

Recto Anal Repair (RAR): a viable new treatment option for high-grade hemorrhoids. One year results of a prospective study

ULRIKE SATZINGER (*) - WOLFGANG FEIL (**) - KARL GLASER (***)

(*) *Krankenhaus St. Josef, Vienna*

(**) *Evangelisches Krankenhaus, Vienna*

(***) *Wilhelminenspital, Vienna*

Abstract: Recto Anal Repair (RAR) is a new, minimally-invasive treatment option for high-grade hemorrhoids which combines HAL (Hemorrhoidal Artery Ligation) and "lifting" of the hemorrhoidal prolapse, known as a mucopexy, in one procedure. Our prospective study evaluates both the early and long-term clinical outcomes of this procedure. 83 patients (43% female, 57% male, mean age 56 years (range 20-83)) with high-grade hemorrhoids (90% grade III, 10% grade IV) were treated using the RAR technique (equipment: A.M.I. GmbH, Austria) by the same surgeon in two different hospitals. Follow-up was carried out at 1 week, and then at 1, 3, 6 and 12 months, whereby clinically relevant parameters such as hemorrhoidal symptoms and re-prolapse were recorded and the spatial distribution of treated arteries analysed.

Results: The number of patients showing relief of hemorrhoidal symptoms at 12-month follow-up was high. Bleeding was resolved in 89% of the patients, itching in 95%, burning in 100% and soiling in 100%. The recurrence of prolapse at 12 months was low, with no re-prolapse being recorded in 89% of the patients. Patient satisfaction was consistently high (>90%) at all follow-up intervals and the complication rate was low. In addition, data indicated that course of the branches of the superior rectal artery (SRA) into the corpus cavernosum recti (CCR) is unpredictable and varies considerably from patient to patient. Recto Anal Repair not only has several perioperative advantages – minimally-invasive surgery, low pain levels and no major complications – but also offers prolonged relief for all hemorrhoidal symptoms and for re-prolapse. RAR is an effective form of treatment for high-grade hemorrhoids.

Key words: Hemorrhoids; Rectal arteries; Hemorrhoidal Artery Ligation; Hemorrhoidectomy; Doppler.

INTRODUCTION

Over the last decade, several novel treatment options have been developed for high-grade hemorrhoids with the intention of minimising the drawbacks of what is considered today to be the gold-standard, the conventional hemorrhoidectomy. Two of these new methods are HAL (Hemorrhoidal Artery Ligation)¹ and stapled hemorrhoidopexy.² Both techniques have shown potential benefits for high-grade hemorrhoids, particularly with regard to the perioperative parameters and at least partially also with respect to long-term results. However, both also have drawbacks still requiring improvement. The stapled hemorrhoidopexy has a much higher re-prolapse rate than the gold standard, and the resolution of hemorrhoidal symptoms is lower.³ In addition, severe complications after stapled hemorrhoidopexy are known and have also been reported in literature.^{4,6} The increased re-prolapse rate for high-grade hemorrhoids is also shared by the HAL method.⁷ However this shortcoming has more recently been addressed by the advent of RAR, a technique which is an extension of the HAL method. Bearing in mind that the HAL method appears to provide effective relief of symptoms,⁷⁻¹⁵ and not one major complication has been reported in literature so far, we decided to pursue a study on the effectiveness of RAR.

The purpose of this prospective study was to observe how the clinically relevant parameters of high-grade hemorrhoids developed over a period of one year subsequent to treatment with RAR.

THE RAR CONCEPT

The concept of Doppler-guided hemorrhoidal artery ligation (DG-HAL) to treat symptomatic hemorrhoids was first reported by Morinaga¹ in 1995. This method was based principally on the theory of a misbalance between the flow of blood to and from the hemorrhoids. To restore this balance, Morinaga proposed reducing the supply of blood from the rectal arteries to the hemorrhoidal cushions.

