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W. Donald Buie, M.D., *Editor*

Transanal Hemorrhoidal Dearterialization: A Systematic Review

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PURPOSE: Transanal hemorrhoidal dearterialization consists of a Doppler-guided ligation of the distal branches of the rectal arteries. The aim of this review is to assess the current evidence on dearterialization, establish the safety and efficacy of the technique, define its indications, and identify its possible advantages and limitations.

METHODS: All published studies on dearterialization without language restrictions were reviewed systematically. Primary outcome measures were postoperative pain and hemorrhoidal recurrences.

RESULTS: Seventeen articles including a total of 1,996 patients were analyzed. In general, the quality of the studies was low. Operating time ranged between 5 and 50 minutes. Hospital stay was one day for most patients, whereas the return to normal activities was between two and three days in most cases. Postoperative pain was present in 18.5% of patients. Three patients experienced significant postoperative hemorrhages. There were no other major complications. The overall recurrence rate was 9.0% for prolapse, 7.8% for bleeding, and 4.7% for pain at defecation. The recurrence rate at one year or more was 10.8% for prolapse, 9.7% for bleeding, and 8.7% for pain at defecation. When reported as a function of the hemorrhoidal grade, the recurrence rate was higher for fourth-degree hemorrhoids (range, 11.1–59.3%).

CONCLUSION: Transanal hemorrhoidal dearterialization appears to be a potential treatment option for second-degree and third-degree hemorrhoids. Clinical trials and longer follow-up comparing it with other procedures used to treat hemorrhoids are needed to establish a possible role for this technique.

KEY WORDS: Transanal hemorrhoidal dearterialization; Hemorrhoidal artery ligation; Doppler-guided.

The search for a painless surgical treatment for hemorrhoids has in recent years seen the advent of new modalities based on principles different from the principles of conventional hemorrhoidectomy. Among these new surgical techniques, transanal hemorrhoidal dearterialization (THD), also known as Doppler-guided hemorrhoidal artery ligation, represents an innovative approach that has captured the interest of many surgeons. This nonexcisional technique is based on the closure of the hemorrhoidal arterial flow that feeds the hemorrhoidal plexus, through a Doppler-guided identification and ligation of the terminal branches of the superior rectal artery.[1] This is efficiently achieved with the use of a specifically designed proctoscope coupled with a Doppler transducer. At the distal end of the Doppler transducer, there is a small window that allows suturing of the rectal mucosa 2 to 3 cm above the dentate line. With a clockwise rotation of the proctoscope, the Doppler probe allows for the accurate localization of all the terminal branches of the hemorrhoidal arteries, which are then sequentially sutured where appropriate. The reduction in blood flow to the hemorrhoids should lead to shrinkage of the hemorrhoidal cushions and consequent symptomatic improvement. With this technique the sensitive anoderm below the dentate line is avoided, minimizing postoperative pain and potentiat-

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Dis Colon Rectum 2009; 52: 1665–1671
DOI: 10.1007/DCR.0b013e3181af50f4

ing quicker recovery times. Since the encouraging initial results reported by Morinaga and colleagues in 1995, THD has gradually gained in popularity among surgeons,[2–11] yet how this technique works exactly remains controversial, and skepticism persists with regard to its efficacy. The aim of this review is to assess the current evidence on THD to establish the safety and effectiveness of the technique, define its indications, and identify its possible advantages and disadvantages.

MATERIALS AND METHODS

THD was defined as "a Doppler-guided localization and transfixion of the terminal branches of the superior rectal artery (SRA) with or without mucosopexy." THD studies published in peer-reviewed journals, including retrospective and prospective series, prospective randomized and nonrandomized trials, were searched and selected in the MEDLINE, EMBASE, and Cochrane Library databases with use as key words "hemorrh," "Doppler," "artery ligation," "transanal," "dearterialization," "HAL," and "THD." No language restrictions were used in our inclusion of relevant studies. The search period started in 1995, when this technique was first reported.[1] Potentially relevant studies were identified by the title and the abstract, and full papers were obtained and judiciously studied. Studies published in languages other than English were translated and the full article was evaluated. All letters, abstracts, and personal communications were excluded. A specifically designed data form was generated to facilitate the accurate collection of all relevant data, including the patients' details, demographics, and clinical characteristics, type of treatment, complications, and recurrences. Data collection and analysis was performed independently by two researchers (GG and FM).

