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The evolving role of THD in hemorrhoids

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ABSTRACT

THD® Doppler procedure is commonly utilized to manage hemorrhoidal disease. It has contributed to significant change in the therapeutic approach to this condition. Its purpose is to reduce the arterial overflow to the hemorrhoids by Doppler-guided dearterialization and reduction of hemorrhoidal prolapse by mucopexy. The dearterialization should be considered mandatory, while the mucopexy can be tailored according to the presence and grade of hemorrhoidal and mucosal prolapse. This procedure is overall safe, with minimal risk of life-threatening events or chronic complications, and low risk of recurrence. Postoperative management should allow a regular physiologic bowel movement, avoiding excessive trauma to the area of operation, and giving the best chance for a good long-term outcome.

Introduction

Hemorrhoidal disease (HD) is very prevalent in the general population and its presence negatively impacts quality of life. While the first line of therapy for the majority of patients is conservative management, some patients with severe presenting symptoms or those who fail medical treatment require a procedural intervention. However, patients are usually concerned about the "classical" excisional option because of postoperative pain and some theoretical risk of fecal continence impairment. This has prompted surgeons to search for less traumatic interventions which can address the patient's symptoms while minimizing risks and improving the postoperative recovery experience. As such, several alternatives have been proposed in the last 2 decades to treat HD, including the stapled hemorrhoidopexy and Doppler-guided transanal hemorrhoidal dearterialization with/out mucopexy (mostly performed with either THD® Doppler or DG-HAL technique).[1,4] Of particular interest is the pathophysiology basis justifying the use of dearterialization and mucopexy. Their adoptions have produced interesting results, but also stimulated a variety of technical modifications which in turn have sometimes generated confusion about the main aims of the operation. In this paper, we attempt to clarify the technical aspects of the THD® Doppler procedure and discuss the currently available literature on outcome.

Background of hemorrhoidal dearterialization and mucopexy

The aim of hemorrhoidal dearterialization is to achieve a significant reduction in the arterial blood flow to the hemorrhoidal tissues, which is characteristically increased in patients with HD. The anatomical and physiological characteristics of hemorrhoids have not been fully elucidated. Microscopically, hemorrhoids consist of sinusoidal vessels with direct arterio-venous communications. Traditionally, hemorrhoids have been considered to be localized to the left lateral, right posterolateral, and right anterolateral sites around the circumference of the anal canal. However, this configuration has been demonstrated in less than 20% of patients.[5] In reality, a wider network of arterial and venous vessels has been described.[6] In an autopsy study, Schuurman et al. found an average of eight tortuous thin submucosal arteries originating from the superior hemorrhoidal artery that supply the hemorrhoidal cushions, 2–3 cm above the dentate line.[7] Smaller branches from these arteries also form a plexus in the rectal corpus cavernosum. In a study we previously published we found that most arterial branches situated in the rectum (from 4 to 6 cm above the dentate line) reside outside the rectal wall, while 98% of the hemorrhoidal arteries in the lowest 2 cm are in the submucosa of the six sectors of rectal circumference (96.6% at 2 cm and 100% at 1 cm from the dentate line).[8] Investigation of the arterial position within the rectal layers at various levels showed that the mean arterial depth decreased significantly from the highest to the lowest level, reaching the most superficial depth in the most distal 2 cm of the rectum where nearly all of the arteries become submucosal. These features can be easily confirmed during Doppler-guided surgical procedures. The Doppler signals vary with the artery position (perirectal, traversing the rectal wall, or submucosal), the distance from the Doppler probe, and the direction of blood