Morinaga's theory of increased arterial inflow was supported by Aigner's¹⁶ recent findings about changes in mor-

phology, and blood flow of rectal arteries in the muscular wall layers. The study has shown a correlation between the appearance of hemorrhoids, and an increased caliber and arterial blood flow in the terminal branches of the superior rectal artery. He concludes that his study provides strong evidence that the supply of arterial blood to the corpus cavernosum recti (CCR) is relevant to the development of hemorrhoidal cushions. The vascular dilation and increased blood flow suggest that there might exist an increased arterial inflow rather than a venous stasis or outflow problem supporting the development of hemorrhoids. In addition to these findings, a cadaver study by Schuurman¹⁷ examined the vascular anatomy of the CCR in the inner wall of the distal rectum. On average, some eight arteries down to a size of 0.2 mm in diameter were seen in the distal rectum, all originating from the superior rectal artery. Schuurman's study shows that the distribution patterns of the arterial structures differ substantially from the classic 3, 7 and 11 o'clock descriptions: the course of the submucosal vessels and their length, diameter and number differ from patient to patient, indicating that the arrangement of the rectal submucosal arteries cannot be generalised.

The HAL method requires the use of a proctoscope with a Doppler transducer attached (Fig. 1). This Doppler transducer is used to detect the location and depth of arterial structures lying approximately five to six centimetres proximal to the anus. All arteries below the Doppler transducer with flow in the cranio-caudal direction (even if only in part) can be detected. A small fraction of arteries running perpendicular to the detection direction will theoretically not be included. The equipment (A.M.I. HAL II Doppler) (Fig. 2) displays the depth of the detected arteries. This enables that structures located in very deep layers (deeper than 8-10 mm) can be excluded. Once an artery is detected, it will be ligated with an absorbable 5/8 suture. The arteries' arbitrary branching pattern means it is essential to make the ligation very close to the Doppler transducer. If the ligation is too high, there is a greater risk of missing the artery. Therefore the distance between the Doppler transducer and the ligation window of the equipment used must be kept to a minimum.



Fig. 1. – Proctoscope with Doppler (a) and adjacent ligation window (b).



Fig. 2. – HAL Doppler Equipment (A.M.I.) with display of depth of arteries.

The proctoscope is inserted, and the arteries are detected and then ligated with a figure-of-eight stitch. The proctoscope remains inserted at the same depth while the handle is turned gradually to detect and ligate the arteries one by one until the handle has turned a full circle. The handle can then be pulled back approximately one centimetre, and a second rotation made to find additional arteries.

The RAR method, an extension of the HAL method, is a two-step procedure first described by Hussein¹⁸ in 2001. The first step is the artery ligation (HAL) as described above, and the second step is a mucopexy: RAR = HAL + Mucopexy. The mucopexy secures the hemorrhoidal prolapse into the anal canal. Technically, the mucopexy begins with the placement of a running suture that starts proximally and ends distally (Fig. 3). The distal part of the hemorrhoid is then pushed back into the anal canal and the hemorrhoid is secured back in into place by knotting the two ends of the absorbable suture. This second step of the RAR procedure is therefore also known as anal lifting. The equipment used in our study offers a feature that allows controlled opening of the operation window, starting proximally and ending distally, and therefore prevents mucosa from falling into the whole working area at once. With unobstructed vision, the first firm stitch can be placed proximally at a distance of about six centimetres from the anus. We tend to make two proximal stitches and to place a knot at that position. By rotating the handle, the working window can then be opened step by step to access more distal parts. The continuous suture can be made stitch

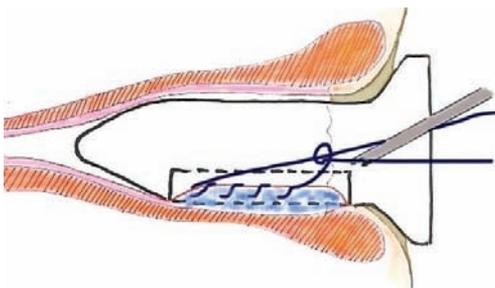


Fig. 3. – Mucopexy to lift hemorrhoidal prolapses.

by stitch, without distal parts of the mucosa falling into the working area while treating more proximal parts. The running suture is completed some 5 to 8 mm above the dentate line to ensure pain levels remain low. Once the most distal stitch is made, the 5/8 needle is cut off and the end of the suture knotted to the other end which remained proximal. Using the index finger or a knotpusher, the knot is pushed upwards and the prolapsing mucosa pulled back into the anal canal.

The mucopexy is based on the theory that hemorrhoidal disease stems from an increased laxity of the connective tissue in the CCR. Depending on the actual prolapse positions, multiple running sutures can be placed to lift all prolapsing hemorrhoids. After four to six weeks, the sutures have been resorbed, and scar tissue remains in the treated parts of the corpus cavernosum recti.