The primary outcome measures of our review were postoperative pain and hemorrhoidal recurrences in terms of recurrent bleeding or hemorrhoidal prolapse. Secondary outcome measures were operative and postoperative complications, pain on defecation, anal stenosis, fecal urgency, and fecal incontinence. Other complications were also analyzed, including fistulas, skin tags, pruritus, and fissures. The continuous variables adopted the mean and standard deviation (mean ± SD) for parameters that assumed a normal distribution, median, and range (minimum and maximum) for those not normally distributed. Normality distributions were verified with histograms, Kolmogorov-Smirnov, and Shapiro-Wilk testings. Description of categorical variables used relative frequencies.

RESULTS

Twenty-eight references were selected from the electronic databases.[1–28] After careful reading, 11 articles were excluded: one [19] because the same group of patients was included in a more recent, larger series[26]; two because they were letters to the editor that commented on other articles[21,22]; one because it was a poster presentation at a conference[5]; one because the procedure consisted of hemorrhoidal ligation without Doppler guidance[20]; five because, after identification of the arteries with the Doppler probe, the authors used phenol injections to correct the symptoms[15,16,23–25]; and one because it was not published in a peer-reviewed journal.[27] Seventeen articles meeting the inclusion criteria were analyzed[1–4,6–14,17,18,26,28] and their quality was assessed by use of the GRADE system (Table 1).[29] Sixteen of these articles were observational studies reporting on case series[1–3,6–14,17,18,26,28] and one article was a randomized trial comparing THD with conventional hemorrhoidectomy.[4] Study quality ranged from low to very low (Table 1).

Patient Characteristics

Across all of the articles, 1,996 patients were evaluated (Table 2). The patients ranged from 21 to 93 years of age, where 58.4% (1,166/1,996) were males and 41.6% (830/1,996) were females. According to the data available, 2.0% of patients were affected by first-degree hemorrhoids (6/305), 36.3% by second-degree hemorrhoids (482/1,329), 57.4% by third-degree hemorrhoids (912/1,589), and 14.6% by fourth-degree hemorrhoids (189/1,295). Two hundred twenty-three patients had previously undergone rubber-band ligation, 322 had undergone sclerotherapy, 13 had undergone cryotherapy, 2 had undergone stapled hemorrhoidopexy, and 3 had undergone Milligan-Morgan hemorrhoidectomy.[7,14,26]

Surgical and Intraoperative Data

Ten studies did not specify the type of anesthesia adopted.[1,2,5,6,9,10,12,14,17,18] Among the other studies, patients were operated on with general anesthesia,[11] locoregional anesthesia,[3,4,7,8,28] or both general and locoregional anesthesia in conjunction.[13,26] In the studies of Dal Monte and Cantero, a plication of the rectal mucosa was performed after the localization and transfixion of the hemorrhoidal arteries was completed.[26,28] Thirteen studies specified the device used for the procedure[1,3,6–10,12–14,17,26,28]: the HAL-Doppler instrument (A.M.I., Feldkirch, Austria) in six studies (844 patients),[7–10,13,17] the KM-25 device (VaiDan Medical Corporation, St. Petersburg, FL) in four studies (362 patients),[3,6,12,14] the KM-25 Moricorn (Hayashi Denki Co., Tokyo, Japan) in one study (116 patients)[1], and the THD instrument (G.F. Medical Division, Correggio, Italy) in two studies (380 patients).[26,28] Twenty-three patients received other procedures in conjunction with the THD, such as fissurectomies, resection of skin tags, and herniorrhaphies.[8]