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flow in relation to the ultrasound waves emitted by the probe. The proximity of the artery to the probe when the artery is located within the submucosa makes the Doppler signal higher than that perceived at more proximal sites. Normally, the hemorrhoidal cushions are supported at the dentate line by the muscularis mucosa and are loosely attached to the internal sphincter. Moreover, the rectal submucosa supports the hemorrhoids to keep them within the upper anal canal at rest. During defecation the hemorrhoids roll downward, favored by relaxation of the internal anal sphincter. The fecal bolus exerts shearing forces on the hemorrhoids, facilitating their physiologic prolapse. The internal hemorrhoids thus descend outwards. However following defecation, the elasticity of the rectal submucosa helps to pull the hemorrhoids back up into the anal canal. In patients with HD, the effects of altered defecation and other predisposing factors cause the rectal submucosa to progressively lose its elasticity, resulting in a pathological hemorrhoidal prolapse. The progressive deterioration of both the connective tissue stroma (Parks' ligaments) and anchoring system (Treitz's muscle) plays a major role in this process. The severity of prolapse is related to persistence of pathogenic factors, hemorrhoidal engorgement, and progressive loss of rectal submucosa elasticity. The mucopexy (MP) that is often performed in combination with the THD® Doppler technique consists of plication of rectal mucosa and submucosa that has been affected by the loss of elasticity. The hemorrhoidal tissue is reduced back up into the rectal ampulla and anchored in place, recovering its normal anatomic position. The scarring process induced by MP serves to affix the plicated mucosa and submucosa to the underlying rectal muscularis.

Indications for THD® Doppler procedure

The THD® Doppler procedure should be reserved to patients with active HD whose symptoms persist despite lifestyle/diet interventions, drug therapy, and office-based procedures. Indications for intervention should be based on the patient's symptoms and physical findings. When hemorrhoidal bleeding is the principal complaint, dearterialization alone with ligation of Doppler-identified hemorrhoidal arteries around the circumference of the low rectum is all that is needed. Usually, at least six arteries are identified and ligated using the THD® Doppler device. If bleeding is associated with hemorrhoidal or muco-hemorrhoidal prolapse, one or more MP should be performed in addition to the dearterialization. Of course, the accurate evaluation of hemorrhoidal prolapse is based on the detailed patient's description (including his/her ability to reduce it inside) and physical examination. Only a reducible hemorrhoidal prolapse should be candidate to THD® Doppler procedure. Fixed, non-reducible prolapse should be treated with excision. Full-thickness internal or external prolapse must be identified and considered a contraindication to this approach. Skin tags must be considered not treatable by THD® Doppler procedure but only with excision. If patient is symptomatic from the skin tags, it is possible to perform THD® Doppler and skin tags excision in the same operation.

Special attention should be dedicated to female patients with clear symptoms of obstructed defecation and/or physical evidence of rectocele. Even if the hemorrhoidal condition by itself could indicate the adoption of THD® Doppler procedure, this decision should be taken with caution. Indeed, the altered defecation mechanism occurring after the operation could disrupt the mucopexy sutures located at the level of rectocele, and cause acute bleeding in the postoperative period and/or progressive prolapse recurrence in the long-term. Complete assessment of obstructed defecation should precede any decision about surgical approach for HD.

THD® Doppler technique

In preparation for surgery, one or two enemas are performed to clean the rectum. Antibiotic prophylaxis, although not to considered mandatory, are often administered. The operation can be performed under either general or locoregional anesthesia. Propofol and fentanyl anesthesia with control of the airway by placement of a laryngeal mask combines the advantages of general anesthesia with complete control of vital parameters, quick reversal of medications, and early hospital discharge. Spinal anesthesia can be confined to the most caudal metameric nerve roots avoiding any prolonged bed rest. The patient can be positioned in either lithotomy or prone jackknife position, depending on the surgeon's preference.

