Original Article

Doppler-guided hemorrhoidal artery ligation with rectal mucopexy technique: initial evaluation of 42 cases

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Rotta CM, Moraes FO, Varella Neto AF, Rotta TCA, Gregório JVAM, Jacomo AL, Martinez CAR. Doppler-guided hemorrhoidal artery ligation with rectal mucopexy technique): initial evaluation of 42 cases. **J Coloproct**, 2012;32(4): 372-384.

ABSTRACT: The treatment of hemorrhoidal disease (HD) by conventional hemorrhoidectomy is associated with significant morbidity, mainly represented by the postoperative pain and the late return to daily activities. Doppler-guided hemorrhoid artery ligation (DGHAL) is a minimal-invasive surgical treatment for HD that has been used as an alternative method in order to reduce these inconveniences. **Objective:** To analyze the initial results of the DGHAL technique associated with rectal mucopexy in the treatment of HD. **Methods:** Forty-two patients with stage I, III and IV hemorrhoids who were submitted to DGHAL were analyzed from December 2010 to August 2011. Eleven patients (26%) were stage II; 21 (50%), stage III; and 10 (24%), stage IV HD. All patients were operated by the same surgeon under spinal anesthesia and using the same equipment and technique to perform the procedure. The 42 patients underwent ligation of six arterial branches followed by rectal mucopexia by uninterrupted suture. Nine patients needed concomitant removal of perianal skin tag. In the postoperative, the following parameters were evaluated: pain, tenesmus, bleeding, itching, prolapse, mucus discharge and recurrence. The mean postoperative follow-up lasted four months (one to nine months). **Results:** Tenesmus was the most common postoperative complaint for 85.7% of patients followed by pain, in 28.6%, perianal burning, in 12.3%, mucus discharge and perianal hematoma in 4.7%. Two patients had severe postoperative bleeding and required surgical haemostasis, one of which needed blood transfusion. Ninety-five percent of the patients declared to be satisfied with the method. **Conclusion:** Even though DGHAL has complications similar to those of other surgical methods, its results present less postoperative pain, allowing faster recovery and return to work. Studies with more cases and a longer follow-up are still necessary to assess the late recurrence.

Keywords: hemorrhoids; hemorrhoids/surgery; ligation; ultrasonography, doppler.

RESUMO: O tratamento da doença hemorroidária (DH) pelas técnicas convencionais cursa com significante morbidade principalmente relacionada à dor pós-operatória e ao considerável tempo de afastamento do trabalho. A técnica de desarterialização hemorroidária transanal guiada por doppler (DHGD) associada à mucopexia retal é uma opção cirúrgica menos invasiva que vem sendo utilizada como método alternativo com objetivo de reduzir esses inconvenientes. **Objetivo:** Analisar os resultados iniciais com a técnica da DHGD associada à mucopexia retal no tratamento da DH. **Método:** Foram estudados 42 pacientes, portadores de DH de graus II, III e IV submetidos à técnica da DHGD, durante o período de dezembro de 2010 a agosto de 2011. Onze pacientes (26%) apresentavam DH do grau II, 21(50%) do III e 10 (24%) do IV. Todos os pacientes foram operados pelo mesmo cirurgião, sob anestesia raquidiana e sempre utilizando o mesmo equipamento e técnica para realização do procedimento. Os 42 pacientes foram submetidos à desarterialização de

Study carried out at the Department of Surgery of the Medical School of Universidade de Mogi das Cruzes (UMC); Department of Surgery at Hospital e Maternidade Mogi-D'or – Mogi das Cruzes (SP), Brazil; Hospital Nove de Julho – São Paulo (SP), Brazil; Health Sciences Post-Graduation Program of Universidade São Francisco (USP) – Bragança Paulista (SP), Brazil.
Financing source: none.
Conflict of interest: nothing to declare.

Submitted on: 03/06/2012
Approved on: 15/09/2012

6 ramos arteriais seguida de mucopexia retal por sutura contínua. Nove necessitaram remoção concomitante de plicomas perianais. No pós-operatório, foram avaliados os parâmetros: dor, tenesmo, sangramento, prurido, prolapso, perda de muco e recidiva. O seguimento médio foi de quatro meses (um a nove meses). **Resultados:** O tenesmo foi a queixa pós-operatória referida por 85,7% dos pacientes, seguida da dor 28,6%, ardor perianal 12,3%, perda de muco e formação de hematoma perianal 4,7%. Dois pacientes apresentaram sangramento pós-operatório de maior intensidade necessitando hemostasia cirúrgica, sendo que em um houve necessidade de reposição sanguínea. Noventa e cinco por cento dos pacientes declararam-se satisfeitos com o método. **Conclusão:** A técnica da DHGD, apesar de apresentar complicações semelhantes a outros métodos cirúrgicos, apresenta bons resultados com pouca dor pós-operatória, possibilitando retorno rápido ao trabalho. Estudos com maior número de casos e tempo de seguimento mais prolongado ainda são necessários para avaliar a recidiva tardia.

Palavras-chave: hemorroidas; hemorroidas/cirurgia; ligadura; ultrassonografia doppler.