TABLE 1. Quality of the studies analyzed evaluated according to the GRADE system

Reference	*Study design*	*Study quality*	*Consistency*	*Directness*	*Other modifying factors*	*Overall quality*
Morinaga *et al.* 1995[1]	Prospective observational study	No serious limitations	No important inconsistency	Direct	Imprecise data	Very low
Sohn *et al.* 2001[2]	Retrospective observational study	No serious limitations	No important inconsistency	Different classification of hemorrhoidal prolapses	None	Very low
Arnold *et al.* 2002[12]	Prospective observational study	No serious limitations	Important inconsistency (follow-up not reported; most degree of prolapses included)	Direct	None	Very low
Shelygin *et al.* 2003[18]	Retrospective observational study	No serious limitations	No important inconsistency	Direct	None	Low
Charúa Guindic *et al.* 2004 [3]	Prospective observational study	No serious limitations	No important inconsistency	Direct	Imprecise data (no reason given for excluded 7 THD patients)	Very low
Bursics *et al.* 2004[4]	Prospective randomized trial	No blindness, inappropriate randomization	No important inconsistency	Direct	None	Low
Lienert and Ulrich 2004[13]	Prospective observational study	No serious limitations	Important inconsistency (59% patients completed follow-up; all degrees of prolapses included)	Direct	None	Very low
Narro *et al.* 2004[14]	Retrospective observational study	No serious limitations	No important inconsistency	Direct	Imprecise data	Very low
Vavra *et al.* 2004[17]	Retrospective observational study	Small sample size, no description of hemorrhoidal degrees, scant methodologic data	No important inconsistency	Lack of data for hemorrhoidal degrees	Imprecise and sparse data	Very low
Ramirez *et al.* 2005[6]	Prospective observational study	No serious limitations	Important inconsistency (low sample size)	Direct	Imprecise data	Very low
Felice *et al.* 2005[7]	Prospective observational study	No serious limitations	No important inconsistency	Direct	None	Low
Scheyer *et al.* 2006[8]	Prospective observational study	Long-term follow-up evaluated by questionnaire	Important inconsistency (26% patients completed follow-up; most degree of prolapses included)	Direct	Imprecise data: symptoms at long-term follow-up evaluated by questionnaire	Very low
Greenberg *et al.* 2006[9]	Prospective observational study	No serious limitations	No important inconsistency	Direct	None	Low
Wallis de Vries et al. 2007 [10]	Prospective observational study	Long-term follow-up evaluated by phone calls	No important inconsistency	Direct	Imprecise data: long-term follow-up data consist of patient satisfaction rate	Very low
Abdeldaim *et al.* 2007[11]	Prospective observational study	No serious limitations	No important inconsistency	Direct	Sparse data (low number of patients)	Very low
Dal Monte *et al.* 2007[26]	Retrospective observational study	No serious limitations	No important inconsistency	Direct	None	Low
Cantero *et al.* 2008[28]	Prospective observational study	No serious limitations	No important inconsistency	Direct	None	Low

TABLE 2. Description of selected studies

Reference	THD patients	Age	Sex (males)	Degree of prolapse	Preoperative bleeding (pts.)	Preoperative pain (pts.)	Preoperative prolapse (pts.)	Operating time (min)	No. of arteries ligated	Day case procedures
Morinaga *et al.* 1995[1]	116	–	72 (62.0%)	–	52 (44.8%)	96 (82.8%)	64 (55.2%)	(20–35)	–	–
Sohn *et al.* 2001[2]	60	48 (22–87)	44 (73.3%)	2, 3, 4	51 (85.0%)	7 (11.7%)	49 (81.7%)	(20–35)	≥ 6	60 (100%)
Arnold *et al.* 2002[12]	105	51 (23–69)	62 (59.0%)	2, 3, 4	83 (79.0%)	54 (51.4%)	43 (41.0%)	–	8	3 (3%)
Shelygin *et al.* 2003[18]	72	44 ± 4.3	49 (67.1%)	2, 3, 4	–	–	–	–	4–7	–
Charúa Guindic *et al.* 2004[3]	49	43 (21–75)	32 (65.3%)	2, 3	–	–	–	–	4–5	–
Bursics *et al.* 2004[4]	30	47 ± 15	18 (60.0%)	1, 2, 3, 4	23 (76.7%)	11 (37.0%)	3 (10.0%)	–	6 ± 2	–
Lienert and Ulrich 2004[13]	248	55 (22–93)	132 (53.2%)	1, 2, 3, 4	–	–	–	(5–25)	5 (1–14)	–
Narro *et al.* 2004[14]	281	45 (27–88)	169 (60.1%)	1, 2, 3	–	–	62 (22.0%)	–	≤ 4	281 (100%)
Vavra *et al.* 2004[17]	10	44 (31–68)	10 (100%)	–	–	–	–	17 (14–24)	2–3	–
Ramirez *et al.* 2005[6]	32	43 (26–76)	15 (46.8%)	3, 4	32 (100%)	–	32 (100%)	27 (18–43)	≥ 6	32 (100%)
Felice *et al.* 2005[7]	68	48 (21–74)	40 (58.8%)	3	56 (82.3%)	11 (16.2%)	68 (100%)	18 (15–30)	6	68 (100%)
Scheyer *et al.* 2006[8]	308	50	189 (61.4%)	2, 3, 4	241 (78.2%)	150 (48.7%)	165 (53.6%)	–	6	25 (8.1%)
Greenberg *et al.* 2006[9]	100	42	42 (42.0%)	2, 3	95 (95.0%)	–	16 (16%)	19 (12–40)	≥ 6	95 (95%)
Wallis de Vries *et al.* 2007[10]	110	48 (25–80)	64 (58.2%)	2, 3	–	–	–	16 (12–23)	7	110 (100%)
Abdeldaim *et al.* 2007[11]	27	58 (30–86)	17 (63.0%)	–	26 (96.3%)	11 (40.7%)	15 (55.6%)	35 (20–50)	4 (3–6)	27 (100%)
Dal Monte *et al.* 2007[26]	330	52 (24–85)	180 (54.5%)	2, 3, 4	212 (64.2%)	–	192 (58.2%)	–	6	–
Cantero *et al.* 2008[28]	50	45 (25–78)	31 (62%)	3	35 (70%)	40 (80%)	6 (12%)	25 (20–35)	6.5	–

