

ORIGINAL ARTICLE

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Radiofrequency ablation and plication of hemorrhoids

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Abstract Background Radiofrequency ablation is emerging as a new therapeutic method in various fields of medicine. This study describes procedure of radiofrequency ablation followed by plication of hemorrhoidal mass in advanced grades of hemorrhoids. **Methods** This non-controlled, prospective study included 300 patients (211 men) treated at Fine Morning Hospital, Laxminagar, Nagpur, India, between July 1999 and December 2000. Patients were followed over a median period of 18 months (range, 15–20 months). **Results** The hospital stay was less than 24 hours for all patients. After 1 week, most of the patients had symptoms like bleeding and pain. At 4 weeks, 21% complained of pruritus, but none had prolapse, incontinence or anal stenosis. At the last follow-up, 96% had relief from bleeding, while 8% of patients had developed external skin tags and 6% had asymptomatic recurrence revealed by anoscopy. **Conclusions** For advanced degree of piles with prolapse as the main symptom, plication of the pile mass along with radiofrequency ablation may be used as an alternative to the various types of hemorrhoidectomies. With this treatment hospital stay is minimized, postoperative pain is low, recurrence is low and return to work is faster.

Key words Hemorrhoids • Prolapse • Radiofrequency ablation • Plication

Introduction

The problems in dealing with advanced hemorrhoids are complex. Precisely, hemorrhoidectomy is the only answer to these types of hemorrhoids, where treatment may vary from ligation and excision to cutting, cauterization, using laser or stapled hemorrhoidopexy. As an effective alternative to these techniques, the combination of hemorrhoid plication with radiofrequency ablation of the pile mass has been found to be quite efficacious and loaded with many added advantages over conventional hemorrhoidectomy, which is often associated with a long and painful postoperative course [1], prolonged convalescence period and high incidence of relapses.

Radiofrequency thermal ablation works by converting radiofrequency waves into heat. The alternating current passing down from an uninsulated electrode tip into the surrounding tissues generates changes in the direction of ions and creates ionic agitation and frictional heating. The tissue heating then drives extracellular and intracellular water out of the tissue, which results in the final destruction of the tissue as a result of coagulative necrosis [2]. This phenomenon is called cellular volatilization [3].

The aim of the present study was to assess the postoperative and follow-up results of the procedure of radiofrequency ablation and plication in advanced grades of hemorrhoids.

Patients and methods

This non-randomized, prospective study included 300 patients with symptomatic and prolapsing hemorrhoids treated by radiofrequency ablation and plication at Fine Morning Hospital, Laxminagar, Nagpur, India, over a period of 18 months from July 1999 to December 2000. Patients previously operated for hemorrhoids, undergoing simultaneous procedures and having thrombosed hemorrhoids were excluded from the study.

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For the radiofrequency ablation, I used the patented Ellman Dual Frequency 4 MHz radiofrequency generator from Ellman International (Hewlett, New York, USA). The unit is provided with a handle to which different electrodes can be attached to meet exact requirements of the procedure [4]. The amount of energy to be delivered can be preset between 1 and 100 watts. A ball electrode of a sufficient length was extensively used in the procedure.

All the patients were subjected to detailed clinical examination before admitting them for the procedure. This included noting down history, local and general examination, and rectal and anoscopic examinations; 33 patients (11%) having colonic symptoms like increased frequency of stool, passage of mucus per rectum or abdominal pain underwent sigmoidoscopy to exclude more proximal diseases.

Outpatient follow-up was at 1, 4 and 12 weeks and then 18 months after the procedure.

Preparation of patients and anesthesia

All the patients undergoing this procedure received written explanation of the technique with a clear mention that they would be treated with the ablation and plication of hemorrhoids, which was new and was prone to potential drawbacks like relapses and a need for repetition of the procedure. A signed informed consent form was obtained from all patients. The procedure was approved by the local Ethical Committee and was performed according to the Declaration of Helsinki.

No specific preparation was advised except keeping the patient on fast from the previous night of the procedure. A dose of laxative such as two tablets of senna or bisacodyl was prescribed and administered on the night prior to the procedure. No shaving was done at the operation site; only the hairs around the anus were trimmed with scissors before commencing the procedure.

