

“The future seems to lie in operations that, instead of extensive excision, are based on ligatures and are, if necessary, combined with excision of the largest and prolapsing pile—a concept that is tailored to every patient’s individual situation.

Management of hemorrhoidal disease: surgical treatments

by M. Wunderlich, Austria



Max WUNDERLICH, MD, FRCS
Zentrum für Proktologie und
Enddarmchirurgie
Privatklinik Confraternität,
Wien, AUSTRIA

Surgery for hemorrhoids is indicated in the presence of long-standing severe symptoms and for when conservative therapy has failed. The object is to reduce the blood supply and the size of the hemorrhoids. The procedures mostly in use at present are conventional hemorrhoidectomy (with or without minor modifications), hemorrhoidal artery ligation/transanal hemorrhoidal dearterialization/rectoanal repair, tailored hemorrhoidectomy, and stapled anopexy (ie, procedure for prolapse and hemorrhoids). No operation is free from drawbacks, as recurrence of symptoms and pain are often seen as mere problems. Complications are severe and include long-lasting pain, urgency, postoperative bleeding, anal incontinence, abscess, or fistula in the operative field, and pelvic sepsis, which may be life-threatening and even lethal. Patients have to be informed extensively about the risks before surgery, particularly when a seemingly harmless and safe method, such as procedure for prolapse and hemorrhoids, is offered. The future seems to lie in operations that, instead of extensive excision, are based on ligatures (hemorrhoidal artery ligation/rectoanal repair) and are, if necessary, combined with excision of the largest and prolapsing pile—a concept that is tailored to every patient’s individual situation.

Medicographia. 2019;41:77-83

Introduction

Surgery for hemorrhoids is indicated when a patient suffers from severe symptoms over a long period of time, which may be arbitrarily defined as at least a total of 3 months per year when adding up all the episodes that substantially interfere with the quality of life. However, the indication for an operative procedure of any kind should only be contemplated when conservative therapy has repeatedly failed and when the piles are too big for minor interventions, such as sclerotherapy or rubber band ligation.¹ Basically, the object of hemorrhoidal surgery is two-fold: first (always), blocking the arterial supply to the vascular plexus and second (only if necessary), reducing enlarged hemorrhoidal tissue (Figure 1, page 78).

Hemorrhoidal surgery of any type should fulfill the following requirements: (i) a tolerable intensity and short duration of postoperative pain if at all; and (ii) a low rate of complications and recurrence. Whitehead’s operation with circular removal of the entire plexus in enormous fourth-degree piles, published in the late 19th century, was certainly radical enough and seems to have produced good results when performed by himself.² Later on, when many cases of postoperative anal stenosis and incontinence were observed, the procedure was given up altogether. The subse-

Address for correspondence:
Max Wunderlich, Zentrum für
Proktologie und Enddarmchirurgie,
Privatklinik Confraternität,
Skodagasse 32, A 1080 Wien, Austria
(email: galaxy.wumax@gmail.com)

www.medicographia.com

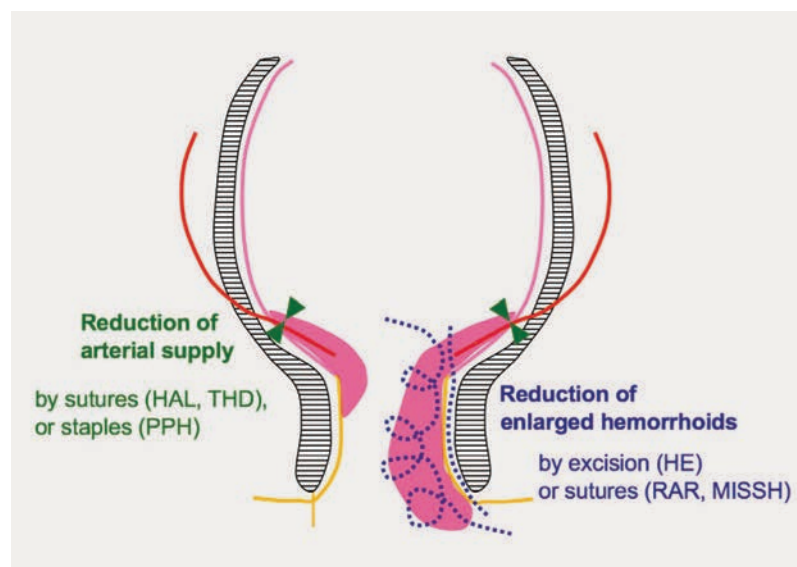


Figure 1. The targets of surgery for hemorrhoids.

