

CLINICAL STUDY

Radiofrequency coagulation: a new option for early grade bleeding hemorrhoids

Gupta PJ

*Gupta Nursing Home, Nagpur, India. drpjg-ngp@sancharnet.in***Abstract**

Background: The treatment of hemorrhoids has undergone significant changes after introduction of new techniques during last years. Radiofrequency coagulation is a new approach for treating grade I and II hemorrhoids. In this procedure, the hemorrhoidal tissue is coagulated by a high frequency radio wave. The author describes his experience using this new technique.

Materials and methods: The procedure was performed using an Ellman radiofrequency generator. Over a period of 18 months, patients with bleeding hemorrhoids were treated with this technique and a 16 months follow-up was carried out to assess a relief in bleeding episodes, complications, and recurrence rate.

Results: While 13 % of patients experienced persistence or recurrence of bleeding, 2 % of patients needed readmission for secondary hemorrhage. None has reported an infective complication. Overall ratio of comfort and patient contentment with pain and bleeding was satisfactory.

Conclusion: The treatment of bleeding hemorrhoids using the radiofrequency coagulation is technically simple, therapeutically effective and virtually complication free. The equipment is portable, easy handling, long lasting, and needs only little maintenance. Long-term follow-up is necessary to justify reliability of this method (Ref. 49).

Key words: hemorrhoids, radiofrequency coagulation, bleeding, office procedure.

Hemorrhoids are one of the most frequent anorectal disorders encountered in the primary care sitting. They are the most common cause of bleeding per rectum and are responsible for considerable patient's suffering and disability (1).

A variety of treatment options for early degree hemorrhoids, i.e. grade 1 and 2, are available. The treatment procedures commonly adopted are injection of sclerosant solution [sclerotherapy] and rubber band ligation. The other procedures include chemical destruction of pile mass by a direct current probe (Ultroid), or by thermal destruction using a bipolar diathermy (Bicap), cryoablation, hemorrhoidal artery ligation and infrared coagulation (2). Yet, despite of the presence of numerous non-surgical therapies, none of them has established its superiority.

Nowadays, a fast and painless procedure that could be carried out in the office practice under local anesthesia will be preferred and accepted (3). Radiofrequency coagulation is one such technique that results in immediate reduction of blood flow to the hemorrhoids followed by tethering of mucosa to the underlying tissue, which subsequently induces healing due to cicatrization (4).

Principle of radiofrequency coagulation

Radio frequency unit generates a very high frequency radio wave of 4 MHz. The unit includes a plastic covered ground plate or antenna, and a 'patient electrode' attached to a handle, which is held by the operating surgeon. No electrical contact is made between the patient and ground plate, unlike operating theatre diathermy equipment. When the high frequency wave is released from the generator, it is focused at the affected tissue through an electrode end. The focused energy produces steam within the cells thereby first vaporizing the fluid and then coagulating the tissues. The tissue resistance in the course of the high frequency wave produces heat that makes the intracellular water to boil, thereby increasing the cell inner pressure to the point of break-

Gupta Nursing Home, Nagpur, India

Address for correspondence: P.J. Gupta, MS, Gupta Nursing Home, D/9, Laxminagar, Nagpur-440022 India.

Phone: +49.712.2231047, Fax: +49.712.2547837

ing it from inside (5). This phenomenon is called as cellular volatilization.

In radiofrequency contact coagulation, the tissue is coagulated in a way eliminating the disadvantages of electro coagulation like grounding the patient, charring the tissues what causes extensive and unpredictable lateral damage leading to subsequent fibrosis. There is an obvious risk of electric current passing through the body using the electrocoagulation, which may cause painful muscular spasms (6). Radiofrequency, on the other hand, being free from these hazards, has proved to be an effective and safe treatment method of early grade bleeding internal hemorrhoids (7, 8).

The radiofrequency generator used in this study is called the Dual frequency 4 MHz. The amount of energy released by this unit is set within the range of 1 and 100. A ball electrode having length of 11 cm, supplied with the unit proved handy, was exclusively used in this procedure.