INTRODUCTION

Hemorrhoidal disease (HD) is one of the most common illnesses in a specialized doctor's office.It is estimated that in industrialized countries, approximately 50% of the individuals aged more than 50 years develop some of its main symptoms throughout life[1,2]. Even though people with HD in its early stage may temporarily benefit from conservative measures, most of the times, when the disease is at a more advanced stage, they need some sort of surgical treatment[3,4]. The most frequent conventional surgical methods to treat for HD are Milligan-Morgan or Ferguson hemorrhoidectomy. In the hands of an expert, both present with few postoperative complications, excellent results in terms of healing the HD and acceptable recurrence rates. However, conventional hemorrhoidectomy (CD) presents some main limitations, such as severe postoperative pain and a prolonged period away from work because of the surgical anodermal wound, since this region has a lot of sensitive nervous terminations. The fear of postoperative pain leads many patients to avoid surgical treatment, choosing to live with the limiting symptoms of HD for the rest of their lives.

With the objective to reduce the inconvenience of CD, from the 1990s on new methods have been proposed to treat HD. Among them, mechanical anorectopexy (MA) became the most diffuse surgical procedure as an alternative method to conventional techniques[5-7]. In MA, the irrigation is interrupted and there is the fixation of the mucosa through the resection of mucosal and submucosal cuff in the lower rectum, above the pectineal line, reconstituting and fixating the borders of the remaining rectal mucosa by means of mechanical circular suture[6,7]. Since no incisions are performed in the mucosa of the anal canal, patients evolved with few painful postoperative symptoms. The lower need to care for the surgical wounds enables the fast return to daily activities[7]. However, despite these benefits, MA is not free of postoperative complications, and recent studies have shown higher recurrence rates at long term when compared to those of CH[8-10]. The presence of severe complications, such as major postoperative hemorrhage and perforation in the rectal wall, has also been described, and it was probably related to the impossibility to standardize the depth with which the purse-string suture was placed into the rectal wall before stapling[10]. When it is too superficial, it might not comprehend the arterial branches present in the submucosa, thus increasing the chances of postoperative bleeding; when too deep, it might comprehend the whole rectal wall, causing the confection of low rectorectal anastomosis during stapling without the protection of a stoma[10].

Aiming to interrupt the blood flow directly onto the branches of hemorrhoidal arteries and to avoid the deep penetration of the suture in the rectal wall, the technique of doppler-guided hemorrhoid artery ligation (DGHAL)[11] was proposed. With this method, it is possible to interrupt the blood flow onto the arterial branches, thus avoiding surgical incisions below the dentate line, which is the main cause of postoperative pain in CH[12,13]. The DGHAL technique, when associated with rectal mucopexy, also enables the high fixation and, therefore, the correction of prolapsed internal hemorrhoids[13-24]. However, despite being used for years, especially in Europe, the DGHAL technique has been little diffused in Brazil. The objective of

this study is to present the initial experience with the DGHAL technique associated with rectal mucopexy in the surgical treatment of HD.

METHODS

Table 1 shows the characteristics of the studied patients. Fourty two of them (29 men), with mean age of 42.3 years (31 to 64) with HD were included in this study. Eleven (26%) presented with HD in stage II, refractory to conservative treatment, 21 (50%), stage III, and 10 (24%), stage IV. No patient had recurrence and nine of them presented with associated anal skin tags. Patients who were excluded presented with other associated anorectal disease, such as: anal fissure, perianal fistula, external hemorrhoid thrombosis, hidradenitis suppurativa, neoplastic disease of any origin or those who were on anticoagulants.

All patients were enlightened as to the surgical procedure to which they would be submitted and, after agreeing to participate in the study, they signed an informed consent form.

All surgeries were elective and performed by the same surgeon (CMR) from December 2010 to August 2011. Before the procedure, all volunteers were submitted to anamnesis with special focus on the time of evolution of the HD, frequency of bleeding, presence of pain, mucosal prolapsed, anal incontinence and history of prior hemorrhoid thrombosis. All of them were submitted to a full rectal examination with static and dynamic inspection, rectal touch and rigid proctosigmoidoscopy. No patient underwent anorectal manometry. Patients aged more than 50 years were submitted not only to rectal examination, but also to colonoscopy to track for colorectal cancer. All patients were followed-up for about four months (one to nine months).

Equipment

The system used was composed of a doppler-fluxometry unit associated with a cold light source (THD UK Ltd., Worcester, United Kingdom). The unit has two exits to which a transducer that captures sonic waves and an optical fiber cable are connected. An anoscope comes with the equipment, and it is especially confectioned for the procedure. It is comprised of a fixed part and a sliding bar to perform mucopexy, a central pivot at the extremity to couple the needle holder and the standardization of the stitch depth penetration performed through the lateral window. Suture thread with a knot threader and the optical fiber cable accompany the equipment. The double crystal transducer captures sonic waves emitted by the arterial branches located on the surface of the rectal wall. When connected to the unit, the sound is amplified. It is a sliding transducer, so it can be freely removed by the surgeon and addressed towards the operating window of the anoscope. Therefore, it is possible to identify the sound coming exclusively from the arterial branches.