Abbreviations: HAL, hemorrhoidal artery ligation; HE, conventional hemorrhoidectomy; MISSH, minimally invasive subanodermal submucosal hemorrhoidoplasty; PPH, procedure for prolapse and hemorrhoids; RAR, rectoanal repair; THD, transanal hemorrhoidal dearterialization.

quent concept of sectoral excision of enlarged hemorrhoids, thus preserving strips of mucosa and anoderm to warrant undisturbed healing of the anal canal lining, is still valid and routinely performed as a “conventional hemorrhoidectomy.” Although the procedure is successful with a lasting effect, the major drawback of a conventional hemorrhoidectomy³ is postoperative pain, often lasting for more than a few days and a pain that is attributed to the open wounds. Therefore, the original procedure has undergone minor variations, mostly consisting of a partial or complete suture of the mucosa and skin, which is linked to the names of their surgical protagonists, in particular Parks and Ferguson. Nevertheless, the menace of pain has not been eliminated for good and new types of procedures were devised to avoid open wounds. For instance, hemorrhoidal artery ligation, which is identical to transanal hemorrhoidal dearterialization, can be combined with rectoanal repair, reducing the size of the piles by means of sutures, with no excision at all. The principle of rectoanal repair, whichplicates the mucosa, can be combined with the removal of the underlying hemorrhoidal tissue, for instance with a laser. Stapled hemorrhoidopexy or anopexy rejoins the mucosal margins immediately after having punched out a substantial part of the mucosa above the hemorrhoidal zone, thus leaving no open areas behind—a method that is subject to justified criticism.

General considerations

Hemorrhoidal surgery is done in a lithotomy or, more rarely, in a prone, position, under general or spinal anesthesia. The bowel should have been prepared at least with an enema. Clearly, most procedures require anal dilatation (manually or with a speculum) to give access to the operative field, which should be done gently and patiently. Perioperative antibiotics are not

mandatory. All the specimens have to be sent for histological examination, with the main purpose of ruling out microscopic pathologies, anal intraepithelial neoplasia as a possible precursor of anal cancer in particular. Postoperative care includes mild laxatives and analgesics if necessary. Cleaning the wounds after defecation under the shower is sufficient; sitz baths are optional when one feels that they have a soothing effect in the region. The postoperative administration of micronized purified flavonoid fraction (MPFF) is strongly recommended because it significantly reduces pain, pruritus, and bleeding.⁴

◆ Conventional hemorrhoidectomy

The various procedures under this heading are thorough with a long-lasting or permanent effect; therefore, these procedures are indicated for third- and fourth-degree hemorrhoids. The traditional operation of Milligan-Morgan³ is still very popular today and referred to as ligation and excision according to the Anglo-Americans.

The piles are grasped with a forceps, usually at 3, 7, and 11 o'clock in the lithotomy position. After an incision of the skin, they are then gradually brought out of the anal canal, while the hemorrhoidal tissue is dissected from the internal sphincter. Once the vascular pedicle within the lowermost rectum appears at the anal orifice, it is ligated followed by resection of the piles. Incision of the internal sphincter, due to the outdated belief that anal hypertonus is responsible for the development of piles, is obsolete. The outline of the open wounds between the mucosal bridges resembles a three-leafed clover, resulting in hardly perceptible scars within a few weeks.

Although the operation was originally described without the use of a speculum, it is certainly advisable to perform it with a device, such as the Parks anal speculum, to allow for better exposure. A speculum is indispensable for the modifications to the Milligan-Morgan operation where sutures are added to the mere ligation of the vascular stalk. At least two variations of the classic method have stood the test of time. First, the “submucosal hemorrhoidectomy” by Parks is a method where the vascular plexus is dissected from the mucosa through racket-shaped incisions before the mucosal flaps are sutured in a sophisticated manner to help reconstruct the anal canal lining, which leaves small open wounds at the anal margin for the purpose of drainage.⁵ Second, the “closed hemorrhoidectomy” by Ferguson is a method where the entire wound is closed from the top to the perianal skin.⁶ Ferguson’s method is still regarded as one of the gold standards of major hemorrhoidal surgery.⁷

With the appropriate skill, any type of conventional hemorrhoidectomy can easily be performed with a scalpel, scissors, and diathermy. The use of a harmonic scalpel or LigaSure is

increasingly recommended in order to reduce pain and the risk of major bleeding postoperatively.⁸⁻¹¹

In the presence of acute hemorrhoidal thrombosis with an irreducible painful prolapse, edema, and imminent necrosis of the piles, conventional hemorrhoidectomy without suturing the perianal skin is certainly the procedure of choice.^{12,13} However, it has to be emphasized that, even in such cases, conservative treatment with high doses of MPFF is a worthwhile alternative in the first place.¹² Yet, if surgery is unavoidable, none of the other, less radical operations will be of help in this situation.

