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Original Research Article

A prospective clinical study comparing the use of conventional electrocautery and harmonic scalpel for hemorrhoidectomy

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ABSTRACT

Background: Haemorrhoids are a common ailment affecting the adult population with hemorrhoidectomy being the standard of care for 3 and 4 haemorrhoids. The purpose of this study was to analyze and compare outcomes between hemorrhoidectomy performed with Harmonic Scalpel vs electrocautery.
Methods: A total of 46 patients admitted in our institute from August 2022 to September 2024 with grade 3 and 4 haemorrhoids were included in the study. Both arms of study had 23 patients each with one arm undergoing hemorrhoidectomy using Harmonic Scalpel and the other using electrocautery.
Results: There was no significant difference observed in operating time. Significantly lower intra as well as post operative bleeding was recorded with Harmonic Scalpel. Post operative pain using VAS scale at 12, 24 and 48 hours was significantly lower in Harmonic Scalpel group. Also the need for post operative analgesia was lower in Harmonic Scalpel group. All above findings contributed to lower hospital stay in Harmonic Scalpel group.
Conclusions: We conclude that , Harmonic Scalpel hemorrhoidectomy is safer, better and is associated with less intra as well as post operative bleeding , decreased pain scores with less analgesia requirement along with reduced hospital stay as compared to electrocautery hemorrhoidectomy.

Keywords: Electrocautery, Hemorrhoidectomy, Harmonic scalpel

INTRODUCTION

A hemorrhoidectomy is the standard treatment for patients with grade III or IV hemorrhoids.[1] The most effective hemorrhoidectomy methods are the Milligan-Morgan open hemorrhoidectomy and the Ferguson closed hemorrhoidectomy. Management of post hemorrhoidectomy pain remains a very unsatisfactory clinical dilemma. The complications particularly, postoperative pain and bleeding are experienced by many patients after undergoing a hemorrhoidectomy and many patients complain of discomfort for a long time which increases the patient's hospitalization period, can delay the return to normal life and the workplace after surgery and can increase the rate of revisits to the hospital.[2] In recent years, several types of surgical equipment have been developed due to advances in technology and now hemorrhoidectomies are being performed with new devices, such as bipolar electro thermal devices, ultrasonic scalpels and circular staplers.

The ultrasonic scalpel uses ultrasonic vibration to cut tissue and automatically stop bleeding at the same time. Hemorrhoidectomy performed with an ultrasonic scalpel has several advantages, including less damage to tissues, better hemostasis, less stimulation to neuromuscular tissues and local control over the surgical site tissue, compared to hemorrhoidectomy performed with surgical scissors or monopolar electric cautery.[3,4] The aim of the present study is to analyze and compare outcomes between hemorrhoidectomies performed with harmonic scalpel coagulation and those performed by using conventional methods, such as electric cautery coagulation.

METHODS

It was a prospective interventional study conducted at GMC, Nagpur. A total 46 patients (above 18 years of age) underwent hemorrhoidectomy for grade III or IV hemorrhoids, in our institute between August 2016 and September 2018. 23 patients underwent hemorrhoidectomy using electric cautery, which was defined as the conventional method and the other 23 patients underwent hemorrhoidectomy using harmonic scalpel. All of the patients' records were prospectively retrieved from a database. Patients with thrombosed/gangrenous internal or external hemorrhoids, other ano-rectal pathology, previous anorectal surgery, bleeding disorders, unfit for surgery were excluded from the present study.