Table 1. *Characteristic of the studied sample.*

Characteristic	n	%
Gender		
Men	29	69.04
Women	13	30.96
Hemorrhoid stage		
II	11	26
III	21	50
IV	10	24
Presence of associated skin tags		
Without skin tags	33	78.57
With skin tags	9	21.43
Mean age (years)	42.3 (31–64)	–
Total of patients	42	100

Doppler guided transanal hemorrhoidal dearterialization surgical technique

All patients were admitted to the hospital in the morning and submitted to mechanical bowel preparation with enema containing 118 mL of dibasic sodium phosphate 0.06 g/mL and monobasic sodium phosphate 0.16 g/mL (Fleet-enema® from Fleet Laboratories, Lynchburg, Virginia, USA), used three hours before the procedure. Surgeries were always performed with spinal anesthesia and all patients received antibiotic prophylaxis with metronidazole (Sanofi-Aventis Farmacêutica Ltda., Suzano, São Paulo, Brazil), 500 mg intravenously during anesthetic induction, repeated every 8 hours during the first 24 hours. All interventions were performed with patients in the lithotomy position.

After rectal touch and gentle anal dilation, the anoscope was lubricated with gel and used to for ul-

trasound. The anoscope was previously coupled to the doppler equipment and introduced carefully, until it reached the lower portion of the rectum, approximately seven centimeters above the anal border. Afterwards, the set was moved to the craniocaudal and laterolateral direction until it was possible to hear the best intensity of the acoustic signal coming from the arterial branch identified in the upper lateral rectal wall. After identifying the cranial branch, the transducer was guided to the rectal direction identifying the segment of the rectal wall where there was no emission of sound waves (non-acoustic window). The traction progressed and was interrupted when finding a second point of sound emission located in the lower portion of the rectum. At this point, located above the dentate line, the mucosa was marked with an electric scalpel. Afterwards, the anoscope was repositioned in the cranial portion of the rectum and the needle-holder was introduced until its extremity was firmly coupled to the pivot, placed to the distal extremity of the anoscope. In its extremity, the needle-holder clenched a cylindrical curved needle with a 5/8 circumference, 2.65 of length, already coupled to the thread, monofilamental (2–0), absorbable and provided with the system. Dearterialization began at the cranial sound emission point by applying two transfixion X stitches manually tied. The depth of needle penetration in the rectal wall through the lateral window of the anoscope was limited by the pivot. After the ligation of the cranial branch, the mucosal prolapse was corrected by continuous suture (three to four) performed with straight vision from the rectum to the anal canal, going through the region without sound emission (non-acoustic window). The suture progressed to the place previously marked with the electric scalpel, where the second point of sound emission was located. Rectal mucopexy was concluded by tying the first to the last stitch. Dearteralization always began by the branch located at three hours clockwise. An identical procedure was repeated at 1, 5, 7, 8 and 11 hours, and six arterial branches were always dearterialized. After the procedure was finished, a healing patch was made by introducing a homeostatic sponge in the anal canal.

At the postoperative period, patients were recommended to have a diet rich in fibers, liquids and *Psyllium* fiber twice a day. The recommendations for patients who were submitted to concomitant resection of skin tags were to have hip baths with warm water after evacuations. All patients were discharged on non-hormonal anti-inflammatories (Tenoxicam – 60 mg/day) and tramadol chlorhydrate (200 mg/day) in case of severe pain. Postoperative follow-up took place in the first and fourth weeks and, afterwards, once a month, so there was no loss to follow-up in the considered period. After one month, all patients were interviewed in relation to the satisfaction with the method.

RESULTS

The main symptoms mentioned before surgery were: bleeding (97%), anal discomfort (95%), hemorrhoid prolapse (92%), anal pruritus (53%) and mucus discharge (23%). Mean surgery time was 35±10 minutes to perform dearterialization and mucopexy. All patients were submitted to rectal mucopexy and dearterialization of six arterial branches. In 9 of them (21.43%), besides dearterialization and mucopexy, there was the need to resect skin tags (one or more). Skin tag resection was performed by elliptical incision and afterwards it was sutured with absorbable monofilament thread (3–0). After dearterialization, there was the need for complementary haemostatic suture during surgery in five patients (8.4%). Figures 1 and 2 show the patients with HD before and after DGHAL with rectal mucopexy.

Figure 3 represents the main complaints in the fourth week after surgery. Thirty six patients (85.71%) complained of tenesmus, 12 (28.6%), of anorectal pain, 8 (19.5%), of burning sensation, 6 (12.3%) of mucus discharge, 2 (4.76%), of anal pruritus. Two patients progressed with perianal hematoma (4.76%), and in one of them, full thrombus regression remained for 30 days. All patients who underwent skin tag resection complained of more frequent anal pain at the postoperative period. Twenty percent of patients developed urinary retention at the immediate postoperative period, requiring the use of probe. In one of them, who also evolved with concomitant external hematoma, the retention lasted for seven days requiring repeated bladder probes during this period. Two patients (4.76%) presented with postoperative bleeding, therefore needing surgical haemostasis, which was performed on the fifth and ninth postoperative days; one of them required blood replacement. One patient mentioned fecal incontinence for one day, and