By ligating the arteries using the HAL method, and subsequently carrying out step two of the RAR procedure, the mucopexy, the blood inflow to the hemorrhoidal cushions is reduced. The widespread network of arteries is partly blocked, however the remaining arteries still provide more than enough blood. Necrosis of the CCR has never been reported in the relevant literature, nor did it occur in our series of patients. Also of note is the fact that hemorrhoidal tissue, and therefore the anorectal function as shown by Walega,¹⁹ are well preserved.

PATIENTS AND METHODS

This study comprises results from 83 patients who underwent the RAR procedure (Tab. 1). At the current time, 1-year follow-up has been carried out on 44 patients. At all intervals (1 week, 1, 3, 6 months and 1 year) follow-up data was collected during a clinical examination of each patient by the same surgeon. A prospective study questionnaire was created prior to this non-randomized study to measure the resolution of hemorrhoidal symptoms and hemorrhoidal prolapse, as well as pain levels. In addition, surgery was documented in detail, photographs were taken of each patient prior to and after surgery, and patient satisfaction was recorded at all follow-up intervals.

Patients with grade II hemorrhoids are treated with HAL. Grade III and IV hemorrhoids are treated with the RAR procedure. This study includes patients with grade III and IV hemorrhoids only (Tab. 2). Surgery was carried out by the same surgeon in two different hospitals.

RAR was performed under anaesthesia (local or spinal), depending on the patient's preference, and patients were placed in the lithotomy position (Tab. 3).

Perioperative Data

Average operating time did not vary greatly between those patients with spinal anaesthesia (26 minutes) and those with

TABLE 1. – Sex of patients.

Female	n = 36 (43 %)
Male	n = 47 (57 %)

TABLE 2. – Goligher classification of hemorrhoids.

Grade III	n = 75 (90 %)
Grade IV	n = 8 (10%)

TABLE 3. – Anaesthesia.

Spinal	n = 31 (37 %)
General	n = 52 (63 %)

general anaesthesia (27 minutes), nor did the pain levels. On the whole, pain levels recorded for RAR are comparatively low.^{9, 11, 23} In our series, 25% of the patients had no further need for analgesics after the day of surgery, 49% stopped taking them between first and fifth postoperative day and 22% needed analgesics for six to ten days after surgery. Only three patients (4%) needed analgesics for more than 10 days. This may have to do with thrombosis of the hemorrhoids that has been described for a small percentage of patients,^{7, 10, 20, 21} two of which occurred in our series. 87% of patients were hospitalised for three days, which is typical for the Austrian healthcare system, 10% of patients left the

TABLE 4. – Number of ligations.

	Grade III	Grade IV
3	5	1
4	4	2
5	12	1
6	18	2
7	20	1
8	7	1
9	4	0
≥ 10	5	0

TABLE 5. – Number of mucopexies.

	Grade III	Grade IV
1	5	0
2	7	0
3	36	2
4	18	4
≥ 5	9	2

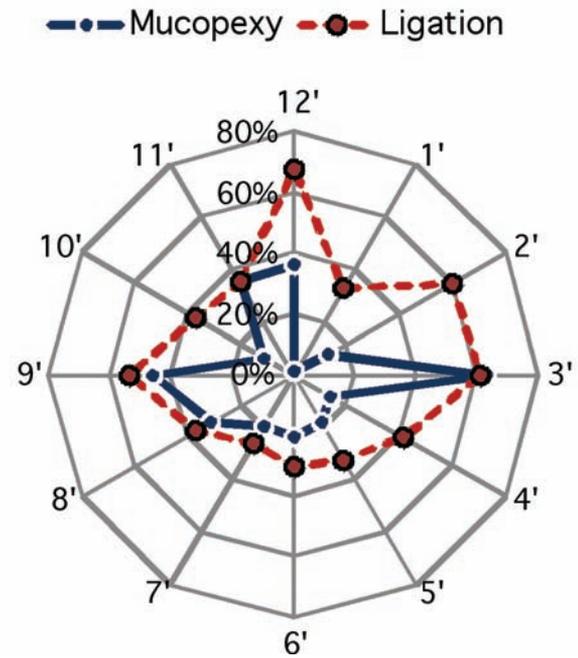


Fig. 4. – Position of ligation and mucopexy.

hospital on day two, two patients stayed for four days and one patient remained for longer than four days in hospital.

On average, six ligations were placed and followed by three mucopexies. The exact figures can be seen in Tables 4 and 5.