Inclusion criteria

All consenting patients above 18 years of age presenting with uncomplicated Grade 3 and 4 hemorrhoids presenting to the department of surgery at GMC, Nagpur. All patients underwent preoperative assessment and were admitted to the hospital the day before surgery. All patients were given a glycerin enema the night before surgery and prophylactic antibiotics were injected before induction of anesthesia. All patients had spinal anesthesia. Tape was attached to both sides of the buttocks to expose the anus and an anoscope was inserted into the anal canal in order to obtain the surgical field. The hemorrhoid stems were lifted with forceps to separate them from the anal sphincter during surgery with hemostasis using bipolar cautery. In the present study, the conventional method performed was the Milligan Morgan open hemorrhoidectomy using monopolar electrocautery and resection of hemorrhoid tissue was performed (Figure 3) with a monopolar electrocautery device (Figure 1). The hemorrhoidectomy using harmonic scalpel (Figure 2) was performed following same principles of open method except in these cases harmonic was used instead of electrocautery for coagulation and cutting. We recorded operative time (minutes) and intraoperative bleeding (Gauze piece method). For postoperative pain control, each patient was prescribed Diclofenac 75 mg, tablets two times a day from the first day after surgery and sitz baths were taken at least two times a day. Authors recorded the postoperative pain by using the visual analogue scale (VAS), after 6 hours, 12 hours, 24 hours and 48 hours as well as the amount of postoperative bleeding, major bleeding (requiring blood transfusion) and urinary retention. We also noted postoperative analgesia requirement, first bowel movement, urinary retention, fecal incontinence, pruritus ani, wound infection, hospital stay, anal stenosis and recurrence. All statistical analyses were performed using Statistical software STATA version 14.0. Continuous variables were presented as Mean±SD. Categorical variables were expressed in frequency and percentages. Continuous variables were compared between 2 groups by performing independent t-test. Categorical variables were compared by Pearson chi^2–test. Mean pain on VAS was compared at different follow-up period in each group by performing one-way repeated measure ANOVA test. Multiple comparison was done by Bonferroni t-test. For small numbers, Fisher exact test was applied wherever required. $P<0.05$ was considered as statistical significance.

Figure 1: Electrocautery.

Figure 2: Harmonic device.

Figure 3: Electrocautery hemorrhoidectomy.

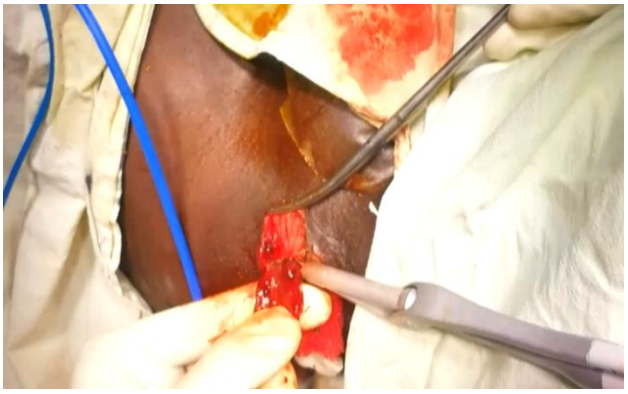

Figure 4: Harmonic hemorrhoidectomy.

RESULTS

The present study has following results of outcomes between hemorrhoidectomies performed with harmonic scalpel coagulation and with electro cautery coagulation. The mean age in the harmonic scalpel group is 50.69±16.33, whereas in the electrocautery group is 49.86±14.20. The male/female ratio in the respective groups is 17/06 and 18/05 respectively. Above results shows that there is no significant difference on age and gender distribution in two groups.

The intraoperative and postoperative bleeding was compared between two groups

There is no significant difference in mean operative time by using either harmonic or electrocautery coagulation, whereas intraoperative bleeding is significantly (p value-0.004) less with harmonic scalpel than electrocautery. Similarly, the postoperative bleeding is significantly (p value 0.0004) less with harmonic scalpel than electrocautery. Group of harmonic scalpel has postoperative bleeding for (1.82±0.77) days and that of electrocautery has (3.94±1.29) days with highly significant p value (0.0004).

Postoperative pain compared in two groups

In present study, mean postoperative pain VAS at different interval i.e., after 6 hours, 12 hours, 24 hours and 48 hours shows highly significant fall in harmonic scalpel group.

Postoperative analgesia dose requirement in two groups

The mean postoperative analgesia dose requirement in 2 groups compared, shows number of doses of analgesia required are significantly (p value 0.0001) more in group of patients operated using electrocautery.

First bowel movement compared in two groups

There is no significant difference between two groups in mean hours for First bowel movement.

Other postoperative complications compared between two groups

Above table shows that other postoperative complications like urinary retention, major bleeding, faecal incontinence, pruritus ani, anal stenosis and wound infection have insignificant p values in both groups.

Also, from the last row it can be seen that, there was no significant difference in recurrence rate in between two groups.

Hospital stay compared between two groups

There is significant difference in hospital stay in two groups, which is higher in patients operated with electrocautery.