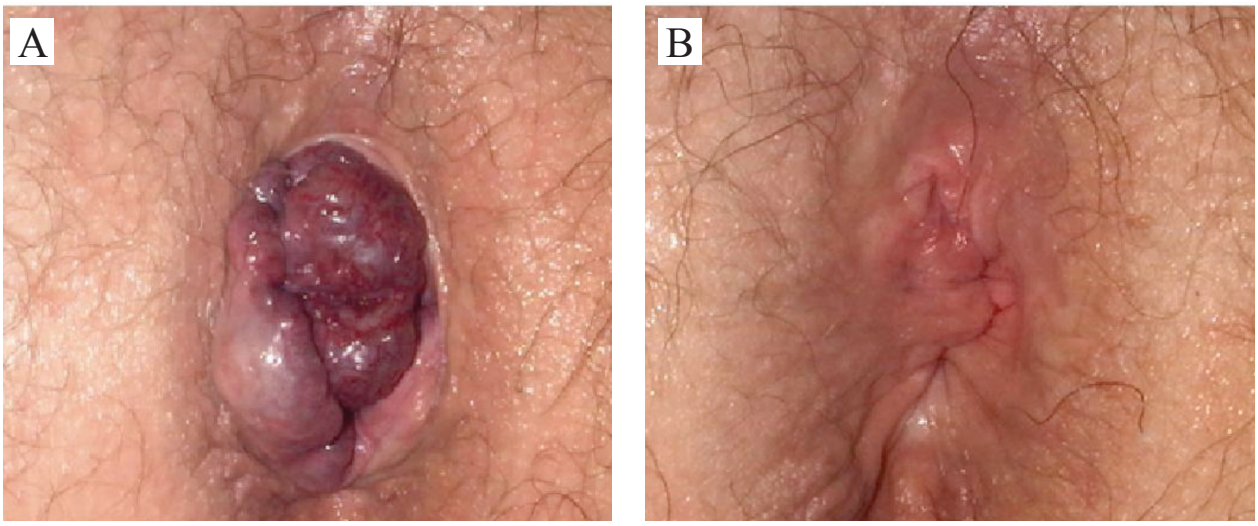

Figure 1. *(A) Preoperative aspecto f patient with hemorrhoid disease in stage III. (B) Immediate postoperative of the same patient submitted to the doppler-guided transanal hemorrhoidal dearterialization with mucopexy.*

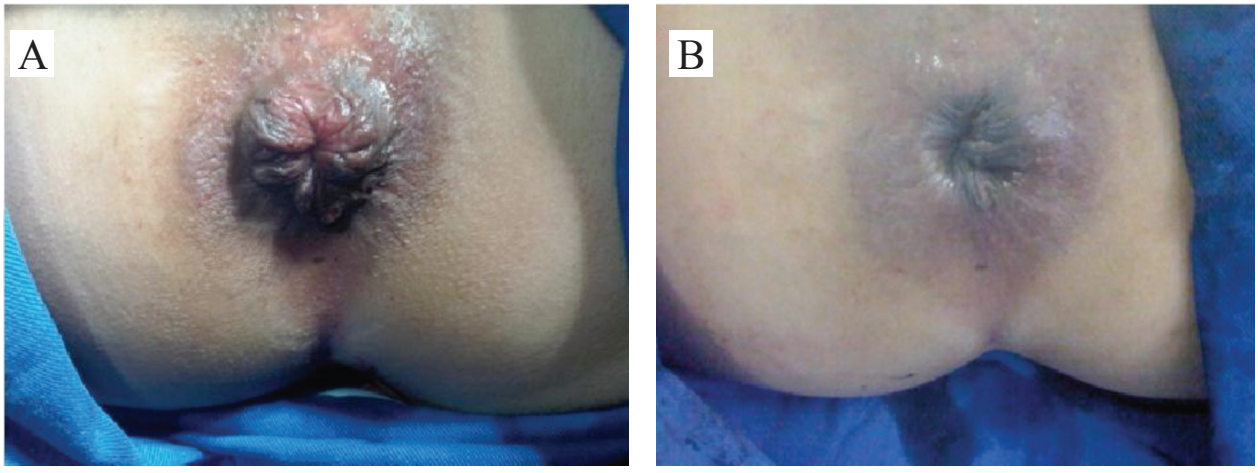

Figure 2. *(A) Preoperative aspect of patient with hemorrhoidal disease. (B) Immediate postoperative of the same patient submitted to the doppler-guided transanal hemorrhoidal dearterialization with mucopexy.*

two others (4.76%) developed anal fissure between the 7th and 15th postoperative days, which healed with clinical treatment. No recurrence was observed in the follow-up period.

DISCUSSION

The best surgical choice to treat symptomatic HD must consider the following: it should provide full remission of symptoms, be of simple technical execution and financially accessible, be well tolerated by the patients and progress with low rates of postoperative complications and recurrence[24,25]. The great number of surgical procedures that are currently available to treat HD shows that until now none of the proposed techniques can gather all of these items. Nowadays, CH is still the most used surgical choice around the world for the treatment of HD. Despite being effective to control