Patients who were on antiplatelet drugs like aspirin were asked to stop taking them one week before the procedure, and were permitted to resume therapy 2 weeks after completion of the procedure. All patients were operated on either with a short general anesthesia or caudal block as per the preference of the anesthetist after evaluation of the patient.

Operative technique

The procedure was performed with the patient in a lithotomy position. Anal stretching was done up to 4 fingers in each patient. This relieved the spasm and helped to minimize postoperative pain. After relief of spasm, the piles, which look very large and prolapsing, reduced in size and became less external. The anal stretching also helped in easier access for operation within the anal canal [5]. This also had relieved pain in patients having associated fissure-in-ano [6].

With the help of straight artery forceps, the three skin tags corresponding to the three principle sites of piles, namely at 3, 7 and 11 o'clock positions were held and retracted out to visualize the piles. All the piles were ablated by rolling the ball electrode over them. The whole mass shrunk and turned dusky white. A power setting at 80 on the coagulation mode of the radiosurgery device was used to get maximum coagulation. The time taken for coagulation of each pile was 15–20 seconds.

Following this maneuver, the whole pile mass was under-run with 1–0 chromic catgut on 45-mm atraumatic needle (No. 4246, Ethicon, UK). This was begun from the most distal end of the pile at the anal verge and then advanced towards the pedicle with continuous locking sutures. If the pile mass was found to be too voluminous, then the suture was locked and tied in the middle and a fresh under-running undertaken until the final stitch reaching just proximal to the pedicle of the pile mass and including the normal rectal tissue.

If any associated secondary piles [7] (found usually at 1, 5 and 9 o'clock positions) were noticed, they too were coagulated. The external element of the pile mass covered with skin was left untouched.

To end, a generous amount of xylocain ointment was applied over the operated area. A glycerin suppository was kept inside to help in initiating early bowel activity.

All the piles were dealt with in a single sitting and the whole procedure was completed in about 8–12 minutes.

Oral fluids were allowed two hours after the procedure. Regular doses of antibiotics and analgesics were given for the first 10 days according to the departmental protocol. The patients were kept on a daily dose of laxative such as milk of magnesia or ispagol husk. They were asked to take a warm sitz bath twice a day for four weeks.

In the beginning of our study, we were curious to know what happens to the hemorrhoidal mass after the procedure. So we performed anoscopy in 5 of the patients at one week's follow-up. But, as it caused and discomfort to them we abandoned this practice and started doing the first postoperative anoscopy at 4 week's follow-up and at all subsequent follow-ups.

Results

A total of 300 patients (211 men) with symptomatic prolapsing hemorrhoids underwent radiofrequency ablation and plication procedure. There was no significant demographic difference regarding the age or duration of disease between men and women (Table 1).

Bleeding per rectum was found in 277 patients (92%), either in the form of dripping or in jet. A total of 185 patients (62%) had associated pain, and 65 patients (22%) had associated anal fissure (Table 2). 135 patients (45%) had pruritus, perianal sailing, 84 patients (28%) had constipation and 65 (21%) had associated anal fissure.

Patients under study had hemorrhoid prolapse of some degree. Of them 18 (6%) had second degree, 249 (83%) had third degree, and 33 (11%) had fourth degree hemorrhoids. All these patients were discharged within 24 h of the procedure.

All patients complained of post-defecation pain which lasted for an average of 40 minutes on the first postoperative

Table 1 Characteristics of patients who underwent radiofrequency ablation and plication of hemorrhoids. Values are mean (SD)

	Men (n=211)	Women (n=89)
Age, years	42 (9.2)	37 (8.8)
Disease duration, months	67 (12.2)	58 (11.4)

Table 2 Clinical presentation of the hemorrhoidal disease in 300 patients

Symptom	Patients, n (%)
Bleeding	277 (92)
Anal pain	185 (62)
Associated fissure	65 (22)
Pruritus	96 (32)
Perianal soiling	39 (13)
Constipation	84 (28)

Table 3 Clinical characteristics and symptoms of the 300 patients during follow-up