Table 1: Mean intraoperative and postoperative bleeding in 2 groups.

Variable	Harmonic scalpel	Electrocautery	P value
Intra operative bleeding			
Min	18	7	0.004, HS
Moderate	5	14	
Severe	1	2	
Postoperative bleeding (days)	1.82±0.77	3.94±1.29	0.0004, HS
Mean operative time (MIN)	43.95±8.94	42.39±8.64	0.5492, NS

HS: high-significant, NS: non-significant.

Table 2: Mean pain on VAS at different follow up period in 2 groups.

Postoperative time	Harmonic scalpel (VAS)	Electrocautery (VAS)	P value
6 hours	5.93±1.38	7.21±1.17	0.0015, HS
12 hours	5.39±1.23	6.30±1.23	0.0157, S
24 hours	4.73±1.32	5.67±1.55	0.0335, S
48 hours	1.95±1.55	3.30±1.33	0.0028, HS

HS: high-significant, S: significant.

Table 3: Mean postoperative analgesia dose requirement in 2 groups.

Variable	Harmonic Scalpel	Electrocautery	P value
Mean postoperative analgesia dose requirement (No. of dose)	1.71±0.90	3.69±1.89	0.0001 (HS)

HS: high-significant.

Table 4: Mean hours for first bowel movement in 2 groups.

Variable	Harmonic Scalpel	Electrocautery	P value
Mean hours for first bowel movement	20.17±2.82	20.47±3.70	0.7554 (NS)

NS: non-significant.

Table 5: Other postoperative complications.

Complications	Harmonic scalpel	Electrocautery	P value
Urinary retention			
Yes	7	5	0.738, NS
No	16	18	
Major bleeding	1	1	1.000, NS
Faecal incontinence	0	1	1.000, NS
Pruritus ani	0	1	1.000, NS
Anal stenosis	1	1	1.000, NS
Wound infection	2	4	0.628, NS
Recurrence			
Yes	2	1	1.000, NS
No	21	22	

NS: non-significant.

Table 6: Mean days of hospital stay in 2 groups.

Variable	Harmonic scalpel	Electrocautery	P value
Mean hospital stay (days)	3.08±0.90	5.91±4.04	0.0001 (HS)

HS: high-significant.

DISCUSSION

Hemorrhoidectomy is the most effective and definitive treatment for symptomatic third- and fourth-degree hemorrhoids. Traditional hemorrhoidectomy techniques, including Milligan-Morgan open hemorrhoidectomy and Ferguson closed hemorrhoidectomy, are known to be very effective and appropriate treatments for grades III–IV internal hemorrhoids. However, these traditional surgical methods are characteristically accompanied by complications such as postoperative pain and bleeding.[5] Recently, hemorrhoidectomies done with circular staplers and other newly developed equipment have been reported to result in less postoperative pain, less bleeding, rarer complications (urinary retention, anal stenosis), shorter operation times and shorter hospital stays.[6-9]

A hemorrhoidectomy with a circular stapler is performed to excise a complete ring of mucosa, including the hemorrhoid tissue, above the dentate line.[9,10] However, this procedure is limited to removing prolapsed hemorrhoid tissues of the anal verge or skin tags.[11] In addition, the cost of performing a hemorrhoidectomy with a circular stapler is high and the method often leads to complications such as postoperative bleeding, rupture of the anastomosis site, pelvic sepsis, anastomotic stricture and rectovaginal fistulae.[12] The LigaSure and harmonic scalpels are newly developed harmonic scalpel instruments with automatic vessel-sealing systems. These instruments contain a bipolar, electro thermal, hemostatic device that use radiofrequencies and pressure to ensure complete cutting and coagulation of vessels up to 7 mm in diameter, with minimal surrounding thermal spread (<2 mm) and limited tissue-charring.[13] For a hemorrhoidectomy performed with an ultrasonic scalpel, intraoperative bleeding may be minimized and the visibility of the surgical field is better. In contrast, for a hemorrhoidectomy performed with conventional methods, the surrounding mucosal tissues and blood vessels can be damaged during resection of the hemorrhoid tissue and the time to hemostasis of the blood vessels and tissues may cause increases in both the operation times and the possibility of postoperative bleeding.