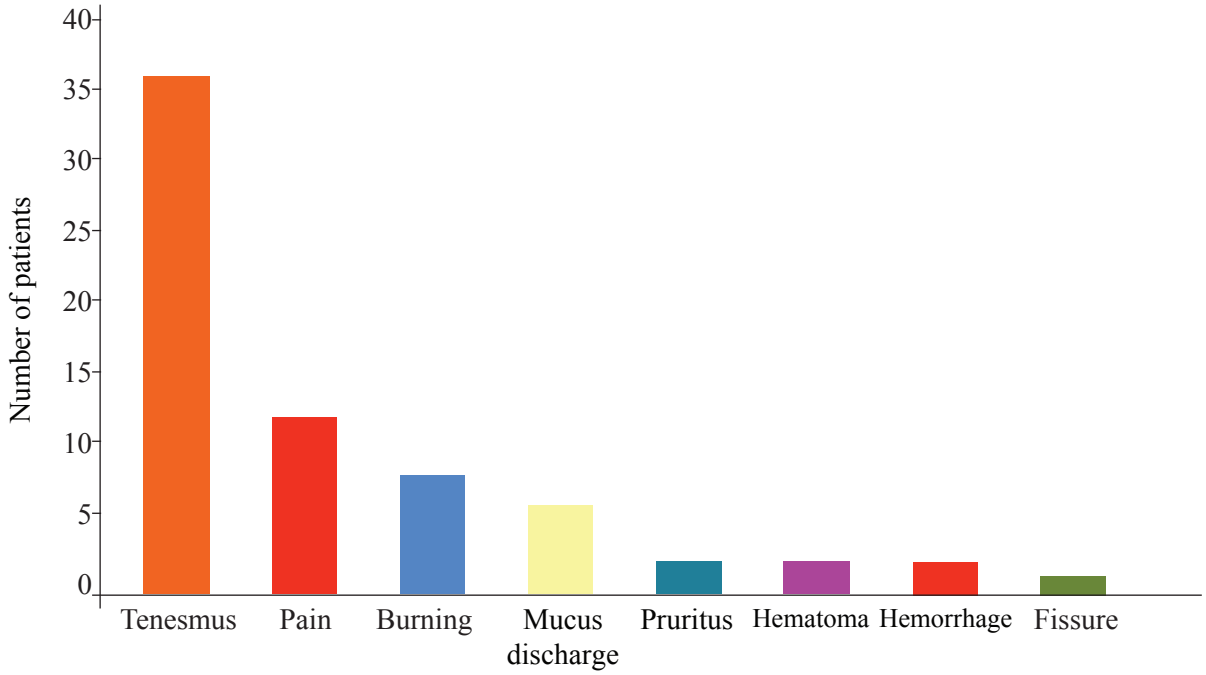

Figure 3. *Main symptoms reported until the fourth week after the surgery.*

symptoms and evolving with low recurrence rates, its main limitations are the severe postoperative pain and the necessary care during convalescence, and because of that the patient is away from daily activities for a considerable amount of time[24,25]. Aiming to come up with alternative methods that are able to minimize the inconvenient of CH, new surgical options have appeared to treat HD[6,11]. In the modern group of therapies to treat HD, MA and DGHAL represent the most used alternatives[23,25]. Despite the advantages of both methods concerning reduced postoperative pain and faster return to the patient's social daily life, the main limiting factors for the greater acceptance of such procedures are related to higher costs for the health systems (both public and private), which certainly do not cover all necessary expenses to perform these methods, thus condemning the patients to pay for part of them, and to the yet minor postoperative follow-up.

The proposal of both techniques is to treat HD by the interruption of blood flow to the hemorrhoidal plexus and the reduction of mucosal prolapse with rectal mucopexy, thus restablishing the regular an rectal anatomy[6,11]. Both procedures try to achieve these objectives by interrupting the blood flow to the hemorrhoidal plexux and by fixating the excess of rectal mucosal prolapse, resecting it and fixating it (MA), or just by fixating it inside the rectum (DGHAL)[14].

The MA technique proposed by Longo[6], in 1998, interrupts the blood flow to the hemorrhoidal plexus and reduces prolapsed by the resection of a circular mucosal and submucosal segment above the dentate line, and fixating the remaining mucosa at a higher situation by means of mechanical circular suture[24]. The resection of the excess of mucosa with posterior replacement inside the rectum, besides correcting hemorrhoidal prolapsed, also has the advantage to improve the mechanisms of continence since it normalizes the anal pressure at rest. Since there are no incisions below the dentate line, which is an anatomic region rich in sensitive terminations, the MA technique significantly reduces the intensity of postoperative pain when compared to conventional techniques[25]. The absence of surgical wound in the anoderm decreases the need for frequent postoperative care and enables the patient to get back to daily activities faster[25]. However, despite these undeniable advantages, recent sample reviews have shown that the MA technique evolves with long term recurrence rates up to 5.5 times higher than CH[8,25,26].

The reduction of blood flow to the hemorrhoidal plexus, with the MA technique, is obtained by the