◆ ***Hemorrhoidal artery ligation, transanal hemorrhoidal dearterialization, and rectoanal repair***

These procedures may be summarized under the title “ligature-based operations,”¹⁴ which, at least during the phase of interrupting the arterial blood supply, require a special proctoscope with an integrated ultrasonic sensor to audibly detect the pulsating vessels under the mucosa so that they can be tied off as precisely as possible through a sideward “window” in the proctoscope.¹⁵⁻¹⁷ Hemorrhoidal artery ligation is indicated for grade 2 and 3 hemorrhoids, but it may well be useful for first-degree piles when sclerotherapy or rubber band ligation has failed.

Although hemorrhoidal artery ligation/transanal hemorrhoidal dearterialization could be done without anesthesia, even in the left lateral position, it is usually performed under general or spinal anesthesia. A review of 98 clinical trials has clearly stated that transanal hemorrhoidal dearterialization produces significantly less postoperative complications and pain than a conventional hemorrhoidectomy, but there is a higher rate of recurrence.¹⁸

Rectoanal repair in addition to hemorrhoidal artery ligation/transanal hemorrhoidal dearterialization is recommended for grade 3 and 4 hemorrhoids, as the sole interruption of the arterial supply does not always sufficiently prevent the tendency to prolapse.^{19,20} The combination of ligating the vessels and plicating the mucosa reduces pain and major bleeding in the postoperative course.^{19,20} However, the recurrence of prolapse in 25% of patients after rectoanal repair in the long run²¹ suggests that a conventional hemorrhoidectomy may still warrant a more sustained success when dealing with a tenacious prolapse of grade 4 hemorrhoids.

◆ ***Minimally invasive subanodermal submucosal hemorrhoidoplasty***

Plication of the mucosa without removing the underlying vascular plexus is probably responsible for the high rate of recurrence. This problem may be obviated by excising the vascular plexus while still leaving the mucosa intact, as realized with minimally invasive subanodermal submucosal hemorrhoidoplasty combined with supraanal lifting.²² After ligating

the arteries, similar to hemorrhoidal artery ligation, the hemorrhoidal tissue is removed by means of a synovial shaver from orthopedic surgery. Finally, longitudinal sutures are applied that lift the prolapsed mucosa like a curtain when tied. In a series of 614 patients without major complications, bleeding or superficial fistulae were seen in 1% of the cases and recurrences in 4.9% only.²² Astonishingly, until now, this promising method is not in widespread use.

◆ ***Laser hemorrhoidectomy***

The procedure is similar to minimally invasive subanodermal submucosal hemorrhoidoplasty. The vascular cushions under the mucosa are destroyed with a laser, which carries the risk of mucosal perforation and postoperative fistula formation. The advantages of quick recovery and little postoperative pain are neutralized by 18% of patients having postoperative complications (up to Clavien-Dindo grade 3b) and a recurrence rate of 34% within a median time of 21 months.²³⁻²⁵

◆ ***Tailored hemorrhoidectomy***

Conventional hemorrhoidectomy as the most “radical” procedure often goes along with considerable postoperative pain. Hemorrhoidal artery ligation and rectoanal repair plus their modifications are better tolerated, but have a higher risk of recurrence in patients with grade 4 hemorrhoids. Therefore, we have developed the concept of a “tailored hemorrhoidectomy,” with respect to each patient’s individual situation, that combines both types of operations for those frequent cases when there is just one permanently protruding pile, whereas the others are of degree II and III. The largest pile is resected according to the method of Parks⁵ and the others are reduced with hemorrhoidal artery ligation and rectoanal repair²¹; this way the aftermath of pain is excluded as well as an early recurrence of the disease, without increasing the incidence of complications.^{1,26}