Aim of the study

The aim of this study was to show that radiofrequency coagulation is an effective, safe, and less painful alternative compared to other conventional modalities used for the treatment of early degree bleeding hemorrhoids.

Patients and method

In the presented retrospective study, the effect of radiofrequency coagulation in patients with hemorrhoids was observed during follow up period ranging from 12 to 18 months. Totally 240 patients were treated by radiofrequency coagulation. This group of patients included 126 males and 114 females. The mean age of the patients was 34 yrs (range between 19 and 69 yrs). The study was conducted at Gupta Nursing Home, Nagpur between July 2001 and December 2002.

The diagnosis of hemorrhoids was based on anoscopic examination and patients with first and second degree bleeding hemorrhoids were selected for the procedure. 117 of the patients have Grade I hemorrhoids. Remaining 123 patients have Grade II hemorrhoids, which use to prolapse during defecation and reduce by their own. 197 patients from the study had already undergone treatment in the past, but have failed to respond to the conservative treatment.

Exclusion criteria

Patients with associated anal fissure or infective anal pathologies like cryptitis or proctitis were excluded from the study.

All the patients received a written explanation of the technique including potential drawbacks, such as relapses and a possible need to repeat the procedure or to resort to other mode of treatment. The procedure was approved by the local ethical committee and was performed according to the declaration of Helsinki.

In this procedure, no anesthesia was given. However, 5% xylocain ointment was infused in the anus about 10 minutes before the actual procedure to reduce the sensitivity of the area.

Procedure of Radiofrequency coagulation

In most cases, lithotomy posture was preferred as it gave the surgeon enough ease maneuver. Left lateral position was opted in cases where lithotomy position was not possible.

A well-lubricated anoscope was gently inserted in the anal canal to visualize the hemorrhoids. Starting at the base of the pedicle, the whole pile mass was coagulated by gradually rotating the ball electrode of the radiofrequency probe over the hemorrhoid. Shrinkage and gradual change of hemorrhoids to dusky white color (blanching) indicated a satisfactory coagulation necrosis.

Hemorrhoids at all the three principal positions i.e. at 3, 7, and 11' o clock were coagulated one after one. There was no special preference for the positions of hemorrhoids to begin with; though the largest pile was dealt first. The time required for coagulation of each pile was 20 to 40 seconds depending on the size of the hemorrhoid mass.

The patients were assessed after an hour and were sent home when they didn't complain. The patients were asked to take 10 grams of psyllium husk (Naturolax) at bedtime for a month. They were also advised to apply Xylocain 5% ointment locally just before and after defecation to relieve the pre and post defecation discomfort and the possible burning sensation at the operation site. They were cautioned not to strain at stool and that they should expect little bleeding in the first week of the procedure.

An independent observer, not belonging to the operating team, carried out the assessment of the postoperative findings. Pain was assessed using a visual analogue scale from 0 (no pain at all) to 10 (the worst pain the patient had ever experienced). The first follow up was made on the 7th post procedure day. Subsequent follow-ups were made after 1 month and then after a minimum of 15 months after the procedure.

Results

23 patients (10%) complained of bleeding during first 2 weeks. This has most frequently occurred between day 5 and day 10 of the procedure. The bleeding was associated with defecation. It was attributed to sloughing of the tissue at the base of hemorrhoids and oozing from the raw area thus created.

However, 4 patients returned with heavy bleeding during the first week of the procedure. This bleeding was spontaneous, unassociated with defecation. They were admitted to the hospital. 3 of these patients have responded to conservative therapy using local compression and haemostatic medication. However, one patient needed an examination performed under general anesthesia. The active bleeding source was located and duly secured. Thereafter all of them had an uneventful recovery.

29 patients complained of pain in the anal region. The intensity of pain was 1 to 2 on visual analogue scale. They were prescribed appropriate analgesics. Rest of the patients did not complain of pain.

4 patients complained of a brownish, foul smelling discharge from the anus soiling the clothes. This was noticed at the end of the first week. While the exact cause of this discharge could not be determined, probably it was due to shedding of necrotic mu-

cosa over pile. No specific treatment was advocated. The discharge ceased spontaneously by the end of second week.