pts. = patients; – = results absent or not clearly reported in the text.

TABLE 3. Early postoperative outcomes

Postoperative early events	*No. of patients (%)*
Postoperative pain (first day)	353/1905 (18.5)
Residual protrusions	61/485 (12.6)
Bleeding	86/1986 (4.3)
Fever	15/383 (3.9)
Thrombosed hemorrhoids	25/1386 (1.8)
Anal fissure	14/1695 (0.8)
Urinary retention	10/1468 (0.7)
Incontinence	3/693 (0.4)
Anal fistulas	3/815 (0.4)
Proctitis	2/909 (0.2)
Stool retention	1/711 (0.1)

Early Postoperative Results

The early postoperative events are described in Table 3. Three patients experienced significant hemorrhages[3,7,14]: one patient was reported to have lost 1.3 liter of blood during a postoperative hemorrhage, requiring a blood transfusion and surgical intervention to achieve hemostasis[3]; another patient bled during the eighth postoperative day and required two transfusions to recover completely[7]; and a third patient with coagulopathy experienced bleeding.[14] Three studies reported data on the length of hospitalization,[4,12,26] which for most patients lasted for one day. The patients' normal activities were restored on average two to three days postoperatively,[4,14,28] but one study reported that the mean was 3.5 days (range, 1–14 days).[26]

Follow-Up Results

Table 4 describes the individual results of all studies included, and the overall results are presented in Table 5. Seventy-seven percent of patients completed the follow-up (1,540/1,996). Twenty-seven patients underwent a second THD procedure to correct a recurrent hemorrhoidal prolapse.[10–11,14] When those studies with a follow-up of one year or more were analyzed,[4,6,8,9,26,28] prolapse was present in 10.8% of patients (46/427), bleeding in 9.7% of patients (49/507), and pain on defecation in 8.7% of patients (18/206). The comparison of results obtained between studies with a follow-up equal to or greater than 12 months[4,6,8–9,26,28] with studies with a follow-up of less than 12 months[1–3,5,7,10,11,12,13,18] found a significant increase in the occurrence of bleeding (<12 months, 40/638 = 6.3% *vs.* ≥12 months, 49/507 = 9.7%; chi-squared test, $P < 0.05$), a significant increase in pain on defecation (<12 months, 35/917 = 3.8% *vs.* ≥12 months 18/206 = 8.7%; chi-squared test, $P < 0.01$), and no significant changes in the occurrence of prolapse (<12 months, 50/638 = 7.8% *vs.* ≥12 months, 46/427 = 10.8%; chi-squared test, P = NS).

One study reported results classified according to the preoperative hemorrhoidal degree.[8] In this study, 6.7% of patients affected by second-degree hemorrhoids, 13.5%