◆ ***Stapled anopexy***

Stapled anopexy corresponds to procedure for prolapse and hemorrhoids that was presented by Longo in Italy in 1998.²⁷ By means of a circular stapler, derived from those that are inserted through the anus to construct an anastomosis after rectal resection, the entire circumference of the mucosa immediately above the hemorrhoidal plexus is resected and the margins are united with a ring of staples. With these virtually synchronous actions of the stapler, the shrinking vascular ring, deprived of its blood supply, should be lifted more or less to its original level. Whereas, now and then, the procedure is praised as simple, painless, and perfectly safe by some authors,²⁸⁻³⁰ an increasing number of studies and reviews from all over the world, Italy in particular, unanimously disagree with the somehow euphemistic view of procedure for prolapse and hemorrhoids as a harmless surgical panacea for hemorrhoidal disease: There is definitely a risk of pain associated with urgency and tenesmus, perhaps less than in conventional hemorrhoidectomy, but sometimes more chronic

Author	Year	Conventional hemorrhoid-ectomy	Procedure for prolapse and hemorrhoids	Comment
Cheetham et al ³¹	2000	NA	31%	Including urgency
Ortiz et al ³²	2005	0	4%	Tenesmus
Ho, Ho ³³	2006	=	=	
Martinsons et al ³⁴	2007	25% 4.8%	42% 0.7%	Severe pain
Pescatori, Gagliardi ³⁵	2008	8%	1.6% to 31% 14% to 50%	Chronic pain Tenesmus and urgency
Giordano et al ³⁶	2009	0	13.8%	Tenesmus
Infantino et al ³⁷	2012	=*	=	*Hemorrhoid artery ligation
Porrett et al ³⁸	2015		0.2% to 25%	Tenesmus and urgency
Aly ³⁹	2015		1.5% to 31%	
Watson et al ⁴⁰	2016	Fewer	More	
Carvajal López ²⁰	2019	Fewer	More	

Table I. Pain after surgery for hemorrhoids.

(Table I). Recurrences are reported in up to 85% of patients (Table II). Fecal incontinence, certainly a debilitating complication, is rarely looked at, but when it is mentioned, the incidence ranges from 0% to 31% of cases.^{35,36,38,42}

In a series of 100 patients after procedure for prolapse and hemorrhoids in various hospitals and who have been assigned to a highly specialized proctological unit from 1999 to 2007, fecal incontinence was the predominant problem in 47%, followed by pain in 38%.⁴³ The majority of the patients had not been thoroughly informed about these and other risks before the operation.

Serious and life-threatening complications, pelvic sepsis above all, almost inevitably require abdominal surgery with an intestinal stoma and may be followed by death as stated in reviews (Table III) and case reports,⁴⁶ and this occurs more frequently after procedure for prolapse and hemorrhoids than after manual hemorrhoidectomy.³⁵

In view of these results the popularity that stapled anopexy has gained within a few years is somehow puzzling. One reason may lie in the customary promotion of medical instruments, such as staplers that have no doubt contributed to

the beneficial development of minimally invasive abdominal surgery on one hand. On the other hand, surgeons, including those who are less familiar with the anatomical and functional subtleties of the anorectal region, may be tempted to replace the traditional dissection of the hemorrhoidal plexus from the internal sphincter under good vision by blindly firing an instrument into the depth of the rectum. Clearly, if ever it is applied, anopexy is a method that is “only good in the hands of experienced colorectal surgeons.”⁴⁶

While an anastomosis created after rectal resection can be controlled from the outside, for leaks in particular, there is no possibility to ascertain the integrity of the staple line beyond the level of the mucosa immediately after procedure for prolapse and hemorrhoids.

Furthermore, nowadays a circular stapler is an indispensable tool for the restoration of intestinal continuity at the rectal level, and of course, those patients are informed about the eventuality of a leak with subsequent peritonitis. Considering the various surgical procedures for hemorrhoids, the use of a stapler is optional, and one may wonder to which method patients would give their

consent if they are properly informed about the incidence of life-threatening complications after what is considered a minor, often day-case, surgery.

Discussion

Surgery for hemorrhoidal disease comes into play when two prerequisites are fulfilled. First, interventions of any kind are only indicated when a patient chronically suffers from the strain of the symptoms and second, when conservative therapy has failed. Advocating the value of noninvasive remedies as the first step is highly justified by the knowledge that, for instance oral medication, MPFF in particular, often achieves excellent results, even in the presence of acute hemorrhoidal prolapse.⁴⁷ In addition, conservative therapy is free from serious side effects, if any.