Furthermore, several previous studies have reported that the use of the ultrasonic scalpel results in significantly shorter operation times and less postoperative bleeding

when compared with a conventional hemorrhoidectomy.[14-17] In the present study's Harmonic scalpel group, patient experienced postoperative bleeding for average 1 to 2 days (Mean- 1.82±0.77), however, in the electrocautery method group, patients experienced average 3 to 4 days (Mean- 3.94±1.29), with p value 0.0004.

One of the causes of postoperative pain after a hemorrhoidectomy is excessive damage to the sensitive perianal skin or tissue and sometimes pain occurs due to stress or strain at the site of the mucosal sutures in closed methods.[2] A number of ways have been attempted to relieve pain after a hemorrhoidectomy. For example, Ala et al reported that cholestyramine ointment was effective against postoperative pain after a hemorrhoidectomy, the ointment group experienced less pain 12 and 48 hours after surgery than the control group did and their pain completely disappeared 2 weeks later.[18] Other effective treatments for the relief of postoperative pain, including preoperative lactulose, postoperative metronidazole, a left lateral anal sphincterotomy with hemorrhoidectomy and botulinum injections, have been reported.[14,19-22] However, these methods have individual variations in pain-relief effectiveness and there are no general effects. The harmonic scalpel minimizes the damage to surrounding tissues and suture closure is not required for hemostasis during the hemorrhoidectomy. This limited spread reduces anal spasms, allows for a bloodless hemorrhoidectomy and can result in reduced postoperative pain and faster wound-healing. Previous studies have reported less immediate postoperative pain and less pain 24 hours and 7 days after surgery in harmonic scalpel groups compared with electrocautery groups. A shorter time to return to ordinary life and shorter hospital stays have also been reported.[14-17] In the present study, highly significant less pain after 6hrs (p=0.0015) and 48 hours (p=0.0028) was found in the harmonic scalpel group, so ultimately there was significant differences in post-operative analgesia dose requirement were noted, where harmonic group requires less analgesia with early recovery.

In a study done by Di Vita et al and Patti et al it was observed that a reduced time to healing with reduced spread of necrosis and inflammatory pattern, associated with reduced post-operative pain and the lower analgesic consumption was seen in the group which underwent hemorrhoidectomy with harmonic scalpel and they concluded that the use of ultrasonic scalpel to perform Milligan-Morgan hemorrhoidectomy, compared with conventional instruments, reduced post-operative pain, expediated healing and lead to an early return to normal activity.[22,23]

In our study, there was also a statistically significant decrease in post-operative pain score and analgesia requirement in the Harmonic scalpel group. Dae Ro Lim et al, in his study involving 50 patients showed post-operative pain score of 6.5±1.7 following conventional hemorrhoidectomy compared to 3.8±1.4 following HSH. Follow up pain score was 1.5±1.2 versus 0.8±0.8 in conventional method group and HSH group respectively and these differences had statistical significance (p <0.05).[24] In a meta-analysis of the random trials in literature comparing harmonic scalpel hemorrhoidectomy and traditional surgical procedures done by Mushaya et al where 8 randomized controlled trials were compared, they observed significant decrease in postoperative pain score and decreased analgesia post operatively following Harmonic scalpel hemorrhoidectomy as compared to conventional methods (p <0.005).[25] All these studies had similar percentage of pain score post-operatively after hemorrhoidectomy and were comparable to present study.

In a study done by Bulus et al, mean operating time for Harmonic scalpel was 16.8±4.1 while it was 25.5±7.7 for electrocautery, p<0.001 for a sample size of 151 patients.[26] In a case control study by Joel Sayfan et al, mean operating time was 11.09 minutes (range 5-15, SD 3.40) in the study group (HSH Group) and 38.76 minutes (range 20-60, SD 11.0) in control group (MMH Group) 13. But, in present study, the operation times were longer in the harmonic scalpel group than they were in the electrocautery method group (43.95±8.94 minutes vs. 42.39±8.64 minutes, respectively; P- 0.5492), which is not significant. All procedures were performed by different surgery teams.

