring at the base of the haemorrhoidal node. This ring pinches the stalk of the node, which allows blood to flow into it. The end of the blood flow eventually causes the node to die and leave the body naturally, painlessly, during the act of defecation.This is carried out on different stages of hemorrhoids: from 1 to 3; Ineffective at the 4th stage and external hemorrhoids; Manipulation lasts less than 1 minute; Conducted under local anesthesia; Depending on the number of nodules, no more than 2 - 3 x procedures with an interval of 2-4 weeks; Conducted on an outpatient basis; No special or complicated preparation. When this method of treatment is contraindicated: Any inflammatory changes in the anus, anal fissures; Inflammatory processes in the rectum, pararectal fatty tissue: proctitis, sigmoiditis, paraproctitis, anal fissures; Stage 4 hemorrhoids with prolapse of nodes from the anus (Figure 4).

Sclerotherapy for haemorrhoidal nodes. This method involves injecting a sclerosing substance (thrombovar, etoxysclerol - 1.5-2 ml) into the haemorrhoidal node, which causes the vessels to stick together and flatten. Injection is recommended in no more than 2 haemorrhoidal nodes, as pain may develop [32,34]. It is possible to repeat sclerotherapy 12-14 days after the first session. Sclerotherapy is not indicated in the following cases: presence of anal

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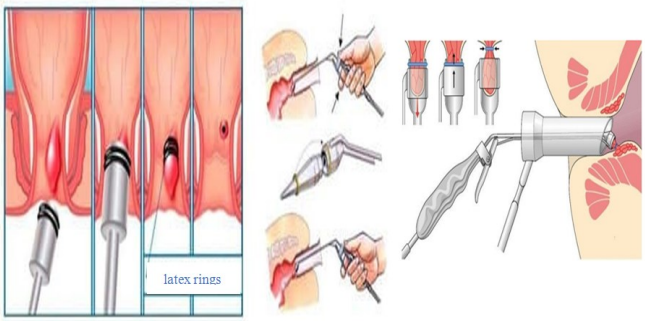

Figure 4: Ligation of Hemorrhoids with Latex Rings

Figure 6. Implementation of the HAL-RAR technique

fissures; inflammatory bowel diseases: proctitis, proctosigmoiditis, infectious colitis, cryptitis; acute and chronic paraproctitis; acute thrombosis of the node; external or combined haemorrhoids; pregnancy (Figure 5).

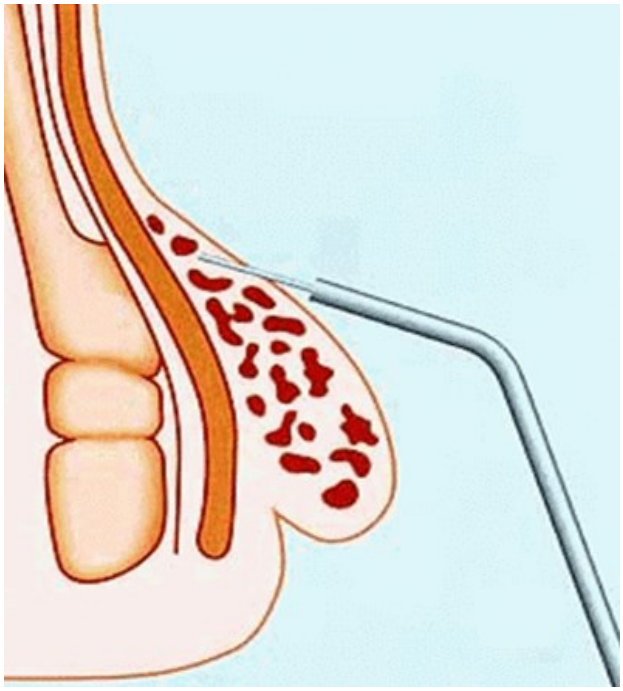

Figure 5. Sclerotherapy for haemorrhoidalnodes

What is HAL-RAR. HAL-RAR stands for haemorrhoidal arterial ligation plus proctoplasty. HAL-RAR refers to the minimally invasive treatment of the disease. This treatment was pioneered by K. Morinagoyi of Japan in the year one thousand nine hundred and ninety-five. It was widely spread in European countries some time later. HAL-RAR is based on ligation of hemorrhoidal arteries, the same arteries that feed the hemorrhoidal node, under ultrasound Doppler ultrasound monitoring in combination with hemorrhoidal node lift (Fig. 6).