A comparison of all the surgical procedures is difficult and raises a good deal of questions concerning the postoperative course: what is to be considered as “just an immanent problem of a method” or as a complication? Recurrence of the disease (see Table II) can be regarded as a mere problem that, however, goes along with understandable frustration in patients who may have hesitated a long time before they finally entrusted themselves to surgery. Postoperative bleed-

Author	Year	Conventional hemorrhoidectomy	Procedure for prolapse and hemorrhoids	Comment
Ortiz et al ³²	2005	0	53 %	
Jayaraman et al ⁴¹	2006	15%	85%	Cochrane review
Giordano et al ³⁶	2009	1.7%	8.7%	
Porrett et al ³⁸	2015		up to 58.9%	
Aly ³⁹	2015		0% to 53.3%	
Watson et al ⁴⁰	2016	14%	32%	
Carvajal López et al ²⁰	2019	0	0	

Table II. Recurrence after surgery for hemorrhoids.

ing is a problem, not uncommon after most anal operations, but admittedly a complication in the rare instances when it requires a reintervention to stop it. When does urinary retention, mostly a minor problem, become a complication?⁴⁸ In addition, how, for example, should the intensity and the duration of pain be defined? Beyond which degree on the visual analog scale and beyond which day after surgery is major pain to be judged as a true complication? Is the chronic feeling of urgency a neglectable discomfort that has to be accepted as a small price for an operation that has relieved a patient of long-standing severe symptoms? Pain may be due to open wounds (conventional hemorrhoidectomy) or to sutures that accidentally have grasped the sensible anoderm (hemorrhoidal artery ligation/rectoanal repair), but how can it happen so surprisingly often after procedure for prolapse and hemorrhoids with no wounds whatsoever and a staple line far above the anal canal (see Table I)?

Fecal incontinence after hemorrhoidal surgery is definitely a complication. It can be explained by an inadvertent injury to the internal anal sphincter, which is rare. More frequently, postoperative anal incontinence is due to a preexisting, but unknown weakness or a defect in the external sphincter that almost exclusively affects the female sex. Those lesions go back to deliveries, often decades ago.

Nevertheless, since then, the hemorrhoidal cushions had been the guarantee for continence until the day when surgery came to interfere with this last stronghold in anorectal anatomy, which so far has functioned efficiently enough. Accordingly, in

women with a history of difficult childbirth or in multiparous women, anal ultrasound and sphincter-manometry may contribute to the decision-making process. Anyway, when there is the slightest doubt regarding postoperative anal continence, one should renounce surgery or at least refrain from procedures that imply excision or stapling. The same, of course, is advisable in women with a record of urinary incontinence.

Minor anal sepsis after hemorrhoidal surgery is very rare, presumably with an incidence of not more than 3%,^{35,38} becoming manifest as fissures and fistulae that can easily be cured. Life-threatening septic complications are extremely sporadic. Although pelvic sepsis is usually reported in connection with procedure for prolapse and hemorrhoids (see Table III), none of the other interventions for hemorrhoidal disease is free from a lethal course; however, probably “only” in one out of millions of cases. Adverse events, like Fournier’s gangrene, have not only been registered after conventional hemorrhoidectomy and stapled anopexy, but even

after seemingly harmless office procedures, such as sclerotherapy or rubber band ligation, the latter, for instance, with 6 deaths in 17 cases.⁴⁹

The evaluation of the results and their sometimes-controversial interpretation in the literature is not devoid of subjective impressions from the surgeons’ side as well as the patients’. As it is often difficult to assess the nature of symptoms and their impact on quality of life without one or another bias, there is clearly a demand for “a standardized definition for commonly reported outcomes,”⁵⁰ with scores that already exist.^{24,25}

The surgical therapy for hemorrhoids has a broad spectrum that has evolved and will continue to do so for two purposes before all: it should minimize or eliminate postoperative pain, while reducing the rates of complications and recur-

Author	Year	Reviews
Pescatori, Gagliardi ³⁵	2008	3.2% pelvic sepsis, 0.08-0.09 life threatening/fatalities
Cirotto ⁴⁴	2009	13 cases >> all needed a stoma/3 deaths
Naldini ⁴²	2011	46 serious and life-threatening complications
Faucheron et al ⁴⁵	2012	40 cases of pelvic sepsis >> 35 needed a stoma/4 deaths
Porrett et al ³⁸	2015	16 cases >> 15 needed a stoma/5 deaths

Table III. Severe complications after procedure for prolapse and hemorrhoids.

rence. The variety of interventions and the risk of pitfalls demand that the indication for hemorrhoidal surgery and the choice of the appropriate procedure must be reserved for surgeons who are specialized in proctology. Ideally, these surgeons should be familiar with the simple outpatient interventions as well as with each of the hospital operations in order to circumvent the dictum "if your only tool is a hammer, then every problem looks like a nail."