The THD® Doppler procedure is performed using a specifically designed commercial device (THD Slide®, THD S.p.A., Correggio, Italy), consisting of a proctoscope equipped with a Doppler probe and a light source. The proctoscope allows the operator to slide the part bearing the Doppler probe longitudinally and to alter the size of the operative window as needed. The recommended suture is absorbable 2–0 polyglycolic acid on a 5/8-inch needle (included in the disposable kit). THD® Doppler is based on two technical steps: (1) targeted ligation of hemorrhoidal arteries (named "dearterialization"), under the guide of Doppler; (2) plication and lifting of prolapsing rectal mucosa/submucosa (named "mucopexy" - MP). Aim of dearterialization is to significantly reduce the arterial overflow to the hemorrhoids. Following gel lubrication, the proctoscope is inserted through the anal canal reaching the low rectum, about 6–7 cm from the anal verge. The Doppler system is then turned on. The Doppler signal corresponding to all 6 main trunks of the hemorrhoidal arteries (which are most frequently located at 1, 3, 5, 7, 9, and 11 o'clock of the low rectal circumference) is sought by slowly rotating clockwise and/or tilting the proctoscope, and makes possible a correct identification of those arteries when not located at the usual odd hours positions. The proctoscope is pulled slowly back to follow the artery distally up to the hemorrhoidal apex, and the best Doppler signal is searched for. According to the features from our previous study, the Doppler signal is quite clear at the proximal site (corresponding to the proximal part of the lower rectum, where the hemorrhoidal arteries usually lie in the perirectal fat), attenuated or absent at the intermediate site (where the arteries travel through the rectal wall), and again clear at the distal site (within the most distal 2 cm of lower rectum, where the arteries lie in the rectal submucosa, just above the internal hemorrhoidal piles, Fig. 1).[8] The best place to find the hemorrhoidal arteries is the most distal part of the rectum. This is the fundamental principle of distal Doppler-guided dearterialization (DDD).[9] Then, the Doppler system is turned off. If the patient is a candidate for dearterialization alone (complaining bleeding only, without prolapse), each artery, once

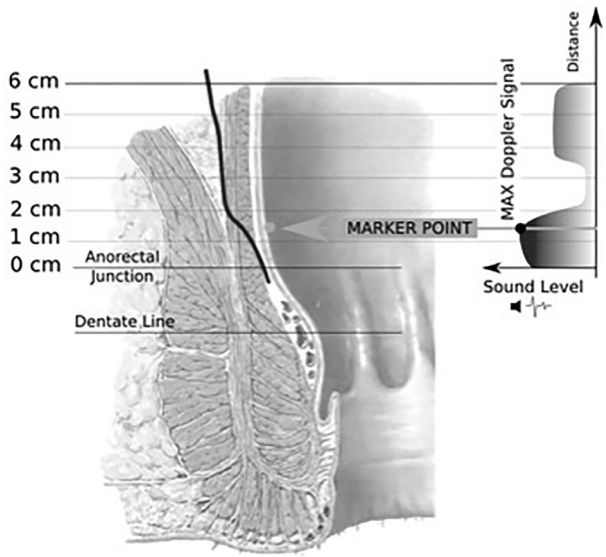

Fig. 1. Anatomical course of a hemorrhoidal artery and different levels of Doppler signal related to the position of the artery.

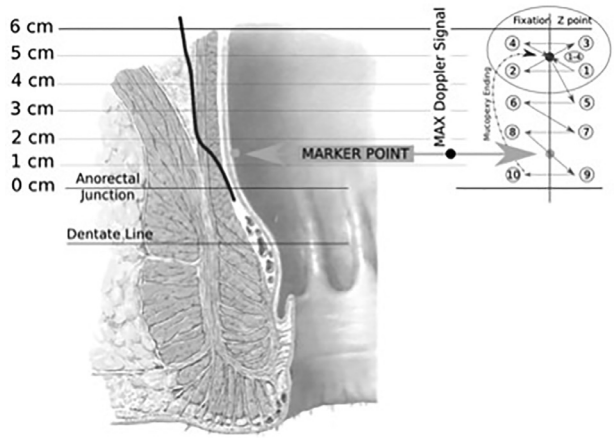

Fig. 2. Mucopexy fixation point and continuous suture.