In our study, we also observed the positions at which ligations were placed and the positions at which a mucopexy was performed. Our data recorded for the ligation positions confirms the anatomical findings of Schuurman and Aigner,^{16, 17, 22} which indicated that the position of the rectal arteries is unpredictable. Ligations were often made at every clock posi-



Fig. 5. – Photos taken before and after RAR treatment, the two sample cases.

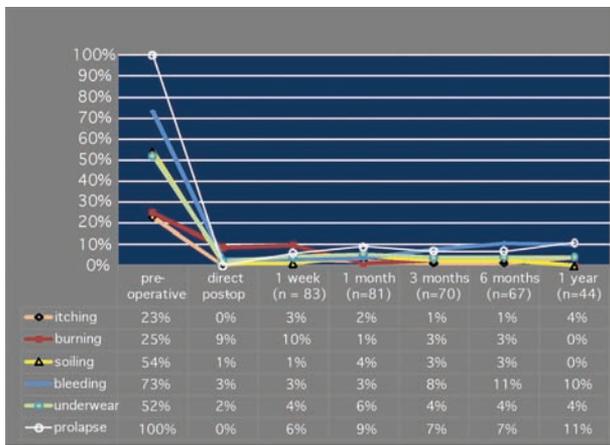


Fig. 6. – Relief of symptoms and prolapse.

tion. On average, we found that the probability of finding an artery in every single position was 41% (range of probabilities 26% to 67%). There were no correlations found between the patients. However, our study did show that the mucosa prolapsed in three particular positions more than elsewhere. These positions are 3, 8/9 and 11/12 o'clock (Fig. 4).

Visually, the effect of the RAR procedure is most convincing, as can be seen in the two sample cases (Fig. 5). While maximum shrinkage of the hemorrhoids with HAL occurs some 6 to 8 weeks after treatment, the mucopexy carried out during the RAR procedure ensures an immediate visual improvement. The hemorrhoidal cushions still undergo the same shrinking process over 6-8 weeks as with ligation alone, however the lifting of hemorrhoids back into the anal canal dominates in terms of prolapse treatment.

Results of 1-year follow-up

All patients treated in our study were suffering from either grade III or IV hemorrhoids. Therefore viewed objectively, the most common problem prior to surgery was a hemorrhoidal prolapse (by definition 100%). However, the problems reported by the patients prior to the operation only included prolapse in 55% of the cases. The other most common subjective problems included bleeding (73%), soiling (54%), burning (25%) and itching (23%). The question put to the patients regarding “dirty underwear” was already covered to some extent by the question regarding soiling. However in case of any misunderstandings regarding the term soiling, we chose to ask the additional question regarding underwear.

The relief of symptoms over time shows the effectiveness of the RAR method. Bleeding was the symptom that recurred the most frequently (Fig. 6).

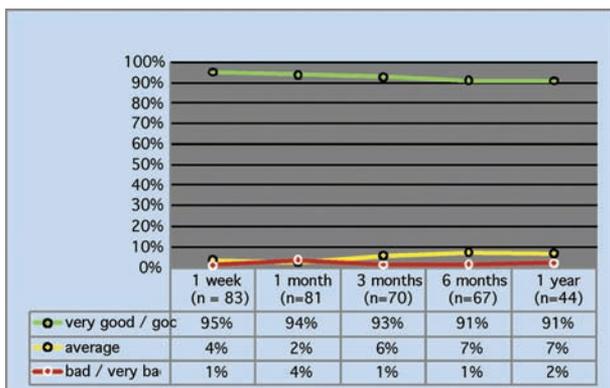


Fig. 7. – Patient satisfaction.

Complications after 83 RAR procedures included the formation of one fissure, one event of postoperative bleeding (which can most likely be attributed to an existing case of diverticulitis), perianal thrombosis in two cases, one case of fever above 38°C, and three cases of urinary retention that needed catheterization. The urinary retention can most likely be attributed to the spinal anaesthesia. From a total of 276 mucopexy sutures, five sutures ruptured the mucosa in part or fully, resulting in one re-operation three months after the initial procedure. We also experienced two abscesses (16 days and 5 weeks postoperatively). These occurred in patient numbers 81 and 82, and so were well beyond the learning curve. Because this complication has seldom been published, we reviewed our surgical regimen and considered a connection with single-shot antibiotics that we didn't use in our series. Now we do it too. Discussions with other experienced centres indicated that single-shot antibiotics are often used. Out of all the patients treated in our RAR series and additional patients treated with HAL, there was not one who suffered from a major complication either during or after surgery.