TABLE 4. Results of each study at the end of follow-up

Reference	Follow-up (months)	Patients completed follow-up (%)	Patients with bleeding (%)	Patients with pain on defecation (%)	Patients with prolapse (%)
Morinaga *et al.* 1995[1]	5–12	116 (100)	–	–	–
Sohn *et al.* 2001[2]	3–4	60 (100)	6 (10)	2 (3)	4 (7)
Arnold *et al.* 2002[12]	–	105 (100)	4 (4)	5 (5)	26 (25)
Shelygin *et al.* 2003[18]	11	72 (100)	4 (5.6)	0	2 (2.8)
Bursics *et al.* 2004[4]	12 (±5)	30 (100)	1 (3)	2 (7)	–
Charúa Guindic *et al.* 2004 [3]	4	49 (100)	0	0	0
Lienert and Ulrich 2004[13]	1,5	147 (59)	22 (15)	17 (12)	6 (4)
Narro *et al.* 2004[14]	24	279 (99.3)	–	3	–
Vavra *et al.* 2004[17]	–	–	–	–	–
Felice *et al.* 2005[7]	11 (3–18)	68 (100)	1 (1)	0	2 (3)
Ramirez *et al.* 2005[6]	12	32 (100)	6 (19)	–	7 (22)
Greenberg *et al.* 2006[9]	12	96 (96)	11 (11)	0	0
Scheyer *et al.* 2006[8]	18	80 (26)	17 (21)	16 (20)	30 (37)
Abdeldaim *et al.* 2007[11]	6	27 (100)	2 (7)	1 (4)	1 (4)
Wallis de Vries *et al.* 2007 [10]	9 (5.5–14.5)	110 (100)	1 (1)	7 (6)	9 (8)
Dal Monte *et al.* 2007[26]	46 (22–79)	219 (66)	10 (5)	–	9 (4)
Cantero *et al.* 2008[28]	12	50 (100)	4 (8)	–	–

– = results absent or not clearly reported in the text.

of patients affected by third-degree hemorrhoids, and 59.3% of patients affected by fourth-degree hemorrhoids had a residual prolapse at the follow-up. Bleeding was present in 2.2% of patients with second-degree hemorrhoids, 6.8% of patients with third-degree hemorrhoids, and 3.7% of patients with fourth-degree hemorrhoids. Pain on defecation was reported in 1.1% of patients with second-degree hemorrhoids, 2.2% of patients with third-degree hemorrhoids, and 0% of patients with fourth-degree hemorrhoids.[8] One study reported long-term results classified on the basis of preoperative hemorrhoidal degree after one year of follow-up.[26] In this study, the relapse rate was 4.8% (5/104) for third-degree hemorrhoids and 26.7% (4/15) for fourth-degree hemorrhoids (Fisher's exact test, $P < 0.01$), with a relative risk of 5.6 for fourth-degree hemorrhoids when compared with third-degree hemorrhoids. In the same study, the application of the mucosal plication after the regular transfixion of vessels produced differences in the occurrence of relapse.[26] Within the subgroup that implemented the figure-eight technique, the relapse rate for patients with third-degree hemorrhoids was 6% (3/50), but in the subgroup that used plication, the relapse rate was 3.7% (2/54). For those patients with fourth-degree hemorrhoids, relapse was 50% (3/6) in the figure-eight subgroup and 11.1% in the plication subgroup. However, this apparent difference between the subgroups described did not reach statistical significance (Fisher's exact test, $P = 0.6696$ for the third-degree group and 0.3034 for the fourth-degree group).[26]

TABLE 5. Overall results

Overall results	No. of patients (%)
Itching	27/254 (10.6)
Prolapse	96/1065 (9.0)
Bleeding	89/1145 (7.8)
Pain at defecation	53/1123 (4.7)
Anal fissure	4/177 (2.3)

DISCUSSION

The pathophysiology of hemorrhoidal disease remains controversial. Vascular hyperplasia,[30,31] internal anal sphincter tone,[32–34] degeneration of connective tissue,[35,36] sliding of the hemorrhoidal cushions, impaired venous drainage,[37] and malfunction of the arteriovenous shunts within the hemorrhoidal plexus[38] may all play a role in the development of hemorrhoidal disease. Although it is not fully understood what the exact initiating factor or combination of factors might be, several anatomic and clinical studies demonstrated a substantial contribution of vascular hyperplasia to the development of hemorrhoids.[30,31] An excessive distention of the plexus arises secondary to the vascular hyperplasia. This may lead in turn to the destruction of the muscular and connective tissue forming the suspensor ligaments of the hemorrhoidal cushions over time, which may then cause a further imbalance between in-flow and out-flow and further laxity of the connective tissue.

In 1975, Thomson suggested that prolapse of the hemorrhoidal cushions and anal mucosa could be the actual predisposing pathologic factor in the development of hemorrhoids, rather than a consequence of it.[37] As a result of the prolapse, the venous drainage from a hemorrhoid may be impeded, leading to further engorgement and damage to the suspensory ligaments. Whatever the main initiating factor may be, there is no doubt that both arteriovenous flow imbalance and prolapse are the main contributory factors in the development of hemorrhoidal disease. A re-

cent anatomic study demonstrated that the terminal branches of the SRA solely contribute to the arterial blood supply of the hemorrhoidal plexus.[39] In patients with hemorrhoidal disease these branches are dilated with an associated increase in blood flow.[40] Furthermore, patients with more advanced disease have larger vessels with a higher flow[40] suggesting an important and possibly predominant role of increased arterial blood flow in the development of vascular hyperplasia.