In present study there was a statistically significant reduction in postoperative bleeding in Harmonic scalpel group (mean- 1.82±0.77 days) compared with electrocautery group (mean- 3.94±1.29 days). Lim et al in his study showed that 3 patients (12%) following HSH experienced minor bleeding, however in electrocautery method group 2 patients (8%) experienced major bleeding and 6 patients (24%) had minor bleeding. P value was <0.05.[24] Morri et al, in their study of 50 patients showed that 31 patients (62 %) had insignificant bleeding (less than one gauze) following Harmonic scalpel hemorrhoidectomy.[27] A study by Tsunoda et al showed that the average blood loss during Harmonic scalpel hemorrhoidectomy was less than 5 ml which makes this procedure almost bloodless.[28] The results in these studies were similar to the results in present study.

Recurrence was higher in electrocautery group (6.7% in 6 months follow up) compared with the Harmonic group (nil). Electrocautery group showed a higher duration of treatment with mean duration of 8.13 days compared with HSH group (4.02 days). Both these studies were statistically significant. However; in present study there was no significant difference in recurrence in two groups. (p-1.000). Thus, in comparison with all the above-mentioned trials present study shows a statistically significant decreased intra-operative blood loss, pain score, analgesic requirement, postoperative bleeding and hospital stay following Harmonic scalpel as compared to electrocautery group. Similar to recent reports on

Harmonic Scalpel™ hemorrhoidectomy, the present study shows that Harmonic scalpel is as safe and effective, with decreased complications. In study results, lesser blood loss, decreased postoperative pain are upheld and the Hemorrhoidectomy can be conducted as day surgery.

The main limitation of the study is the small sample size, short patient follows up. Cost will always be a concern with newer technology.

CONCLUSION

In present study we conclude that, harmonic scalpel hemorrhoidectomy is advantageous, safe and more effective as compared to electrocautery hemorrhoidectomy in terms of amount of intraoperative bleeding, post-operative pain, postoperative analgesia requirement and hospital stay. Although the use of the Harmonic Scalpel has a prolonged learning curve with increased cost, but it has its own advantages.

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REFERENCES

1. MacRae HM, McLeod RS. Comparison of hemorrhoidal treatment modalities. A meta-analysis. Dis Colon Rectum. 1995;38:687–94.
2. Goligher JC, Graham NG, Clark CG, De Dombal FT, Giles G. The value of stretching the anal sphincters in the relief of post-haemorrhoidectomy pain. Br J Surg. 1969;56:859–61.
3. Jayne DG, Botterill I, Ambrose NS, Brennan TG, Guillou PJ, O'Riordain DS. Randomized clinical trial of Ligasure versus conventional diathermy for day-case haemorrhoidectomy. Br J Surg. 2002;89:428–32.
4. Bulus H, Tas A, Coskun A, Kucukazman M. Evaluation of two hemorrhoidectomy techniques: harmonic scalpel and Ferguson's with electrocautery. Asian J Surg. 2014;37:20–3.
5. Chen JS, You JF. Current status of surgical treatment for hemorrhoids: systematic review and meta-analysis. Chang Gung Med J. 2010;33:488–500.
6. Sgourakis G, Sotiropoulos GC, Dedemadi G, Radtke A, Papanikolaou I, Christofides T, et al. Stapled versus Ferguson hemorrhoidectomy: is there any evidence-based information. Int J Colorectal Dis. 2008;23:825–32.
7. Gravie JF, Lehur PA, Huten N, Papillon M, Fantoli M, Descottes B, et al. Stapled hemorrhoidopexy versus milligan-morgan hemorrhoidectomy: a prospective, randomized, multicenter trial with 2-year postoperative follow up. Ann Surg. 2005;242:29–35.
8. Ascanelli S, Gregorio C, Tonini G, Baccarini M, Azzena G. Long stapled haemorrhoidectomy versus Milligan-Morgan procedure: short- and long-term results of a randomised, controlled, prospective trial. Chir Ital. 2005;57:439-47.
9. Hetzer FH, Demartines N, Handschin AE, Clavien PA. Stapled vs excision hemorrhoidectomy: long-term results of a prospective randomized trial. Arch Surg. 2002;137:337–40.
10. Longo V. Treatment of haemorrhoid disease by reduction of mucosa and haemorrhoidal prolapse with a circular-suturing device: a new procedure; In: Proceedings of the Sixth World Congress of Endoscopic Surgery; 1998, Italy. Bologna: Monduzzi Editore, International Proceedings Division;.1998: 777–784.
11. Engel AF, Eijsbouts QA. Haemorrhoidectomy: painful choice. Lancet. 2000;355:2253–4.
12. Ravo B, Amato A, Bianco V, Boccasanta P, Bottini C, Carriero A, et al. Complications after stapled hemorrhoidectomy: can they be prevented. Tech Coloproctol. 2002;6:83–88.
13. Sayfan J, Becker A, Koltun L. Sutureless closed hemorrhoidectomy: a new technique. Ann Surg. 2001;234(1):21-4.
14. Jayne DG, Botterill I, Ambrose NS, Brennan TG, Guillou PJ, O'Riordain DS. Randomized clinical trial of Ligasure versus conventional diathermy for day-case hemorrhoidectomy. Br J Surg. 2002;89:428–32.
15. Bulus H, Tas A, Coskun A, Kucukazman M. Evaluation of two hemorrhoidectomy techniques: harmonic scalpel and Ferguson's with electrocautery. Asian J Surg. 2014;37:20–3.
16. Gentile M, De Rosa M, Carbone G, Pilone V, Mosella F, Forestieri P. LigaSure haemorrhoidectomy versus conventional diathermy for IV-degree haemorrhoids: is it the treatment of choice? A randomized, clinical trial. ISRN Gastroenterol. 2011;2011:467258.
17. Milito G, Cadeddu F, Muzi MG, Nigro C, Farinon AM. Haemorrhoidectomy with Ligasure vs conventional excisional techniques: meta-analysis of randomized controlled trials. Colorectal Dis. 2010;12:85–93.
18. Ala S, Eshghi F, Enayatifard R, Fazel P, Rezaei B, Hadianamrei R. Efficacy of cholestyramine ointment in reduction of postoperative pain and pain during defecation after open hemorrhoidectomy: results of a prospective, single-center, randomized, double-blind, placebo-controlled trial. World J Surg. 2013;37:657–62.
19. London NJ, Bramley PD, Windle R. Effect of four days of preoperative lactulose on post haemorrhoidectomy pain: results of placebo controlled trial. Br Med J. 1987;295:363–4.
20. Carapeti EA, Kamm MA, McDonald PJ, Phillips RK. Double-blind randomised controlled trial of effect of metronidazole on pain after day-case haemorrhoidectomy. Lancet. 1998;351:169–72.