The relief of prolapse after RAR was of particular interest due to a novel technique used. All the data recorded was gathered during personal follow-up visits to the ordinationclinic. There, the surgeon used a proctoscope to examine each patient for a recurring prolapse. Recurrent prolapse was diagnosed in five patients at 12 months, however the size and position of the prolapse at that time substantially differed from the prolapse recorded pre-operatively. Out of 44 patients followed up at 12 months, three patients were suffering from a de-novo prolapse at a position that was different from the pre-operative positions. The two other patients suffered recurrences at a position that had been surgically treated. One of these patients will undergo a RAR reoperation, the second patient developed the recurrence between 3 and 6 months after the RAR treatment and has continued to live with the small residual prolapse for over a year without requiring reoperation. All re-prolapses after RAR are clearly smaller than those occurring preoperatively.

Patient satisfaction was measured at all intervals on a 5-point scale. As shown in the patient satisfaction chart, the very positive levels remain constant over the full follow-up period (Fig. 7).

DISCUSSION

The RAR technique is based on two parallel concepts that explain the development of symptomatic hemorrhoids: A) increased arterial blood supply to the CCR¹ and B) increased laxity of the rectal mucosa.^{2,4} Regardless of the reason for the hemorrhoidal disease, the RAR operation deals with both in an easy to learn, minimally invasive procedure.

The fact that the patients in this study were bothered more preoperatively by the hemorrhoidal symptoms (e.g. bleeding, itching etc.) than by the prolapse highlights the importance of those ligations carried out carefully during the HAL procedure. In our series, bleeding one year after surgery was observed in a higher number of patients than reported in other RAR studies.^{21, 23} If our results are compared with the data from Theodoropoulos and Zagriadskiy (3.5% and 1.4% bleeding respectively at the final follow-up), it can be seen that we placed significantly fewer ligations per patient. The bleeding reported by our patients during follow-up was in many instances minimal, with one patient reporting one instance of blood on the toilet paper every two weeks after defecation. There is not one patient in our series who has dropping blood after RAR on a regular basis.

TABLE 6. – Comparison of results from different treatment options for high-grade hemorrhoids.

	n	follow-up	hemorrhoidal symptoms present	persistent bleeding	persistent pruritus ani	persistent pain	fecal urgency	persistent prolapse	further surgeries (not peri-operative)
stapled hemorrhoidectomy [LIT]	174	7-14 months (median)	22,4%	14,9%	8,0%	8,7%	10,2%	10,2%	7,3%
conventional surgery [LIT]	188	7-14 months (median)	14,1%	11,7%	11,1%	10,4%	10,7%	2,2%	3,2%
RAR: Theodoropoulos [LIT]	37	15 months (average)	4,0%	1,4%	no data	no data	no data	2,2%	2,7%
RAR: Zagryadskiy [LIT]	85	10 months (average)	9,4%	3,5%	0,0%	0,0%	0,0%	1,2%	no data
RAR: our series	44	12 months (minimum)	no data	11,4%	4,6%	no data	0,0%	11,4%	2,3%

All together, RAR clearly improves the clinical outcome for residual prolapse compared to HAL,⁷ yielding the conclusion that the additional mucopexy has a positive effect.

Our study data shows that the position of the rectal arteries (the branches of the superior rectal artery) is not predictable. Therefore use of the Doppler ultrasound is essential to the procedure. Our data based on 83 patients treated for high-grade hemorrhoids confirms neither the traditional assumptions that the arteries are present at 3, 7 and 11 o’clock, nor other authors’ recommendations to ligate at set positions - namely at odd hours 1, 3, 5, 7, 9 and 11 o’clock - where they claim the terminal branches of the SRA were always detected in series of several hundred patients.²⁴²⁵ Instead our study data closely correlates with Schuurman’s recent anatomical findings from macroscopic cadaver examinations and serial sectioning of cadavers.

We observed in our study that the visual hemorrhoidal prolapse subsequently treated with the mucopexy was predominant at three positions: 3, 8/9 and 11/12 o’clock. We found no correlation between the position of the outer prolapse and the internal location of the arteries.