Radiosurgical treatment of haemorrhoids. Radiofrequency surgery with the Surgitron apparatus is a unique non-contact method of cutting and coagulating soft tissue using high frequency radio waves. The incision effect is achieved through the heat generated by the resistance of the tissue to the penetration of guided high frequency waves. The high-frequency energy is concentrated at the tip of the "active" or "surgical" electrode and causes a surge of intracellular molecular energy that heats the tissue and effectively vaporises the cells. In addition, the radiosurgery technique, completely eliminates painful muscle contractions or stimulation of nerve endings as the waves pass through the patient's body.

LigaSure haemorrhoidectomy technique. The internal haemorrhoidal node is grasped with a Luer clamp and the vascular pedicle is sutured. The LigaSure coagulation clamp jaws are applied to the base of the node from the outside inwards with further coagulation. The node is cut off along the outer edge of the coagulation layer with scissors up to the vascular pedicel. Coagulation of the vascular pedicle is performed twice with the device jaws moving without leaving a gap between the coagulated areas. Then, the stalk is crossed with scissors along the outer edge of the coagulation layer and the node is removed.

UltraCision haemorrhoidectomy technique. The tissue at the base of the external haemorrhoid node is dissected with ultrasound scissors in cutting mode. Then the external and internal component is removed in stages until it is completely crossed. The vascular pedicle is treated in coagulation mode (Fig. 7).

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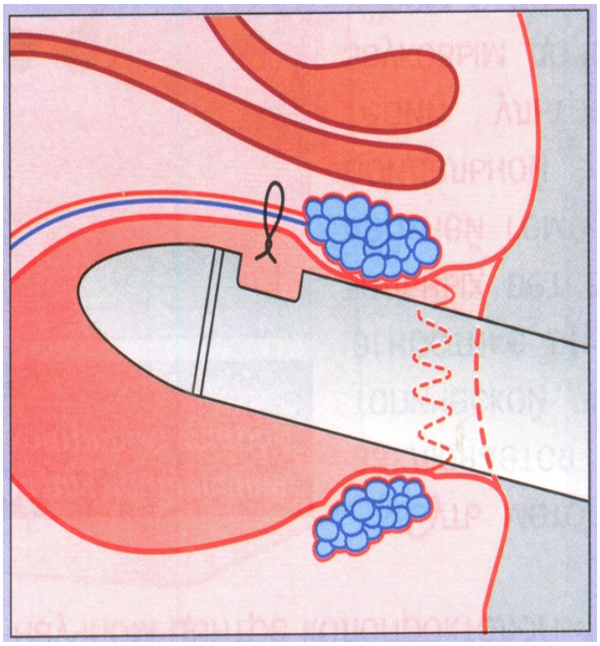

Figure 7: Transanal internal haemorrhoidal node desarterisation under ultrasound Doppler monitoring