transaction of caudal branches of the upper rectal artery during the resection of the mucosal and submucosal cuff followed by mechanical stapling[23]. However, a recent study evaluating arterial blood flow in the hemorrhoidal plexus, before and after the procedure, did not find significant differences, thus suggesting that the MA technique is not able to completely interrupt the blood flow by the intramural branches of the upper rectal artery, located below the point where the stapling was performed[27]. It is possible that the height the rectum where the stapling is performed in the rectum may be involved in the lower dearterialization. The maintenance of blood supply by these caudal branches may be one of the factors responsible for higher rates of late recurrence when compared to CH[27]. Concerning the complications of MA, major postoperative bleeding and pain resulting from the stapling being too close to the dentate line or because of the presence of the surgical staples are usually described[7,25]. The urge to evacuate, tenesmus, sensation of a foreign body in the rectum, persisten proctalgia and incomplete evacuation have been increasingly described, while stenosis and lack of stapling are rarer complications[26,28]. However, the most feared complication from MA is the risk of potential pelvic infections when the full resection of the whole rectal wall takes place during mechanical stapling[8-10]. The result of the complication is similar to performing an ultra low rectal anastomosis, in a rectum without mechanical preparation, and without the protection of a proximal stoma, which can evolve to severe abdominal and pelvic infections, mostly fatal[8-10]. Since this kind of complication can happen with surgeons at different stages in relation to learning the method, it is possible that it occurs due to the confection of suture in a purse string without the standardization of depth to penetrate the stitches into the rectal wall[10]. In favor of this probability is the constant presence of segments of muscle layers from the rectal wall in the resected specimens, submitted to histopathological analysis[29]. Changes in the initially designed equipment and new devices have been proposed in order to decrease the possibility of such a severe complication[11,30,31]. As to the costs of MA, when compared to CH there is still controversy. Two studies demonstrated that MA costs more in relation to CH, while a third analysis showed the opposite[32-34]. With these considerations, despite the advantages in relation to CH concerning the less intense postoperative pain and the faster return to daily activities, the MA technique costs more and probably has higher recurrence rates at long term.

The DGHAL technique, in theory, presents the same technical proposal of MA: the interruption of blood flow through the distal branches of the upper rectal artery by the application of transfixion stitches directly over these branches and posterior fixation of prolapsed hemorrhoids inside the rectum at a higher situation[11]. Unlike MA, the use of a Doppler equipment associated with a light source attached to an anoscope, especially designed for the procedure, enables the precise location of the arterial branches that are present in the rectal wall[11,23]. Therefore, these arteries are individually identified, which not only enables the employment of the transfixion stitch directly over these arteries, but also allows verifying if the blood flow has been completely stopped after the conclusion of the suture. The technological characteristics of the system is comprised of a double crystal echo acoustic transducer that can capture sonic waves emitted by the smallest branches located on the surface of the rectal wall, thus increasing the precision of the ligation of these vessels. The exact location through which an arterial branch passes enables the suture and the posterior mucopexy to be performed exactly onto the vessel throughout the longitudinal axis of the rectum, thus leaving free room between each stitch. This detail decreases the chance, at least in theory, as with MA, of the full blockage of the venous flow by the hemorrhoidal venous plexus, which is responsible for postoperative cases of external hemorrhoid thrombosis. The space between stitches also reduces the chance of the total obliteration of the rectal lumen, which is a complication described after the use of MA[28]. Another advantage of DGHAL in relation to MA is that the provided anoscope already coupled to the transducer and cable light enables the application of transfixion stitches to be performed with straight view, and its depth is guided by the pivot placed in the equipment. Such details also help to decrease the chance of reaching the deeper layers of the rectal wall. Since the depth of the stitches becomes standardized, and there is no resection of the rectal mucosal and submucosal cuff, the possibility to completely cut the rectal wall, which is one of the main concerns with MA, is minor with DGHAL. However,

it is worth to mention that despite the greater risk of lesion in the rectal wall with MA, the possibility to resect and fixate a considerable segment of the prolapsed mucosa at a higher situation inside the rectum brings theoretical advantages to MA as to the lower chance of prolapsed recurrence at long term.

The possibility to identify and perform the individual dearterialization of each arterial branch (5–9 branches) may explain the different number of ligations when comparing the DGHAL technique with other methods of elastic ligation of HD, in which it is not possible to identify exactly where the arterial branch passes[15,19-23,27,32-34]. Because of the greater selectivity as to the location of arterial branches, the number of stitches (ligations) ranges from three to nine, according to different authors in most published articles[12-16]. In this study, six arterial branches were ligated and identified in positions 1, 3, 5, 7, 9 and 11 hours. The patient was in the lithotomy position.

In this study, the DGHAL technique was indicated for patients with hemorrhoids in stage II, III and IV. Similarly to MA, the DGHAL technique was initially used with patients with stage II HD who were refractory to conservative treatment or those at the stage III of the disease[19,23,25,35]. Afterwards, with the addition of mucopexy to surgical time, enabling the reduction and fixation of prolapsed hemorrhoids, it was possible to indicate the method for patients with stage IV HD[36-38]. Unlike what happens with MA, that is, the amount of resected tissue and the height of stapling range from case to case, with DGHAL it is possible to define the places where mucopexy will begin and end, as well as the amount of tissue involved, even for those with stage IV HD. A study assessed the DGHAL technique associated with rectal mucopexy in 35 patients with the objective to decrease the need to perform CH and, consequently, also decrease the intensity of postoperative pain in patients with non-fibrous stage IV HD[39]. The authors dearterialized six arterial branches and average surgical time was of 33±12 minutes. They also checked that during postoperative follow-up, three patients (8.6%) presented with external hemorrhoid thrombosis; one of them needed additional surgical treatment and two (5.7%) evolved with postoperative bleeding. One of the latter needed haemostasis surgery. Five patients (14.3%) presented with urinary retention and required an intravesical probe, which was less than the findings in this study. At a mean postoperative follow-up of 10 months (2-28 months), there was a significant improvement of symptoms in 33 patients (94%). Nine patients (25.7%) evolved with irregular bleeding when evacuating in the first weeks they evacuated spontaneously, 3 (8.6%) had mild anal pain, 4 (11.4%) felt transitory anal burning, and 4 (11.4%) had tenesmus. Ten patients (28.6%) presented with some degree of residual prolapsed and only 2 (5.7%) had a more significant mucosal prolapse and needed surgery. Despite the short follow-up period, the authors could not find anal stenosis or incontinence. After applying a satisfaction questionnaire with the method, they noticed that after a ten-month follow-up, there was significant number of patients who were happy about it[39]. However, even though some suggest the DGHAL technique can be used in patients with stage IV HD, the postoperative results, like with MA, do not present the same degree of satisfaction when compared to patients with less advanced stages of HD[39]. A second multicenter study analyzing 507 patients with HD in stages II (28.4%), III (63%) and IV (8.6%), who were submitted to the DGHAL technique and followed-up for one year, found good results with the procedure with 69.2% of the patients, and acceptable in the remaining 4.8%[40]. However, when gathering the patients according to the stage of HD, they observed that 92.4% of those with stage II hemorrhoids and 84% of patients with stage III were satisfied with the method, whilst only 41% of those with stage IV HD felt the same way[40].