21. Galizia G, Lieto E, Castellano P, Pelosio L, Imperatore V, Pigantelli C. Lateral internal sphincterotomy together with haemorrhoidectomy for treatment of haemorrhoids: a randomised prospective study. Eur J Surg. 2000;166:223–8.
22. Patti R, Almasio PL, Muggeo VM, Buscemi S, Arcara M, Matranga S, et al. Improvement of wound healing after hemorrhoidectomy: a double-blind, randomized study of botulinum toxin injection. Dis Colon Rectum. 2005;48:2173–9.
23. Di Vita G, Patti R, Petrone R, Arcara M, Sieli G. Milligan-Morgan haemorrhoidectomy with ultrasonic scalpel. G Chir. 2003;24(11-12):422-7.
24. Lim DR, Cho DH, Lee JH, Moon JH. Comparison of a hemorrhoidectomy with ultrasonic scalpel versus a conventional hemorrhoidectomy. Ann Coloproctol. 2016;32(3):111-6
25. Mushaya CD, Caleo PJ, Bartlett L, Buettner PG, Ho YH. Harmonic scalpel compared with conventional excisional haemorrhoidectomy: a meta-analysis of randomized controlled trials. Tech Coloproctol. 2014;18(11):1009-16.
26. Bulus H, Tas A, Coskun A, Kucukazman M. Evaluation of two hemorrhoidectomy techniques: Harmonic scalpel and Ferguson's with electrocautery. Asian J Surg. 2014;37(1):20-3.
27. Morri A, Prabhakar KB, Kurra SS. Ligasure (Precision) Haemorrhoidectomy at government general hospital. J Evidence based Med Healthcare. 2015;2(39):6383-6.
28. Tsunoda A, Sada H, Sugimoto T, Kano N, Kawana M, Sasaki T, et al. Randomized controlled trial of bipolar diathermy vs ultrasonic scalpel for closed hemorrhoidectomy. World J Gastrointest Surg. 2011;3(10):147-52.

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