	Patients, n (%)
Findings at 1 week	
Post-defecation pain	300 (100)
Bleeding per rectum	243 (81)
Incontinence for flatus	19 (6)
Findings at 4 weeks	
Post-defecation pain	7 (2)
Bleeding per rectum	26 (9)
Anal narrowing	33 (11)
Pruritus	64 (21)
Findings at 12 weeks ^a	
Discomfort on prolonged sitting	40 (14)
External skin tags	38 (13)
Findings at median 18 months ^b	
Bleeding per rectum	11 (4)
Asymptomatic recurrence	17 (6)

^a For 296 patients

^b For 280 patients. Range of follow-up was 15–20 months

Table 4 Postoperative complications

	Patients, n (%)
Retention of urine	9 (3)
Massive bleeding requiring hospitalization	3 (1)
Perianal hematoma	40 (13)
External skin tags	22 (7)

day and for 18 minutes on the seventh postoperative day (Table 3). At this time, 243 (81%) patients had bleeding, which smeared the stool. While it stopped within one week, 26 of the patients (9%) continued to have minor bleeding as long as up to 4 weeks. The rest of the patients (19%) did not have any bleeding.

A total of 260 patients (87%) had a bowel movement on the morning after surgery. This was possibly due to introduction of suppository and the effect of oral laxatives. The defecation was painful but easy. Of the 300 patients, 258 (86%) were able to resume their routine as early as the tenth postoperative day; the remaining resumed their activities after 15 days.

Some amount of narrowing of the anal canal was detected during digital examination in 33 patients (11%) after 4 weeks. It subsided with time and was not seen in the subsequent follow-up examination. Itching in and around the anus was an annoying symptom for 64 (21%) of the patients under study. Appropriate symptomatic treatment was prescribed and they were relieved. None of the patients had any evidence of infection or sepsis, meaning a frank suppuration causing purulent discharge per anus with a throbbing pain in the anal canal and fever. None of the patients had any complaint of fecal incontinence; 19 patients (6%) had incontinence for flatus in first 2 weeks, but it was self-limiting.

Four patients (1.3%) were lost to follow-up after 12 weeks. Of the remaining 296 patients, none had any complaint of bleeding or pain during defecation; 40 patients (14%) had some amount of discomfort on prolonged sitting; 38 (13%) of them had external skin tags but there was no edema in the perianal region. There was no complaint of any prolapse per rectum. There was no case of stenosis, soiling, or incontinence.

Another 16 (5%) patients were lost to follow-up at a median of 18 months (range, 15–20 months) and all the 280 patients who came for follow-up at 18 months underwent anoscopic examination. At this time, 11 patients (4%) complained of bleeding in small amounts. Anoscopy showed evidence of small hemorrhoids at one or two sites. All of them advised to undergo band ligation. During anoscopic examination, 17 patients (6%) were found to have presence of varicosities at the treated area, but as they were free of symptoms, no specific treatment was advised.

At the 1 week follow-up, anoscopy performed in 5 patients showed that the pile mass was slightly enlarged and congested. We abandoned this practice of anoscopy at 1 week follow-up in the remaining patients due to pain and discomfort caused to them. The external element of the piles showed edema and thrombosis, but this started reducing thereafter and the resolution was completed by the twelfth week. At 12 weeks, the plicated pile mass looked shrunken and segmented. At the last follow-up, the pile mass was replaced by fibrous bands.

Nine male patients (3%) had retention of urine in the immediate postoperative period (Table 4). Seven got relief from warm sitz baths, while two required catheterization.

Three of the patients had massive bleeding requiring hospitalization between days 12 and 17. This was probably due to a secondary hemorrhage caused by infection and sloughing of the pile mass. Two of them responded to conservative treatment in the form of local compression and hemostatic, while in the third patient the bleeding area needed resuturing under anesthesia. All these 3 patients had an uneventful recovery.

Forty patients (13%) had post-procedural perianal hematoma mainly at the three classic sites of the pile mass, i.e. at 3, 7 and 11 o'clock positions. It was tender for the first 2 weeks, but thereafter the discomfort reduced. Total resolution in such cases took about 12–14 weeks. The perianal

hematoma after resolution led to development of external skin tags. These tags tended to shrivel by the third month after the procedure, but in 22 patients (7%) it persisted even at the last follow-up.