When surgery for hemorrhoidal disease is definitely indicated, the appropriate operation is to be considered according to the symptoms and degree of hemorrhoids. Naturally, first- or second-degree hemorrhoids are best dealt with by hemorrhoidal artery ligation or transanal hemorrhoidal dearterialization, with the addition of rectoanal repair for third degree, whereas fourth-degree piles often require a conventional hemorrhoidectomy, in particular when the prolapse is circumferential. While the planning of surgery in the presence of small hemorrhoids is usually straightforward, the concept for larger hemorrhoids may have to be altered straightaway during the operation. The diagnosis of third-degree hemorrhoids has to rely on the patient's history. A temporary and reducible pro-

lapse that is rarely reproducible before surgery, even when patients are forcefully straining during the clinical examination while awake, and then, under anesthesia and with relaxation of the pelvic floor, a voluminous circumferential prolapse may appear as a surprise. The same applies for what had previously looked like a solitary fourth-degree pile. In such cases, conventional hemorrhoidectomy is preferable in order to prevent recurrence, even when originally one of the ligature-based operations or tailored hemorrhoidectomy had been planned in favor of a less painful postoperative course.

These considerations are to be conveyed to patients during the process of preoperative information. Even more so, they must be informed thoroughly about all the risks, ie, the sum of the aforementioned problems and complications, which is best corroborated with etchings that every layperson understands. This way it is conceivable that the majority of people who suffer from hemorrhoidal disease will opt for hemorrhoidal artery ligation/rectoanal repair or tailored hemorrhoidectomy and refuse to give their consent to procedures that, although rarely, but just unexpectedly, may interfere with their quality of life in the long run.^{39,43} ■