Nine patients complained of itching in and around the anal canal. The itching stopped in a few days spontaneously.

None of the patient developed an infective complications like suppuration in the operated area or perianal inflammation.

Follow-up findings

This was carried at a mean period of 18 months (range 15–23 months). 31 patients have dropped out from follow up.

Bleeding

During this period, 33 patients experience a bleeding recurrence. They were re-examined. All of them presented with hemorrhoid. They were asked for repeated radiofrequency coagulation. While 27 patients agreed, remaining 6 patients refused to undergo the procedure again. As 3 patients undergoing a repeated procedure failed to achieve relief, they were subjected to band ligation. In the rest of patients, no bleeding was reported.

Other complaints

While none of the patients had pain in the anal region, a few complained of minor discomfort during defecation. On being asked to specify, the discomfort was found related to their faulty dietary habits. They were instructed about the proper diet.

Discussion

Numerous non-operative treatments have been proposed and are being extensively used for the management of 1st and 2nd degree hemorrhoids. However, despite availability of such therapies, none is considered absolutely safe and efficacious (9).

The trend is to prefer an improved ablation technique rather than opting for hemorrhoids excision. The radiofrequency coagulator works on the same principle as the CO₂ laser. This method has many advantages (10) for the treatment of hemorrhoids. The system of radio wave surgery uses high frequency radio waves at 4.0 MHz, which deliver low temperature through RF micro-fiber electrodes and is similar to the frequency of marine band radios. The treated tissue itself resists the course of the waves and gets heated, thereby leaving the RF micro-fiber electrode in a cool state. The intracellular tissue water resisting the waves vaporizes. This vaporization of tissue fluid results in significant hemostasis without actually burning the tissue (11).

The results of radiofrequency coagulation of hemorrhoids are comparable or even better than the conventional procedures in vogue, namely, rubber band ligation, cryoablation, sclerotherapy, bipolar and heater probe and infrared coagulation.

Rubber band ligation

Although, rubber band ligation has been proved to have a greater long-term efficacy, it is associated with a significantly higher incidence of post treatment pain (12). In contrast, radiofrequency coagulation is associated with fewer and less severe

complications. The most efficacious therapy, however, may not be the optimal one if the risks of potential complications outweigh the benefits of the treatment (13).

No special training is required to carry out coagulation if the area of coagulation is kept above the dentate line. While application of band needs training for placing the band at the right place, failing of which can lead to complications like pain, strangulation of pile, necrosis, or even sepsis. The anatomical results following RFC suggest that the progression of hemorrhoids and the need for surgery are prevented (14).

Band ligation is marked by a great number of inflammatory complications (15, 16). Rubber band ligation has been associated with life threatening complications (17) like tetanus (18), liver abscess (19), pelvic cellulitis (20), rectovaginal fistula, and bacteremia. Septic complications are manifested by clinical triad: pain, fever and retention of urine (21). None of such complications has been seen in radiofrequency coagulation (14).

Radiofrequency coagulation is also well tolerated by the younger patients with hyperactive anal sphincter, where rubber band ligation had caused conceivable pain after therapy (22).

Pain after RBL occurs more often than was previously recognized. It is suggested that informed consent has be obtained before RBL and that patients should be given the opportunity to delay treatment if they so wish (23).

Cryosurgery in hemorrhoids

Cryosurgery is a fading alternative in the treatment of hemorrhoids (24) as it is associated with a higher rate of complication and less patient satisfaction (25). Though it is still used by many surgeons in India, it is almost never justified. The main drawback of the procedure is a profuse and foul smelling discharge from the treated area over a long period causing irritation and discomfort to the patient (26, 27).

The various complications following cryodestruction of hemorrhoids include severe pain (28), lower gastro-intestinal tract bleeding (29), and development of external skin tags needing later excision (30).

In addition, serious septic complications (31) including tetanus (32) and meningitis (33) have been reported in cryosurgery of hemorrhoids.