identified, can be directly ligated with a "Z-stitch". When the patient needs to undergo dearterialization and MP (due to a hemorrhoidal or muco-hemorrhoidal prolapse), the rectal mucosa can be marked ("marker point") at the site of the best Doppler signal (Figs. 2, 3) to indicate where the arterial flow will be interrupted. Then, the MP follows: the proctoscope is again pushed fully inside the distal rectum, a "Z-stitch" is made as a proximal "fixation point" of MP, and the knot is tied (Fig. 4). Thereafter, moving back only the sliding part of the proctoscope, a continuous suture is carried out, including the redundant and prolapsing mucosa and submucosa, in a proximal-to-distal direction, along a longitudinal axis. The recommended distance between each passage of the suture is approximately 0.5 cm, optimal to avoid sutures too tight or too loose. While performing MP, when the "marker point" is visualized, the surgeon makes a passage of the running suture above and another below the "marker point" (Figs. 5, 6) to entrap the hemorrhoidal artery within the running suture and accomplish the dearterialization. Each MP should be spaced from the adjacent one to guarantee enough blood outflow from the hemorrhoids via the venous plexus to minimize risk of thrombosis. The MP running suture is stopped at the proximal apex of the internal hemorrhoid (usually corresponding to the color variation of mucosa from the pink rectal mucosa to the purple/darker anal canal mucosa), avoiding its inclusion into the MP. When performed this way, the THD® Doppler method can effectively be considered a hemorrhoid-sparing procedure. Finally, the suture is gently tied (Fig. 7). MP can be tailored according to the severity of hemorrhoidal prolapse. In case of

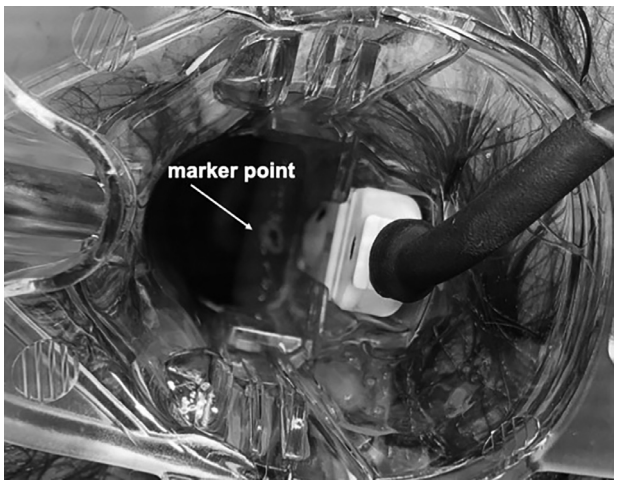

Fig. 3. "Marker point" on the distal rectal mucosa to identify the best Doppler signal obtained from the submucosal hemorrhoidal artery.

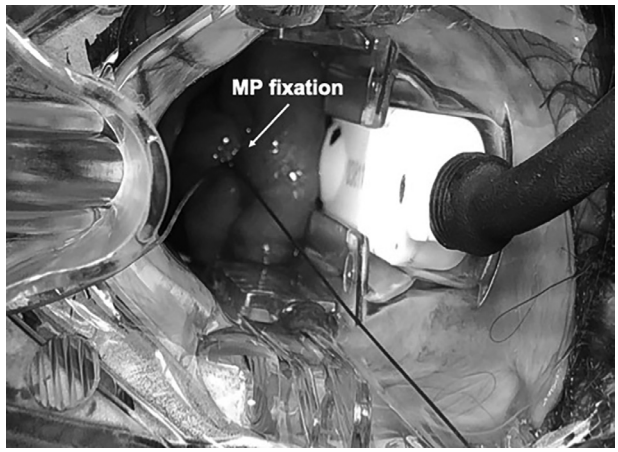

Fig. 4. Fixation point at the proximal edge of the mucopexy continuous suture.

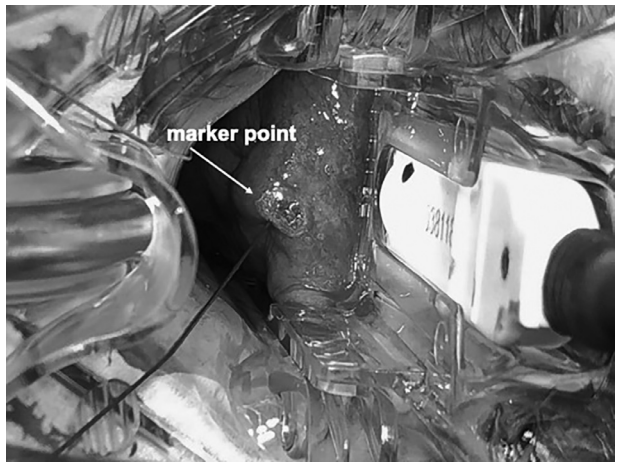

Fig. 5. Mucopexy: passage of the running suture above the "marker point".