References

1. Wunderlich M. Update hämorrhoidalleiden. *Die Punkte Gynäkologie/Proktologie*. 2019;(1):3-8.
2. Whitehead W. Surgical treatment of haemorrhoids. *Br Med J*. 1882;110(1):148-150.
3. Milligan ETC, Morgan C, Neuton Jones LE, Officer R. Surgical anatomy of the anal canal, and the operative treatment of haemorrhoids. *Lancet*. 1937;2:1119-1124.
4. La Torre F, Nicolai AP. Clinical use of micronized purified flavonoid fraction for treatment of symptoms after hemorrhoidectomy: results of a randomized, controlled, clinical trial. *Dis Colon Rectum*. 2004;47(4):704-710.
5. Parks AG. Hemorrhoidectomy. *Surg Clin North Am*. 1965;45:1305-1315.
6. Ferguson JA, Mazier WP, Gonchrow MI, Friend WG. The closed technique of hemorrhoidectomy. *Surgery*. 1971;70:480-484.
7. Milone M, Maietta P, Leongito M, Pesce G, Salvatore G, Milone F. Ferguson hemorrhoidectomy: is still the gold standard treatment? *Updates Surg*. 2012;64:191-194.
8. Lim DR, Cho DH, Lee JH, Moon JH. Comparison of a hemorrhoidectomy with ultrasonic scalpel versus a conventional hemorrhoidectomy. *Ann Coloproctol*. 2016;32:111-116.
9. Mushaya CD, Caleo PJ, Bartlett L, Buettner PG, Ho YH. Harmonic scalpel compared with conventional excisional haemorrhoidectomy: a meta-analysis of randomized controlled trials. *Tech Coloproctol*. 2014;18:1009-1016.
10. Talha A, Bessa S, Abdel Wahab M. Ligasure, Harmonic Scalpel versus conventional diathermy in excisional haemorrhoidectomy: a randomized controlled trial. *ANZ J Surg*. 2017;87:251-256.
11. Altomare DF, Milito G, Andreoli R, et al. Ligasure Precise vs. conventional diathermy for Milligan-Morgan hemorrhoidectomy: a prospective, randomized, multicenter trial. *Dis Colon Rectum*. 2008;51:514-519.
12. Wunderlich M. Der proktologische Notfall. *Chirurgie*. 2012;8-10.
13. Lohsirawat V. Anorectal emergencies. *World J Gastroenterol*. 2016;22:5867-5878.
14. Aigner F, Conrad F, Haunold I, et al. Konsensusbericht Hämorrhoidalleiden. *Wien Klin Wochenschr*. 2012;124:207-219.
15. Felice G, Privitera A, Ellul E, Klaumann M. Doppler-guided hemorrhoidal artery ligation: an alternative to hemorrhoidectomy. *Dis Colon Rectum*. 2005;48:2090-2093.
16. Scheyer M, Antonietti E, Rollinger G, Mall H, Arnold S. Doppler-guided hemorrhoidal artery ligation. *Am J Surg*. 2006;191:89-93.
17. Greenberg R, Karin E, Avital S, Skornick Y, Werbin N. First 100 cases with Doppler-guided hemorrhoidal artery ligation. *Dis Colon Rectum*. 2006;49:485-489.
18. Simillis C, Thoukididou SN, Slesser AA, Rasheed S, Tan E, Tekkis PP. Systematic review and network meta-analysis comparing clinical outcomes and effectiveness of surgical treatments for haemorrhoids. *Br J Surg*. 2015;102:1603-1618.
19. Ratto C, de Parades V. Doppler-guided ligation of hemorrhoidal arteries with mucopexy: a technique for the future. *J Visc Surg*. 2015;152(suppl 2):15-21.
20. Carvajal López F, Hoyuela Alonso C, Juvary Gómez M. Prospective randomized trial comparing HAL-RAR versus excisional hemorrhoidectomy: postoperative pain, clinical outcomes, and quality of life. *Surg Innov*. 2019;26(3):328-336.
21. Scheyer M, Antonietti E, Rollinger G, Lancee S, Pokorny H. Hemorrhoidal artery ligation (HAL) and rectoanal repair (RAR): retrospective analysis of 408 patients in a single center. *Tech Coloproctol*. 2015;19:5-9.
22. Burgard MG. MISSH (minimally invasive subanodermal submucosal hemorrhoidoplasty with supra-anal lifting)—a new surgical procedure for the correction of fixed hemorrhoidal and anal prolapse shapes without anodermic incision. *Coloproctology*. 2005;27(2):85-95.
23. Faes S, Pratsinis M, Hasler-Gehrer S, et al. Short and long-term outcomes of laserhemorrhoidoplasty for grade II-III haemorrhoidal disease. *Colorectal Dis*. 2019;21(6):689-696.
24. Clavien PA, Barkun J, de Oliveira ML, et al. The Clavien-Dindo classification of surgical complications: five-year experience. *Ann Surg*. 2009;250:187-169.
25. Slinkamenac K, Graf R, Puhan MA, Clavien PA. Perception of surgical complications among patients, nurses and physicians: a prospective cross-sectional survey. *Patient Saf Surg*. 2011;5:30.
26. Arezzo A, Podzemny V, Pescatori M. Surgical management of hemorrhoids. State of the art. *Ann Ital Chir*. 2011;82:163-172.
27. Longo A. Treatment of hemorrhoidal disease by reduction of mucosa and hemorrhoidal prolapse with a circular suturing device: a new procedure. In: Proceedings of the 6th World Congress of Endoscopic Surgery. Bologna, Italy: Monduzzi Editore; 1998:777-784.
28. Senagore AJ, Singer M, Abcarian H, et al. A prospective, randomized, controlled multicenter trial comparing stapled hemorrhoidopexy and Ferguson hemorrhoidectomy: perioperative and one-year results. *Dis Colon Rectum*. 2004;47:1824-1836.
29. Riss S, Riss P, Schuster M, Riss T. Impact of stapled haemorrhoidopexy on stool continence and anorectal function: long-term follow-up of 242 patients. *Langenbecks Arch Surg*. 2008;393:501-505.
30. Aytac E, Gorgun E, Erem HH, Abbas MA, Hull TL, Remzi FH. Long-term outcomes after circular stapled hemorrhoidopexy versus Ferguson hemorrhoidectomy. *Tech Coloproctol*. 2015;19:653-658.