Studies have clearly shown the advantages of the MA technique in relation to CH, especially concerning the intensity of postoperative pain and the early return to daily activities[7,41-43]. A review of 12 studies that compared CH with MA, with follow-up between 6 months to 4 years, showed that CH is more efficient to reduce long term recurrence (OR=3.85; 95%CI 1.47–10.07; $p<0.006$)[43]. CH also prevented the development of new hemorrhoids after 12 or more months of postoperative follow-up (OR=3.6; 95%CI 1.24–10.49; $p<0.02$). CH was better in relation to preventing prolapsed (OR=2.96; 95%CI 1.33–6.58; $p<0.008$), as well as to avoid the development of prolapse after one or more years of follow-up (OR=2.68; 95%CI 0.98–7.34; $p<0.05$). There were no significant differences favoring CH when the following was analyzed: the proportion of

asymptomatic patients, presence of postoperative bleeding, mucus discharge, difficulties with hygiene and fecal incontinence, presence of perianal skin tags and need for future surgeries. As to MA, the authors could not find advantages concerning pain, anal pruritus, symptoms of obstructed evacuation or stenosis[43].

However, few studies have compared the DGHAL technique with other surgical options to treat HD, which makes it difficult to conduct a more precise evaluation[44,45]. Bursics et al.[14], in 2004, compared the DGHAL technique with CH after a one-year follow-up. They showed that the patients submitted to the DGHAL technique required less postoperative analgesia and less days to return to work faster[14]. These results were confirmed by other authors[27,45]. Avital et al.[46], in 2001, compared the MA and DGHAL techniques in 63 patients and found that those submitted to DGHAL presented less pain after evacuating (2.1±1.4 versus 5.5±1.9) and were on less painkillers. The length of hospital stay, the interval for the first evacuation and the complete functional recovery to evacuate were shorter for those submitted to DGHAL[46]. However, 18% of patients treated with DGHAL remained with bleeding or hemorrhoidal prolapse and needed complementary surgical resection, compared to only 3% of those submitted to MA[46]. When the questionnaire to assess the satisfaction of patients with the procedure was applied, it was observed that those submitted to MA were happier in relation to those who underwent DGHAL. As previously suggested it is likely that the higher incidence of prolapse after DGHAL is associated with the performance of a less effective rectal mucopexy.

A recently published systematic literature review, whicht selected only randomized and controlled studies showed, in 150 patients (80 of them submitted to DGHAL and 70 to MA), that both procedures were similar in terms of satisfaction, length of operation, recurrence and postoperative complications[47]. However, the DGHAL technique proved to be superior in relation to the intensity of postoperative pain[47]. A double blind randomized study compared the simple elastic ligation from the hemorrhoidal plexus associated with mucopexy without using the DGHAL equipment with the conventional DGHAL method in patients with stage III HD[48]. Results shows that the DGHAL technique presented longer surgical time, and patients presented more postoperative pan, thus needing to consume painkillers for longer[48]. Probably, the most intense postoperative pain is related to the larger number of ligations performed with DGHAL and to the association of rectal mucopexy. One year after surgery, recurrence rates were similar[48]. The authors concluded that the simple elastic ligation of HD is a simple and cost effective method to treat the disease in stage III, so there are no advantages to use the whole equipment of DGHAL to assist the ligation of hemorrhoidal vessels before mucopexy[48]. Spyridakis et al.[49], in 2011, studied 90 patients who underwent the DGHAL technique and observed that the recurrence rate assessed by the presence of bleeding or mucosal prolapse was identified in 6.6% of patients, being more common in patients with stage IV hemorrhoids.