Comparison of hemorrhoid treatment options

Today, the conventional hemorrhoidectomy is still considered to be the global gold standard procedure for high-grade hemorrhoids. In light of the shortfalls of this procedure, newer techniques including the RAR procedure have been developed. To this date, only a limited number of publications concerning RAR have been available. In 2008, Theodoropoulos²³ first published results from 15-month follow-up of RAR patients, and this was followed in the same year by a publication by Zagriadskiy²¹ with 10-month follow-up. As does our study, both of these studies include grade III and grade IV hemorrhoids only. We grouped our data with the data from these two studies, and then compared this group with the results for conventional hemorrhoidectomy and stapled hemorrhoidopexy published in a Cochrane Analysis. Although there is some variance in the study parameters, and the comparison is therefore not exact, it is still able to provide us with an initial indication as to which parameters may be most positively affected by the RAR procedure.

Jayaraman’s Cochrane Analysis³ compared patients treated conventionally with patients treated by means of stapled hemorrhoidopexy. Data from Shalaby²⁶ was excluded in Table 6 for two reasons: firstly, the data was also excluded several times in the Cochrane Analysis because Shalaby’s publication had been identified as being potentially subject to bias, and secondly, the data also includes grade II hemorrhoids and differs therefore from the other data based solely on treatment of high-grade hemorrhoids.

Table 6 shows that the resolution of hemorrhoidal symptoms (bleeding, pruritus ani, pain) with RAR is considerably higher than for conventional hemorrhoidectomy and stapled hemorrhoidopexy. This effect can be attributed to the ligation of the arteries of the CCR. Average re-prolapse rates after RAR lie somewhere between the rates for other

treatment options. While two of the studies have results as good as those for conventional hemorrhoidectomy, the results from our series are closer to those for stapled hemorrhoidopexy.

CONCLUSION

The present study confirms that the RAR procedure is a very effective technique for treatment of high-grade hemorrhoids. RAR offers a variety of advantages, including improved treatment of symptoms, lower pain levels, shorter hospital stays, less time off work and high patient satisfaction levels. In addition, there has not been one major complication reported in literature for a total of more than four thousand HAL patients to date.²³ However, in order to draw a more definite and scientifically-based conclusion about the outcome of RAR as compared to other high-grade hemorrhoid treatment options, a control group treated with conventional hemorrhoidectomy would be required. Such a study may be best be carried out in a university environment. A randomized study incorporating a control group is not appropriate in our hospital because of the several clear benefits offered to patients by the RAR procedure.

REFERENCES

1. Morinaga K, Hasuda K, Ikeda T. A novel therapy for internal hemorrhoids: ligation of the hemorrhoidal artery with a newly devised instrument (Moricorn) in conjunction with a Doppler flowmeter. *Am J Gastroenterol* 1995; 90: 610-3.
2. Longo A. Treatment of haemorrhoidal disease by reduction of mucosa and hemorrhoidal prolapse with a circular stapling device: a new procedure. *Proceedings of 6th World Congress of Endoscopic Surgery, Rome, June 3 to 6, 1998. Bologna: Ed. Monduzzi Editore, 1998: 777-84.*
3. Jayaraman S, Colquhoun PH, Malthaner R. Stapled versus conventional surgery for hemorrhoids. *Cochrane Database of Systematic Reviews* 2006; 4. Art. No.: CD005393
4. Pescatori M, Aigner F. Stapled transanal rectal mucosectomy ten years after. *Tech Coloproctol* 2007; 11: 1-6.
5. 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.
6. Cirocco WC. Life threatening sepsis and mortality following stapled hemorrhoidopexy. *Surgery* 2008; 143: 824.
7. Scheyer M, Antonietti E, Rollinger G, Mall H, Arnold S. Doppler-guided hemorrhoidal artery ligation. *Am J Surg* 2006; 191: 89-93.
8. Faucheron JL, Gangner Y. Doppler-Guided Hemorrhoidal Artery Ligation for the Treatment of Symptomatic Hemorrhoids: Early and Three-Year Follow-up Results in 100 Consecutive Patients. *Dis Colon Rectum* 2008; 25.
9. Wilkerson PM, Strbac M, Reece-Smith H, Middleton SB. Doppler-guided hemorrhoidal artery ligation: long-term outcome and patient satisfaction. *Colorectal Dis* 2008; 394-400.
10. Meintjes D. Doppler guided hemorrhoidal artery ligation (HAL) for the treatment of hemorrhoids. Results in 1415 patients. *Patients studies* 2000. Available at www.pharma.it/eng/pati.htm