Discussion

The history of ligation of the pile mass is quite old. Surgeons in ancient Greece and Rome used to perform this regularly. Miles used to leave the pile distal to the ligature at the pedicle because he thought that the escape of blood might reduce the size of pile stump and predispose to slipping of ligature [8]. The entire hemorrhoid was thus left to slough off.

Farag [9] described a pile suture method similar to what I have performed. He used three interrupted sutures. By a similar technique, Bhansali and Kale [10] achieved good results. Patnaik and Mangual [11] have operated as many as 300 patients in this way, were satisfied with the results and recommended this as a better option in dealing with advanced grades of piles. Pfenninger [12] advocated a method of "pile stitch". He used absorbable sutures, which were placed above the dentate line to attach the cushion back to the internal sphincter. He claimed that this obliteration of the hemorrhoidal blood supply reduced the bulk of the pile mass. Apple [13] described plication of rectal mucosa as a day hospital procedure, which is free of complications and had a better compliance. Marquez et al. [14] performed simultaneous binding and sclerosis with electrocoagulation, achieving satisfactory results.

When compared, the benefits of plication of hemorrhoids after radiofrequency ablation over traditional hemorrhoidectomy are quite encouraging. The procedure requires a perceptibly short time and can be carried out under brief anesthesia.

Although the disease affects men and women in equal proportions, in this study the percentage of female patients was much less, probably because Indian women are reluctant to be examined and treated for this disease.

The amount of suture material required in plication of hemorrhoids is almost one-fourth of that for the conventional ligation and excision procedure (1.3 packs (mean) of catgut in plication vs. 4.6 packs (mean) of catgut in hemorrhoidectomy). Bleeding is negligible throughout the procedure and is more often encountered when the pile mass is too big, vascular or turgid. Delayed bowel movements and delayed wound healing are rarely seen [15]. As the evacuation is early, the hospital stay is quite short and postoperative complications like anal narrowing and stenosis are negligible [16]. There is no specific contraindications to this procedure and, therefore, it can be performed on patients with systemic diseases. Age is no barrier to this method, which can be done in any advanced

grade of piles. A technique of ligation-anopexy was successful in dealing with advanced degree of hemorrhoids [17]. Symptoms like persistent pain and fecal urgency reported with stapled hemorrhoidopexy were not complained of after this procedure [18].

The incontinence to flatus in some of the patients was possibly due to anal stretching, which was performed at the beginning of the procedure [19]. Complications like micturition syncope and sepsis reported after hemorrhoidectomies [20] were absent in the patients operated in this study. The reasons for postoperative anal pruritus in the patients were multiple. It was mainly due to the discharge caused by sloughing of the pile mass and partly due to the application of local anesthetic ointment.

Addition of radiofrequency ablation of the pile mass doubly ensured complete blockage of blood supply to the pile mass [21]. This technique could also deal with secondary piles found on occasion at 1, 5, and 9 o'clock positions through a direct coagulation [22]. The radiofrequency ablation of the hemorrhoidal mass helps in tethering of the mucosa to the underlying anorectal wall. This prevents possibility of recurrence.

This ablation and plication achieves three major goals, which are needed to tackle an advanced hemorrhoidal disease. They are (1) fixation of the hemorrhoidal cushions to the underlying internal sphincter, (2) reduction of hemorrhoidal prolapse, and (3) minimization of hemorrhoidal blood flow.

The development of perianal hematoma after plication was probably due to the obstruction of venous return from the external hemorrhoidal plexus caused by the first stitch of the plication. The incidence was more in the initial cases of this study; with experience, I learned to keep a gauze pad tucked in the anal canal at the end of the procedure. As the patient starts recovering from anesthesia, the sphincter grips the pad, which acts as a tampon and compresses the swollen mass. This has significantly reduced the incidences of development of thrombosis.

Higher incidence of formation of skin tags [23] after this procedure was probably due to application of the first stitch too close to the anoderm. The incidence decreased once I started making the first stitch 1 cm away from the anal verge. The percentage of residual skin tags in the study (8%) was slightly more than that reported with diathermy hemorrhoidectomy (3%) and stapled hemorrhoidopexy (4%) [24].