Direct current probe and heater probe treatment of hemorrhoids

Direct current probe (Ultroid, Homeron) application is used to produce a chemical destruction of the hemorrhoids. However, the procedure takes a very long time to be performed (about 10 minutes for each hemorrhoid). Complications in the form of perianal abscess and fistula requiring surgery has been reported (34). The recurrence rate with the direct current probe treatment is as high as 31 % (35).

Similarly, complications like fissures, bleeding, and rectal spasm had occurred with the bipolar probe and with the heater probe. The heater probe caused more pain during treatments (36).

While the heater probe causes damage similar to 3rd degree burns (37), the tissue damage occurring in RFC is very superficial and comparable to that occurring using Lasers (38). The amount of tissue destruction caused by such probes is simply unpredictable.

Sclerotherapy

Injecting sclerosant solutions in the submucosa of pile mass to produce aseptic inflammation and fibrosis is a century old procedure, which is still favored by many proctologists. However, this technique is associated with septic complications of mild to severe in nature (39). Life threatening complications like retroperitoneal sepsis and necrotizing fasciitis have been reported after submucosal injection therapy (40). Few others are pelvic infection and impotence (41). 'Oleogranuloma' is another complication reported with the sclerotherapy (42). Such complications are not found using RFC.

Infrared coagulation of hemorrhoids

Photocoagulation of hemorrhoids using an infrared coagulator is in practice almost 25 years and it is supposed to be a safe and swift procedure for internal hemorrhoids (43).

However, this procedure is an indirect way of hemorrhoids treatment wherein the pedicle of the pile mass is spot welded with the device to arrest blood supply to the pile mass. Today, the mechanism of development of hemorrhoidal disease focuses on the mechanical theory (44). It has been established that the laxity of the supportive tissue results in distention of the hemorrhoidal sinusoids leading to various symptoms of hemorrhoids. Under these circumstances, the basis of arresting the blood supply to the hemorrhoidal mass by infrared coagulation to achieve its regression is open to debate.

While the infrared coagulator is useful in merely coagulating the hemorrhoid pedicle, radiofrequency generator has got additional uses in performing various proctological procedures (45).

Pregnancy is not a contraindication for radiofrequency coagulation (46). It is a safe and swift procedure, which can be repeated in case of bleeding recurrence (47).

The cost of radiofrequency coagulation is limited to the acquisition of the radiofrequency generator. It is maintenance free, if care is taken during disinfection and usage. The running cost of the procedure is negligible. Moreover, with its multidisciplinary usage, the unit could be used by a multi specialty clinic for a variety of applications (48, 49).

Conclusion

The study shows that radiofrequency coagulation could be adopted as an effective alternative to conventional methods used for the treatment of early grades of symptomatic hemorrhoids.

Except the initial cost of the instrument, there are no recurring expenses. The application is easy and requires no special

training. In comparison, it is better tolerated than the band ligation and more effective when compared to other modalities of hemorrhoid treatments in practice.