The results found in this study showed that even though all patients were discharged still on anti-inflammatories, 85.71% of them complained of tenesmus at the postoperative period which regressed after the second week. Despite the use of anti-inflammatory, eight patients (19.5%) complained of anal pain, and six (12.30%) mentioned constant burning, which also regressed after the second and third weeks, respectively. In three patients, the pain was prolonged for one month and required the use of painkillers for longer. These results are different from those found by other authors, showing that 72% of patients submitted to DGHAL did not need postoperative analgesia[21,35]. It is likely that these discomforts are owed to suture and fixation of the prolapsed hemorrhoid, which leads to ischemia, necrosis with a consequent inflammatory process at the site of mucopexy[21]. That is why most of the patients followed-up in this study, as well as those described by other authors, presented with more intense pain and tenesmus in the first week after surgery, which disappeared as the days passed by[35]. Most authors describe the occurrence of minor bleeding associated with evacuations in the first days after surgery, similarly to other techniques[35]. Data from literature report that postoperative bleeding takes place in 1 to 20.9% of the patients submitted to DGHAL[12-15,17,18,34,49-51]. A randomized study comparing patients submitted to MA and DGHAL report that 12% of those who underwent MA presented with more intense bleeding, thus requiring readmission to control the hemorrhage, compared to only 4% of the patients submitted to DGHAL[52]. In this study,

in the first two weeks most patients (68%) presented with minor bleeding during evacuations. However, for two patients rectal bleeding was major and required reintervention for the hemostasis of the bleeding vessel. In one of them there was the need for blood replacement in order to control acute anemia. In one of the patients, bleeding came from one of the transfixion stitches, while in the second, with the major bleeding, it was originated from the site where pexy had been performed in one of the prolapsed hemorrhoids. It is probable that the hemorrhage is a result of necrosis, and consequent dehiscence of mucopexy, and that the continuous use of non-hormonal anti-inflammatory in the first week, since in interferes with the blood profile, may also have contributed for the bleeding. Other less frequent symptoms were mucus discharge in 6 (14.30%) patients, urinary retention in 8 (19.4%) and anal pruritus in 2 (4.76%). Two patients evolved with the formation of perianal hematoma at the postoperative period, and in one of them, with stage III HD, the perianal hematoma presented a larger proportion, lasting for 3 weeks and associated with prolonged urinary retention; however, it was healed after 30 days. These results are similar to those described by other authors who followed-up a larger sample[34]. Even though DGHAL preserves the venous drainage between mucopexy sutures, which is not true for MA, it can also evolve with external hemorrhoid thrombosis associated with the difficulty of venous return. In this study, for 38 patients (90.5%) postoperative complaints did not prevent the return to regular activities one week after intervention.

A systematic literature review considering all published DGHAL cases, and included 2,000 patients, showed recurrence rate of 10.8% for mucosal prolapse, 9.7% for postoperative bleeding and 8.7% for pain when evacuating[51]. When considering only patients followed-up for more than one year, the recurrence of prolapse and bleeding increased to 10.8 and 9.7%, respectively[51]. A recent randomized study that assessed patients submitted to CH, MA and DGHAL did not find differences between the techniques concerning the improvement of symptoms such as bleeding or pain[52]. However, as to the healing of the prolapse, CH proved to be superior to MA and DGHAL[52]. Another study comparing DGHAL associated with pexy and MA showed that 78% of the patients submitted to DGHAL and 83% of those submitted to MA presented with complete healing of symptoms 6 weeks after the intervention[52]. In this study, the persistence of the mucosal prolapse was higher in patients who underwent DGHAL, however, most patients with stage IV hemorrhoids were placed in the DGHAL group, which may have influenced the results. In this study, it was observed that most patients who presented with postoperative discomfort had stage IV hemorrhoids or were submitted to skin tag resection. A recent study assessed 244 patients submitted to DGHAL and confirmed these observations[53]. By using the multivariate logistic regression analysis, the authors concluded that the presence of mucosal prolapse is considered as a risk factor for the persistence of symptoms (OR=2.38; 95%CI 1.10–5.15). They also observed that patients with HD in stages III and IV had higher risks of recurrence (OR=4.94; 95%CI 0.67–36.43) and concluded that DGHAL should be carefully indicated for more advanced HD[53]. In this study, it was noticed that the larger number of patients who referred being little satisfied with the technique also presented stage IV HD. They were submitted to concomitant perianal skin tag resection or presented with complications (hemorrhage, perianal hematoma or postoperative anal fissure).

When considering the costs, one article comparing the conventional elastic ligation and DGHAL reports that even though the doppler-guided dearterialization is more efficient than elastic ligation to reduce postoperative pain, recurrence and also to improve the quality of life of patients with stage II and III hemorrhoids without mucosal prolapse, it costs more[54].

Even with the reduced number of patients and the short follow-up at the postoperative period, the results of this study suggest that DGHAL can be considered as a valid choice to treat for HD. Despite the advantages in relation to the less intense postoperative pain and faster return to daily activities, the DGHAL technique may present the same postoperative complications described in other methods. As in other techniques, the postoperative results of DGHAL in stage IV HD seem to be worse, as well as when there is the need to perform procedures that include incisions in the perianal skin or the anal canal. Perianal incisions increase postoperative discomfort and decrease the degree of satisfaction with the method. The

results show that DGHAL is a simple surgical procedure to perform, with a small learning curve due to the possibility to repeat the procedure many times in the same patient. The technique provides the remission of symptoms, especially for those with HD in stages II and III, and is well tolerated. It evolves with acceptable short term recurrence rates. At the moment, the development of a multicenter national study is proposed in order to evaluate more patients with longer follow-up to confirm the validity of this new option of treatment for HD. Only this way it will be possible to verify if recurrence and satisfaction rates concerning the method remain stable throughout the years.

CONCLUSION

The DGHAL technique is a valid alternative to treat for HD in stages II and III, and its main benefits are to evolve with little postoperative pain and to enable the fast return of the patient to daily activities. Studies involving more cases and with longer follow-up are still necessary to assess late recurrence.

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