THD aims to correct the physiology of the hemorrhoidal plexus by restoring the normal anatomy of the hemorrhoidal cushions. This is achieved by reducing the arterial in-flow in a technically very simple manner, *via* the accurate localization and transfixion of the terminal branches of the SRA. The potential advantages over other techniques, such as sclerotherapy and rubber band ligation, are that the dearterialization is guided by a Doppler probe, rather than being undertaken blindly, and is achieved by a robust transfixion of the arteries. The importance of accurately locating and effectively transfixing the branches of the SRA has not been established yet in clinical trials and no studies compared THD *vs.* sclerotherapy, THD *vs.* rubber band ligation, or THD performed with *vs.* without Doppler guidance. However, the use of Doppler guidance has been shown to noticeably improve the outcome of sclerotherapy[24] and it is possible that the accurate location and the effective transfixion of the branches of the SRA are also important determinants in achieving a successful dearterialization with THD. Miles postulated that the course of the arterial branches of the SRA within the rectal submucosa was constant and determined the position of each pile around the anal circumference.[41] This pattern is only observed in 19% of patients,[37] and the distribution of the SRA varies widely as do the entry points of its distal branches into the rectal muscle layers.[37,39] Studies examining the distribution of the SRA have demonstrated a great variation in number and position of terminal branches[37,39] with an average of five branches of the superior rectal arteries reaching the hemorrhoidal zone, ranging from one to eight vessels.[37] In this review most of the authors using Doppler guidance identified and successfully transfixed on average six arteries.

The review of the literature for THD has revealed only one trial published in full and the vast majority of current evidence relies mostly on observational studies consisting of case series of surgeons pioneering the technique. Consequently, the level of evidence provided is inevitably low to very low and it is therefore impossible to draw any definitive conclusion or to comment on how THD would compare with more established techniques. Nevertheless, the results from approximately 2,000 patients present the potential benefits of THD for treating hemorrhoids. Overall, there was a reduction in hemorrhoidal bleeding and prolapse improvement in more than 90% of patients treated. Long-term follow-up, when available, showed that the results were consistent over time, suggesting a long-lasting effect of the treatment. A further advantage conveyed by THD is that the procedure allowed the accurate application of sutures in the area above the dentate line, thereby minimizing the risk of postoperative pain and complications. In fact, a common finding in all of the studies analyzed was that there was a minimal requirement for postoperative analgesia and a similar incidence of postoperative pain on the first postoperative day (less than 20% of patients). Considering its safety profile, in almost 2,000 cases very few significant complications, including three patients that required blood transfusions, and a few minor complications were reported.

Different results were obtained on fourth-degree hemorrhoids. Only two studies specifically addressed this issue and, when data were available, recurrence or persistence of prolapse reached rates of up to 50 to 60%.[8,26] The addition of mucosopexy seemed to drop recurrence rates to 11%.[26] The rationale behind undertaking a mucosopexy in THD is to reduce the hemorrhoidal/mucosal rectal prolapse without excising any tissue. Because it has been suggested that mucosal sliding may impair venous drainage,[37] it is possible that the mucosopexy might reduce recurrences, not only by fixing the prolapse, but also by improving the venous drainage. Repositioning of the hemorrhoidal cushions *in situ* as opposed to excising them also conveys the advantage of restoring the physiological role of these structures in the continence mechanism, because it has indeed been demonstrated that the cushions contribute to approximately 15 to 20% of the anal resting pressure[42] and may serve as a "plug" ensuring complete closure of the anal canal. However, the experience with THD for the treatment of IV hemorrhoids (with or without mucosopexy) remains too limited (to only two articles that present an overall small group of patients) to draw any definitive conclusions. Future studies are now required to properly address this issue.

CONCLUSIONS

On the basis of the available evidence, THD would appear to be a potential nonexcisional technique for the treatment of second-degree and third-degree hemorrhoids, the main advantages being minimal postoperative pain and quick recovery. However, in the light of the poor quality of the studies currently available, clinical trials and longer follow-up are required to establish the possible role of this technique compared with other interventions available for the treatment of hemorrhoids.

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