References

1. **Leff E.** Haemorrhoids. *Postgrad Med* 1987; 82: 95—101.
2. **Smith LE.** Hemorrhoids. A review of current techniques and management. *Gastroenterol Clin North Amer* 1987; 16: 79—91.
3. **Arullani A, Cappello G.** Diagnosis and current treatment of hemorrhoidal disease. *Angiology* 1994; 45: 560—565.
4. **Gupta PJ.** Novel technique: radiofrequency coagulation—a treatment alternative for early-stage hemorrhoids. *Med Gen Med* 2002 4: 1—9.
5. **Huang SK.** Advances in applications of radiofrequency current to catheter ablation therapy. *Pacing Clin Electrophysiol* 1991; 14: 28—42.
6. **Pfenniger JL, Surrell J.** Nonsurgical treatment options for internal hemorrhoids. *Amer Fam Physician* 1995; 52: 821—834.
7. **Gupta PJ.** Radiofrequency coagulation: an alternative treatment in early grade bleeding hemorrhoids. *Tech Coloproctol* 2002; 6: 203—204.
8. **Pfenniger JL.** Modern treatments for internal hemorrhoids. *Brit Med J* 1997; 314: 1211—1212.
9. **Muller-Lobeck H.** Ambulatory hemorrhoid therapy. *Chirurg* 2001; 72: 667—676
10. **Brown JS.** Radiosurgery. 324—325. In: Brown JS (Ed). *Minor Surgery a text and atlas*. London, Arnold 1994.
11. **Wedman J, Miljeteig H.** Treatment of simple snoring using radio waves for coagulation of uvula and soft palate: a day-case surgery procedure. *Laryngoscope* 2002; 112: 1256—1259.
12. **MacRae HM, McLeod RS.** Comparison of hemorrhoidal treatment modalities. A meta-analysis. *Dis Colon Rectum* 1995; 38: 687—694.
13. **Johanson JF, Rimm A.** Optimal nonsurgical treatment of hemorrhoids: a comparative analysis of infrared coagulation, rubber band ligation and injection sclerotherapy. *Amer J Gastroenterol* 1992; 87: 1600—1606.
14. **Gupta PJ.** Radiofrequency coagulation: a treatment alternative in early hemorrhoids. *Indian J Gastroenterol* 2002; 21: 167.
15. **O'Hara VS.** Fatal clostridial infection following hemorrhoidal banding. *Dis Colon Rectum* 1980; 23: 570—571.
16. **Nikitin AM, Dultsev IV, Chubarov-Iulu, Iakushin AV, Minbaev ST.** A comparative study of nonsurgical methods in the treatment of hemorrhoids. *Khirurgiia (Mosk)* 1992; 9—10: 47—50.
17. **Wechter DG, Luna GK.** An unusual complication of rubber band ligation of hemorrhoids. *Dis Colon Rectum* 1987; 30: 137—140.
18. **Shemesh EI, Kodner IJ, Fry RD, Neufeld DM.** Severe complications of rubber band ligation of internal hemorrhoids. *Dis Colon Rectum* 1987; 30:199—200.
19. **Quevedo-Bonilla G, Farkas AM, Abcarian H et al.** Septic complications of hemorrhoidal banding. *Arch Surg* 1988; 123: 650—651.
20. **Clay LD 3rd, White JJ Jr, Davidson JT, Chandler JJ.** Early recognition and successful management of pelvic cellulitis following hemorrhoidal banding. *Dis Colon Rectum* 1986; 29: 579—581.