31. Cheetham MJ, Mortensen NJ, Nystrom PO, Kamm MA, Phillips RK. Persistent pain and faecal urgency after stapled haemorrhoidectomy. *Lancet*. 2000; 356:730-733.
32. Ortiz H, Marzo J, Armendáriz P, De Miguel M. Stapled hemorrhoidopexy vs. diathermy excision for fourth-degree hemorrhoids: a randomized, clinical trial and review of the literature. *Dis Colon Rectum*. 2005;48(4):809-815.
33. Ho KS, Ho YH. Prospective randomized trial comparing stapled hemorrhoidopexy versus closed Ferguson hemorrhoidectomy. *Tech Coloproctol*. 2006;10: 193-197.
34. Martinsons A, Narbutis Z, Bruneniekis I, Pavars M, Lebedkovs S, Gardovskis J. A comparison of quality of life and postoperative results from combined PPH and conventional haemorrhoidectomy in different cases of haemorrhoidal disease. *Colorectal Dis*. 2007;9:423-429.
35. Pescatori M, Gagliardi G. Postoperative complications after procedure for prolapsed hemorrhoids (PPH) and stapled transanal rectal resection (STARR) procedures. *Tech Coloproctol*. 2008;12:7-19.
36. Giordano P, Gravante G, Sorge R, Ovens L, Nastro P. Long-term outcomes of stapled hemorrhoidopexy vs conventional hemorrhoidectomy: a meta-analysis of randomized controlled trials. *Arch Surg*. 2009;144:266-272.
37. Infantino A, Altomare DF, Bottini C, et al. Prospective randomized multicentre study comparing stapler haemorrhoidopexy with Doppler-guided transanal haemorrhoid dearterialization for third-degree haemorrhoids. *Colorectal Dis*. 2012;14:205-211.
38. Porrett LJ, Porrett JK, Ho YH. Documented complications of staple hemorrhoidopexy: a systematic review. *Int Surg*. 2015;100:44-57.
39. Aly EH. Stapled haemorrhoidopexy: is it time to move on? *Ann R Coll Surg Engl*. 2015;7:490-493.
40. Watson AJM, Hudson J, Wood J, et al. Comparison of stapled haemorrhoidopexy with traditional excisional surgery for haemorrhoidal disease (eTHoS): a pragmatic, multicentre, randomised controlled trial. *Lancet*. 2016;388:2375-2385.
41. Jayaraman S, Colquhoun PH, Malthaner RA. Stapled versus conventional surgery for hemorrhoids. *Cochrane Database Syst Rev*. 2006;4:CD005393
42. Naldini G. Serious unconventional complications of surgery with stapler for hemorrhoidal prolapse and obstructed defaecation because of rectocele and rectal intussusception. *Colorectal Dis*. 2011;13:323-327.
43. Wunderlich M, Stieböck C, Tentschert G. Therapie bei rezidiv oder komplikationen des hämorrhoidalleidens. *Chirurgie*. 2007;3:28-31.
44. Cirocco WC. Life threatening sepsis and mortality following stapled hemorrhoidopexy. *Surgery*. 2008;143:824-849.
45. Faucheron JL, Voirin D, Abba J. Rectal perforation with life threatening peritonitis following stapled hemorrhoidopexy. *Br J Surg*. 2012;99:746-753.
46. van Wensen RJ, van Leuken MH, Bosscha K. Pelvic sepsis after stapled hemorrhoidopexy. *World J Gastroenterol*. 2008;14:5924-5926.
47. Cospite M. Double-blind, placebo-controlled evaluation of clinical activity and safety of Daiflon 500 mg in the treatment of acute hemorrhoids. *Angiology*. 1994; 45:566-573.
48. Chik B, Law WL, Choi HK. Urinary retention after haemorrhoidectomy: impact of stapled haemorrhoidectomy. *Asian J Surg*. 2006;29:233-237.
49. McCloud JM, Jameson JS, Scott AN. Life-threatening sepsis following treatment for haemorrhoids: a systematic review. *Colorectal Dis*. 2006;8:748-755.
50. van Tol RR, van Zwietering E, Kleijnen J, et al. Towards a core outcome set for hemorrhoidal disease—a systematic review of outcomes reported in literature. *Int J Colorectal Dis*. 2018;33:849-856.

Keywords: complications; hemorrhoids; hemorrhoidal artery ligation; hemorrhoidectomy; procedure for prolapse and hemorrhoids; rectoanal repair; transanal hemorrhoidal dearterialization