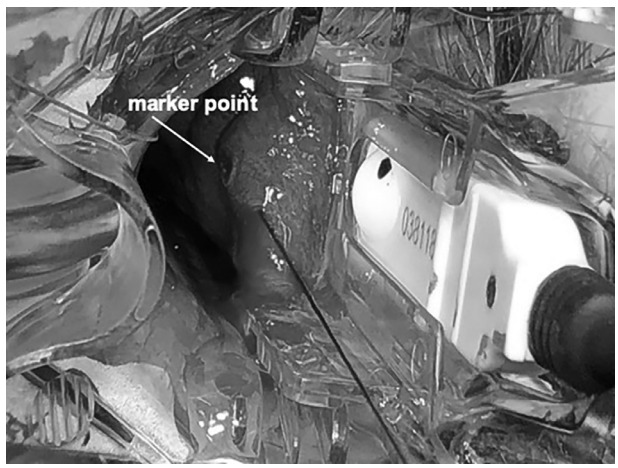

Fig. 6. Mucopexy: passage of the running suture below the "marker point".

circumferential prolapse performance of six MPs is preferred, but if the prolapse is located only in part of the circumference, only a limited number of MPs, is performed.

Special considerations when performing this procedure include:

1) female patients, correct performing of MP on the anterior rectal wall (at 11 and 1 o'clock in lithotomy position) does not need any protection of the vaginal wall because the procedure involves

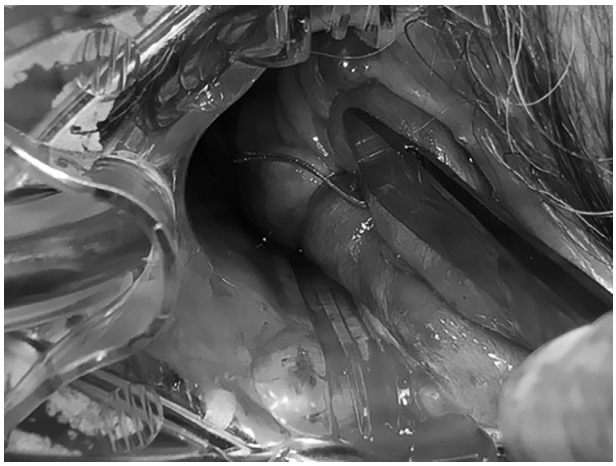

Fig. 7. Final aspect of mucopexy suture, which has reached the apex of the internal hemorrhoidal pile (covered by the instrument).

rectal mucosa and submucosa only. However due to the particular anatomic relationship between rectum and vagina, surgeon must pay attention to avoid any deep passage of suture, particularly if a distal rectocele has been identified

2) in both male and female patients, doing MPs on the posterior rectal wall (at 5 and 7 o'clock), surgeon must evaluate for the presence of posterior bulging of prolapsing rectal wall. When present, this bulging rectal wall should be included in the running suture of MP.

Postoperative management and follow up

Postoperative management should be considered fundamental for a positive outcome of the operation. In fact, particularly the level of MPs is very delicate after THD® Doppler and affected by inflammatory process (due to the procedure) leading to the final scarring and fixation of the plicated tissue on the muscular layer of the rectum. It is essential to avoid hard stool or excessive straining. Patients are advised to take at least 2 liters of water per day and a high fiber diet for at least 2–3 months, in addition to oral stool softeners and laxatives as needed. Both constipation and diarrhea are undesirable since increased straining or frequency of bowel movements may result in an early disruption of the rectal sutures with bleeding from the MP suture lines and possible early recurrence of prolapse. Rectal bleeding after sloughing of the eschar or disruption of MP sutures and consequent damage of mucosa/submucosa may occur in a limited number of patients, usually within 2 weeks after the operation. This event may require rectal irrigation to remove any blood clots. In an emergency entailing bleeding, digital examination should be regarded useless in assessing the severity of bleeding and can be potentially harmful as it can cause further damage to the rectal tissue. Using a well lubricate Foley catheter for rectal irrigation could be worthwhile, but without inflating its balloon. If bleeding persists or increases in frequency and intensity, endoscopy may be necessary to perform surgical hemostasis (by cauterization, suture, or endoclip).