21. **Scarpa FJ, Hillis W, Sabetta JR.** Pelvic cellulitis: A life-threatening complication of hemorrhoidal banding. *Surgery* 1988; 103: 383–385.
22. **Ambrose NS, Morris D, Alexander Williams J, Keighley MR.** A randomized trial of photocoagulation or injection sclerotherapy for the treatment of first and second-degree hemorrhoids. *Dis Colon Rectum* 1985; 28: 238–240.
23. **Hardwick RH, Durdey P.** Should rubber band ligation of haemorrhoids be performed at the initial outpatient visit? *Ann R Coll Surg Engl* 1994; 76: 185–187.
24. **Ferguson EF Jr.** Alternatives in the treatment of hemorrhoidal disease. *South Med J* 1988; 81: 606–610.
25. **Yamamoto Y, Sano K.** Cryosurgical hemorrhoidectomy: how to prevent the postoperative swelling and prolapse. *Cryobiology* 1982; 19: 289–291.
26. **O'Callaghan JD, Matheson TS, Hall R.** Inpatient treatment of prolapsing piles: cryosurgery versus Milligan-Morgan haemorrhoidectomy. *Brit J Surg* 1982; 69: 157–159.
27. **Baltaitis IV, Matiashin MI, Korolenko VB, Mal'tsev VN.** Methods for the cryosurgical treatment of hemorrhoids. *Klin Khir* 1993; 26: 53–56.
28. **Adekunle OO, Kolawole JF.** A comparative study of excisional surgery and cryohaemorrhoidectomy. *Afr J Med Med Sci* 1984; 13: 7–13.
29. **Tanaka S.** Cryosurgical treatment of hemorrhoids in Japan. *Int Surg* 1989; 74: 146–147.
30. **Traynor OJ, Carter AE.** Cryotherapy for advanced haemorrhoids: a prospective evaluation with 2-year follow-up. *Brit J Surg* 1984; 71: 287–289.
31. **Guy RJ, Seow-Choen F.** Septic complications after treatment of haemorrhoids. *Brit J Surg* 2003; 90: 147–156.
32. **Singh K, Chhina RS, Kaul TK.** Postoperative tetanus following cryosurgery for haemorrhoids. *Trop Doct* 1992; 22: 135–136.
33. **Anderson J, Steger A.** Fatal meningitis complicating cryosurgery for haemorrhoids. *Brit Med J (Clin Res Ed)* 1984; 288: 826.
34. **Machicado GA, Cheng S, Jensen DM.** Resolution of chronic anal fissure after treatment of contiguous internal haemorrhoids with direct current probe. *Gastrointest Endosc* 1997; 45: 157–162.
35. **Randall GM, Jensen DM, Machicado GA, Hirabayashi K, Jensen ME, You S, Pelayo E.** Prospective randomized comparative study of bipolar versus direct current electrocoagulation for treatment of bleeding internal hemorrhoids. *Gastrointest Endosc* 1994; 40 (4): 403–410.
36. **Jensen DM, Jutabha R, Machicado GA, Jensen ME, Cheng S, Gornbein J, Hirabayashi K, Ohning G, Randall G.** Prospective randomized comparative study of bipolar electro coagulation versus heater probe for treatment of chronically bleeding internal hemorrhoids. *Gastrointest Endosc* 1997; 46: 435–443.
37. **Pfenninger JL, DeWitt DE.** In Pfenninger JL and Fowler GC [eds] *Radio frequency surgery. Procedures for primary care physicians.* St. Louis: Mosby, 1994; 91–101.
38. **Saidi MH, Setzler FD Jr, Saddler RK, Farhart SA, Akright BD.** Comparison of office loop electro surgical conization and cold knife conization. *J Amer Ass Gynecol Laparosc* 1994; 1: 135–139.
39. **Barwell J, Watkins RM, Lloyd Davies E, Wilkins DC.** Life threatening retroperitoneal sepsis after hemorrhoidal injection therapy: report of a case. *Dis Colon Rectum* 1999; 42: 421–423.
40. **Kaman-L, Aggarwal S, Kumar R, Behera A, Katariya RN.** Necrotizing fasciitis after injection sclerotherapy for hemorrhoids: report of a case. *Dis Colon Rectum* 1999; 42: 419–420.
41. **Pasha JN, Scholefield JH.** Managing haemorrhoids. *Brit Med J* 2003; 327: 847–851.
42. **Santos G, Novell JR, Khoury G, Winslet MC, Lewis AA.** Long-term results of large-dose, single-session phenol injection sclerotherapy for hemorrhoids. *Dis Colon Rectum* 1993; 36: 958–961.
43. **Infrared coagulation:** a new treatment for hemorrhoids. *Dis Colon Rectum* 1981; 24: 602–605.
44. **Haas PA, Fox TA Jr, Haas GP.** The pathogenesis of hemorrhoids. *Dis Colon Rectum* 1984; 27: 442–450.
45. **Gupta PJ.** Sphincterotomy with radio frequency surgery: a new treatment technique of fissure In ano and associated pathologies. *Rom J Gastroenterol* 2003; 12: 37–40.
46. **Gupta PJ.** Radioablation of advanced grades of hemorrhoids with radiofrequency. *Curr Surg* 2003; 60: 447–453.
47. **Gupta PJ.** Randomized trial comparing in-situ radiofrequency ablation and Milligan-Morgan hemorrhoidectomy in prolapsing hemorrhoids. *J Nippon Med Sch* 2003; 70: 393–400.
48. **Gupta PJ.** Use of radiofrequency in the Treatment of Minor Anal Pathology *Acta Chir Belg* 2004; 104: 311–315.
49. **Gupta PJ.** Radiosurgery: A new tool in the proctology practice. *Bratisl Lek Listy* 2004; 105: 270–276.

Received February 20, 2006.

Accepted March 24, 2006.