Compared to electrocautery or laser, the active electrode of the RF unit does not heat up. There is, therefore, minimal or no heat generated at the surgical site. This allows the surgeon to work in direct proximity of the hemorrhoid without disturbing or damaging the functional tissues around, which can lead to anal stenosis or narrowing later. Submucosal hemorrhoidectomy performed in sixty patients with a radio-surgical bistury gave good results [25]. CO₂, or Nd-YAG laser hemorrhoidectomies are also being practiced, but no

significant advantages of these techniques over the conventional ones have been shown. On the contrary, the investment and maintenance costs for these apparatuses are comparatively higher [26–28].

The results of radiofrequency ablation and plication are reassuringly satisfactory when compared to the conventional hemorrhoidectomy like the open (Milligan-Morgan) or closed one (Parks) ones [29]. The results are comparable with those of stapled hemorrhoidopexy, or diathermy hemorrhoidectomy in regards to first bowel movement, patient-assessed symptom control, functional outcome and complications [30, 31].

Besides the radiofrequency unit, this procedure needs no specialized instrument. The equipment is cost-effective, because no disposables are needed, as is the case with stapled hemorrhoidopexy. The procedure can be conveniently performed in any routine surgical set-up.

For advanced degree of piles with prolapse as the main symptom, plication of the pile mass along with radiofrequency ablation is an alternate choice to the conventional procedures in the sense that the hospital stay is short, post-operative pain is low, recurrence rate is minimum, and return to work is fast.

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Invited Comment

Dr. Gupta has written an intriguing article using the combination of radiofrequency ablation and plication of hemorrhoids in a series of 300 patients, most of whom had grade 3 or 4 internal hemorrhoids. He reported good results with a hospital stay of less than 24 hours, resolution of pain and bleeding for most patients within a week and a prompt return to work for most of his patients within two weeks. The procedure was done under a short general anesthetic or caudal block; radiofrequency ablation provided tissue heating in the deep tissues and worked as a result of coagulative necrosis. The primary difficulty with this study is that no comparison group is provided. While there is indication of promise here, there is certainly no proof that this method of treatment of hemorrhoids compares favorably with traditional hemorrhoidectomy, with infrared coagulation, laser treatment or stapled hemorrhoidectomy. While complications are low, such as inability to urinate postoperatively, this may have more to do with fluid administration during the anesthesia than with the procedure itself.

I am somewhat surprised to find that all of these patients underwent a four-finger dilatation, or a Lord procedure, and yet very few patients are incontinent postoperatively. The Lord procedure has been used in the past as a treatment of hemorrhoids and has been abandoned for obvious reasons. Further complicating the situation is whether radiofrequency ablation is the key component, or the suture plication, which is performed after the radiofrequency treatment. How do we know that the radiofrequency treatment is even necessary? In sum, this is an interesting idea with theoretical benefits, but these have not been proven in this retrospective and non-randomized series of patients and must be categorized in the poorest category of medical evidence.

Hopefully, Dr. Gupta will provide us in the future with a randomized prospective trial, perhaps with several different treatment arms and sufficient power for us to adequately evaluate this technique.

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Author's reply

I am grateful to Dr. B.C. Wolff for his insightful and kind comment on my work on prolapsing hemorrhoids with radiofrequency ablation and plication procedure. I agree with him that this is a non-randomized and non-controlled study, but if one goes with the references and reports, the postoperative pain, return to work and wound healing in this procedure is definitely better than those of conventional and laser hemorrhoidectomy. While infrared coagulation is useful only in early grades of hemorrhoids, the complications of stapled hemorrhoidopexy are much more than described.

He is right in doubting if it is the hemorrhoidal plication, or radiofrequency ablation which helped in treating the hemorrhoids. I feel that while plication controls prolapse of the hemorrhoids, radiofrequency ablation minimizes blood flow to the pile mass and fixes the hemorrhoid mass to the anal wall.

I agree that a controlled and comparative analysis of this procedure with other techniques would be more significant. We are working on this and hope to be able to present our results in the future.