Dearterialization alone results in minimal postoperative symptoms. The patients sometimes experience mild discomfort, but pain is rare. However, when dearterialization is combined with MP, the patient may experience tenesmus, at times with severe pain for several days, due to postoperative edema and inflammation or ischemia of the mucosa-submucosa of the low rectum. Discharge of mucus or blood may occur for the same reason. Finally, hemorrhoidal thrombosis has been described, particularly when the MP suture lines are placed too close together, leading to obstruction of the venous return. For all these reasons, oral intake of analgesics and non-steroidal anti-inflammatory drugs may be both useful and efficacious but is rarely required for longer than a week. Urinary retention develops in about 10% of patients, especially in males and patients undergoing MP. Restriction of excessive intraoperative intravenous fluids may help to prevent this. Treatment should consist only of in-and-out bladder catheterization. Tenesmus occurs frequently in the early postoperative course but is usually transient without persistent urgency, soiling, or fecal incontinence. When the THD® procedure is performed according to these principles, neither permanent fecal incontinence nor chronic pain have been observed. Indeed, parameters of anorectal physiology should be unaltered and anal sphincters are not injured following this procedure.[10]

Four follow-up visits are typically scheduled. The first visit is performed 7 to 10 days after the procedure. At this time, a digital anorectal examination is never performed. Only an external inspection is performed to avoid the risk of disruption of the sutures. Particular emphasis is paid to maintaining regular bowel movements. A second visit is scheduled at 1 month. The patient's anorectum is digitally explored. At the 3-month follow-up visit, the patient is evaluated with anoscopy to assess the anatomic result. Patients are thereafter evaluated by telephone with a final visit one year from operation. Long-term follow-up on an annual basis can then be set up. If any symptoms suggestive of a possible recurrence of HD are noted, the patient is seen for a digital examination and anoscopy.

Treatment of recurrences

Recurrent hemorrhoidal bleeding may be treated by medical or surgical approach depending on the symptoms' severity. It may occur in cases when the dearterialization was incomplete in one or more rectal sectors. The bleeding is usually less severe than at the initial presentation and can be easily managed with medical therapy, rubber band ligation, or a repeat dearterialization under Doppler guidance. Most cases of recurrent prolapse seem to occur because of disruption of MP suture lines due to altered defecation. The recurrence may occur early and suddenly (during the immediate postoperative period) or later and progressively (during long-term follow-up). Prevention of recurrent prolapse requires strict adherence to an optimal diet with fiber supplementation to prevent constipation, or appropriate control of diarrhea due to irritable bowel syndrome or chronic inflammatory bowel disease. Patients with minimal recurrent prolapse can be treated conservatively, but re-do MP is often technically feasible. Conventional excisional hemorrhoidectomy is always possible and no more difficult because of previous ligation and MPs.

THD® Doppler in the Literature

Several studies in the literature have legitimized the THD® Doppler procedure as an effective non-excisional operation for symptomatic HD.[11] The technical improvement and optimization in targeted hemorrhoidal artery ligation[2,3,12–14] and the addition of the appropriate MP in those patients presenting with hemorrhoidal/muco-hemorrhoidal prolapse[2] have yielded high success rates in treating the symptoms of hemorrhoidal disease (mainly bleeding and prolapse). The reported operating time ranges between 20 and 45 min. The number of arteries ligated ranges between 5 and 8. In our experience, we can typically find 6 arterial bundles in most patients.[11] Among the reported postoperative complications following THD® Doppler, pain was the most often reported although less than 10% of patients complain of significant postoperative pain which was more frequently noted in patients with more advanced HD. Postoperative bleeding was reported in up to 13% of patients, but the majority of the published papers report an incidence rate below 6%. Surgical reintervention for hemostasis is needed in some but not all cases. Hemorrhoidal thrombosis was observed in less than 3% in the majority of papers. The urge to defecate is infrequently described and is typically a transient postoperative

symptom, possibly related to both tenesmus and acute inflammation. In the literature, there is no mention of any life-threatening complications, nor the major morbidities observed after other surgical procedures (such as rectovaginal fistula, rectal necrosis, retrorectal hematoma, or events requiring stoma formation).