11. Bursics A, Morvay K, Kupcsulik P, Flautner L. Comparison of early and 1-year follow-up results of conventional hemorrhoidectomy and hemorrhoid artery ligation: a randomized study. *Int J Colorectal Dis* 2004; 19: 176-80.
12. 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.
13. Wallis de Vries BM, van der Beek ES, de Wijkerslooth LR, van der Zwet WC, van der Hoeven JA, Eeftink Schattenkerk M, Eddes EH. Treatment of grade 2 and 3 hemorrhoids with Doppler-guided hemorrhoidal artery ligation. *Dig Surg* 2007; 24: 436-40.
14. Arnold S, Antonietti E, Rollinger G, Scheyer M. Doppler ultrasound assisted hemorrhoid artery ligation. A new therapy in symptomatic hemorrhoids. *Chirurg* 2002; 73: 269-73.
15. Dorn HU, Mory M. 5 Years of HAL: Experience and Long-Term Results. A Prospective Study (5 Jahre HAL: Erfahrungen und Langzeitergebnisse. Eine prospektive Studie) *Coloproctology* 2007; 29: 205-10.
16. Aigner F, Bodner G, Gruber H, Conrad F, Fritsch H, Margreiter R, Bonatti H. The vascular nature of hemorrhoids. *J Gastrointest Surg* 2006; 10: 1044-50.
17. Schuurman JP, Go PMNYH, Bleys RLAW, Anatomical branches of the superior rectal artery in the distal rectum, *Colorectal Dis* 2008 (Accepted Article).
18. Hussein AM. Ligation-anopexy for treatment of advanced hemorrhoidal disease. *Dis Colon Rectum* 2001; 44: 1887-90.
19. Walega P, Scheyer M, Kenig J, Herman RM, Arnold S, Nowak M, Cegielnny T. Two-center experience in the treatment of hemorrhoidal disease using Doppler-guided hemorrhoidal artery ligation: functional results after 1-year follow-up, *Surg Endosc* 2008; 22: 2379-2383.
20. Sohn N, Aronoff JS, Cohen FS, Weinstein MA. Transanal hemorrhoidal dearterialization is an alternative to operative hemorrhoidectomy. *Am J Surg* 2001; 182: 515-9.
21. Zagryadskiy EA, Gorely SI. Transanal Doppler-guided hemorrhoidal artery ligation / recto anal repair (HAL-RAR) for treatment of Grade 3-4 hemorrhoids: a new mini-invasive technology, *Pelviperrineology* 2008; 27: 151-155.
22. Aigner F, Bodner G, Conrad F, Mbaka G, Kreczy A, Fritsch H. The superior rectal artery and its branching pattern with regard to its clinical influence on ligation techniques for internal hemorrhoids. *Am J Surg* 2004; 187: 102-8.
23. Theodoropoulos GE, Sevrissarianos N, Papaconstantinou J, Panoussopoulos SG, Dardamanis D, Stamopoulos P, Bramis K, Spiliotis J, Datsis A, Leandros E. Doppler-Guided Hemorrhoidal Artery Ligation (DGHAL), Rectoanal Repair (RAR), Sutured Hemorrhoidopexy (SHP) and minimal mucocutaneous excision (MMCE) for grade III-IV hemorrhoids: a multicenter prospective study of safety and efficacy, *Colorectal Dis* 2008; 14. [Epub ahead of print]
24. Dal Monte PP, Tagariello C, Sarago M, Giordano P, Shafi A, Cudazzo E, Franzini M. Transanal hemorrhoidal dearterialisation: nonexcisional surgery for the treatment of hemorrhoidal disease. *Tech Coloproctol* 2007; 11: 333-8.
25. Cantero R, Balibrea JM, Ferrigni C, Sanz M, García Pérez JC, Pérez R, Luffiego A, Forero RG, Balibrea JL. Doppler-guided transanal hemorrhoidal dearterialisation. An alternative treatment for hemorrhoids, *Cir Esp* 2008; 83: 252-5
26. Shalaby, R, Desoky, A. Randomised clinical trial of stapled versus Milligan-Morgan hemorrhoidectomy. *Br J Surg* 2001; 88: 1049-53.

Correspondence to:

Dr. ULRIKE SATZINGER
St. Josef Krankenhaus - AuhofstraÙ, 189
1130 Wien - +43 (1) 878 44-0