Stapled haemorrhoidopexy (Longo's operation). The indication for the method is stage 3-4 haemorrhoids and the combination of haemorrhoids with prolapse of the mucosa of the lower ampullary segment of the rectum. The aim of the operation is fixation and lifting of the internal haemorrhoid plexus by circular resection of the mucosal-submucosal layer of the lower ampullary segment of the rectum with stapling machine and formation of mechanical suture, which subsequently prevents the prolapse of the internal haemorrhoidal nodes.The internal and external plexuses are not removed as a result of stapler haemorrhoidopexy. Cases of rectovaginal fistula, rectal fistula, rectal stricture, bleeding, retroperitoneal phlegmon, and rectal perforation have been described in the literature as complications after this operation. At stapler hemorrhoidopexy decrease of postoperative pain syndrome and shorter period of rehabilitation of a patient in comparison with traditional hemorrhoidectomy are noted. When comparing results of stapler hemorrhoidopexy and ligation of hemorrhoidal nodes with latex rings, postoperative pain syndrome was worse after hemorrhoidopexy. The serrated line serves as a guide in selecting the height of the suture formation. Through the anoscope, at a distance of 4-5 cm from the serrated line, a cicatricial suture is placed. The suture is started from the projection of 3 h and the mucosa and submucosa of the intestinal wall are captured. Rotating the anoscope, a continuous cicatricial suture is placed around the entire circumference of the lower ampullary segment of the rectum with 0.5 to 1.0 cm distance between stitches. After removing the anoscope, the head of the circular stapler is inserted above the imposed cicatricial suture followed by tightening of the cicatrix on the rod of the apparatus. The mucosa should close tightly around the stem of the device. The ends of the sutures are pulled through the lateral holes at the base of the circular apparatus and fixed on the outside. The head is brought close to the base of the apparatus and the circular section of the mucosal-submucosal layer of the lower ampullary colon is resected with a double-row staple suture (Fig. 8).

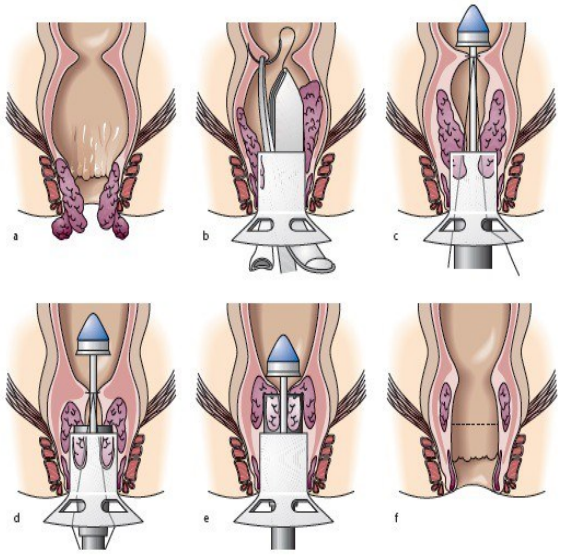

Figure 8: Long operation

Laser haemorrhoidoplasty (LHP) is a minimally invasive treatment that involves subcutaneous submucosal laser vaporisation of internal haemorrhoidal nodes. The procedure is performed in the operating room, under anaesthesia. Around the anus, 3-4 incisions of approx. 0.5 cm are made, through which a light guide with a heat-resistant glass tip is guided into the interior of the haemorrhoid. This is followed by a series of pulses, each pulse lasting 3 seconds, which gradually apply laser energy to the hemorrhoidal tissue. The result is coagulation and subsequent sclerosis of the haemorrhoid. It is very important that the doctor accurately determines the surface area to be treated as well as the power and duration of the laser irradiation, so that the mucosa is not damaged. The operating time is 20-30 minutes. In complicated cases, laser haemorrhoidoplasty can be combined

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with excision of external haemorrhoids, anal fissures, papillomas, small polyps of the rectum, condylomas.

CONCLUSIONS

Thus, there are many different techniques in the treatment of haemorrhoids. However, coloproctologists face the greatest difficulties in the treatment of combined stage III-IV haemorrhoids. This is caused by ligament apparatus disorders of internal hemorrhoids, mucous membrane and anoderma prolapse, anal anatomy disorders in patients of this group. Removal of large amount of cavernous tissue leads to creation of large wound surface at open hemorrhoidectomy or to anal canal narrowing at stitching of mucosa. The large number of techniques used is due to the surgeons' desire to achieve a radical cure for the patient combined with optimum functional results. That is why development and introduction in clinical practice of new techniques of hemorrhoidectomy and perfection of existent ones is an urgent task of modern coloproctology.

FOOTNOTES

Support Source: None
Conflict of interest: Not stated

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