The overall recurrence rate reported in the literature ranges between 3 and 20%. Recurrence of bleeding was noted in 3–16.7% of patients and recurrent prolapse in 2.7–16.7% of patients. Reoperation for recurrence of symptoms was necessary in 4.1–17.8% of cases. In the last published update of our experience in using THD® Doppler procedure in 1000 patients (with a mean duration of 44 ± 29 months), the clinical efficacy of the procedure was demonstrated in more than 90% of patients, while less than 10% of patients experienced recurrence of HD (mainly prolapse) following the primary THD® Doppler procedure.[11] Recurrence was significantly more frequent in patients treated with high ligation of the arteries (used in the first period of the present series demonstrating that the distal dearterialization was really more effective) and grade IV HD.

A few articles have questioned if the Doppler guidance, as proposed in the authentic THD® Doppler operation and described here, is really helpful and necessary.[15,16] Several of these studies were affected by severe methodological bias (i.e., substantially different surgical procedures used in the different subsets of compared patients, inconsistent number of patients primarily used to demonstrate the primary study hypothesis, but then used to demonstrate the secondary study aim). Strangely, they attributed some worse results (higher complications rate and unscheduled postoperative events, more postoperative pain and use of analgesics, higher recurrence of prolapse) to the use of Doppler. However, no scientific explanation was given for such observations. In our opinion the only obvious negative difference between using or not using the Doppler guidance concerns the additional cost for the device. However we feel that the cost issue of using Doppler is offset by the more precise identification of the arteries which in turn provides a more reliable and accurate ligation.

In the last decade, the THD® Doppler procedure has been tested in comparison with other procedures, including rubber band ligation (RBL), stapled hemorrhoidopexy (SH), and excisional hemorrhoidectomy (EH). A few randomized controlled trials (RCT) were specifically designed and some reviews were published in the literature summarizing those data. In 2016, a paper by Brown et al. reported the HubBle trial results.[17] That trial was designed to compare the hemorrhoidal artery ligation (HAL, performed by either HALO or THD device) and RBL in patients with grades 2–3 HD operated in 17 UK centers. The results have generated much discussion and some controversies due to several issues with the study protocol.[18–20] The authors designed the trial choosing a very low level of learning curve for HAL procedure (a minimum of 5 procedures) which seems insufficient. In fact, a significantly higher recurrence rate (30%) was reported in the "HAL group" when compared to 11–17.5% recurrence rate noted in the literature. In addition, HALO and THD® Doppler procedures can be performed in very different ways (in the number and site of arterial ligations and number of MPs). On the other hand, RBL intervention was performed without a prospectively designed number of sessions defining the treatment as "completed" (the authors reported: "at discretion of the surgeon"). Only in the phase of data analysis the concept of "a course treatment" was introduced. In other words, the authors considered the use of RBL liberally as "a course treatment" without limits (1 or more sessions), while they decided that HAL/ THD® Doppler must be considered as effective only if it resolved symptoms after 1 procedure. Furthermore, comparison between RBL and dearterialization/MP seems of little clinical significance given the different indications of these procedures.

No discussion about the role of THD® Doppler in the armamentarium of therapies for HD is complete without comparison with other available techniques such as SH and EH. THD® Doppler and SH are based on a different mechanism of action. THD® Doppler aims to diminish the effects of arterial overflow by dearterialization[7,13,14] and connective tissue scarring and fixation by MP[5] without the need for excision. The whole procedure is performed within the rectal mucosal submucosal layers without breaching the deeper layers of rectal wall. Both phases are performed under direct visualization.[2] SH aims to treat HD (thought to be secondary to a "rectal prolapse" which has not been demonstrated in studies) by the excision of the rectal prolapse (mucosal in most patients but in some full-thickness). Direct visualization of the stapler firing event during SH is not possible. The only theoretical similarity between the two approaches is hemorrhoidal tissue preservation. However, with THD® Doppler sparing hemorrhoidal piles is possible under direct visualization but with SH (with the firing step being partially "blind"), the final position of the suture line could be incorrect being more proximal (within the rectal ampulla, with the possible rectal stricture risk) or distal (within the anal canal, with the hemorrhoidal piles excision or anal canal stricture). Differences in technique can explain difference in postoperative morbidity and outcome. Some degree of complications due to SH can occur in up to half of the patients.[21,22] Furthermore, some patients experience the "stapled hemorrhoidopexy syndrome" which was not described prior to the introduction of SH.[23] On the other hand, THD® Doppler seems to be very safe, without any significant risk of developing any long-term defecation disorder. In THD® Doppler, there is no impact on the rectoanal anatomy and physiology (no recto-anal distortion, no sphincters injuries, no impact on anal pressures and rectal sensation). Thus, no continence impairment or long-term urgency have been noted after THD® Doppler. Severe complications including septic events, possibly leading to stoma formation, have been observed in SH patients including rectal perforation, Fournier's gangrene, rectovaginal fistula formation, pneumo retroperitoneum, pneumo mediastinum, rectal stricture, gangrene, and obstruction, leading to a few cases of death.[21] In THD® Doppler, significant postoperative bleeding requiring intervention is rare and has been reported in less than 2% of the patients. However, extensive hematoma formation in the perirectal and retroperitoneal spaces have been noted following SH (possibly due to active bleeding behind the sutured rectal wall). Such bleeding has not been noted with THD® Doppler. Cases of rectovaginal fistula have been seen after SH but to our knowledge it has never been reported after THD® Doppler. Postoperative pain following THD® Doppler is usually due to MP and the consequent inflammatory process and it is more frequent during the first postoperative week. However, it is a temporary symptom but never long-lasting or chronic. In SH, the pathogenesis of postoperative pain/discomfort and tenesmus is still not clear and frequently can become long-lasting/chronic symptom. The entrapment of muscular or nerve fibers into the suture line has been hypothesized as a potential mechanism. After SH, painful, incomplete, or difficult evacuation has been associated with the development of chronic urgency and/or fecal incontinence.[21] Such complications were not documented long-term following THD® Doppler.

In the last decade, a few RCTs comparing SH to THD® Doppler have been published, including a few recent meta-analysis studies.[24–26] However, due to inclusion of older RCTs performed with the previous generation of devices/techniques and with poor methodological bias in some studies, no conclusive data can be derived from these studies. In summary, they included 6 to 9 RCTs (from 554 to 1077 patients treated with either THD® Doppler or SH). Postoperative bleeding and pain were significantly lower in THD® Doppler patients.[24–26] The short-term recurrence rate was higher in THD® Doppler compared to SH.[24–26] However, the long-term recurrence rate was similar in both subgroups.[26]

Concerning comparison between THD® Doppler and EH, it should be considered that the former is aimed to treat HD avoiding any tissue excision, provided that the hemorrhoidal prolapse can be reducible. On the other hand, the latter procedure is more "radical", providing the excision of both internal and external hemorrhoidal

piles. Consequently, a lower recurrence rate is theoretically expected following EH than THD® Doppler. The most recent meta-analysis comparing THD® Doppler and EH has been published in 2016.[27] A total of 4 RCTs were reviewed, including 316 patients. No statistically significant differences were noted in both postoperative complications, recurrence and re-operation rates.

Conclusions

The introduction of THD® Doppler procedure has provided more options within the treatment armamentarium of patients with HD. It offers the opportunity to save the hemorrhoidal piles and leaves undisturbed both the anatomy and function of the anorectal area. The dearterialization should be considered mandatory, while the MP can be tailored according to the presence and grade of hemorrhoidal prolapse. This procedure is usually safe, without risk of life-threatening events or chronic complications, and with an acceptable recurrence rate. Recurrent disease can be treated with redo THD® or other techniques as the initial use of THD® Doppler in a given patient does not preclude any type of future procedures. Of course, the surgical technique should address an accurate and selectively precise ligation of hemorrhoidal arteries (Doppler guidance seems fundamental in this regard), and a complete reduction of the hemorrhoidal prolapse when indicated, sparing the piles. Surgeons should emphasize to the patient the importance of postoperative management with avoidance of constipation or diarrhea to minimize the risk of bleeding or recurrence of HD.

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