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Comparison of Hemorrhoidectomy by Ligasure and Conventional Milligan Morgans Technique

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ABSTRACT

Objective: To compare the outcomes of LigaSure versus the conventional Milligan-Morgan technique in patients undergoing hemorrhoidectomy. **Study Settings:** Department of General Surgery, Pakistan Institute of Medical Sciences (PIMS), Islamabad from 20 August 2004 to 20 **February 2025**. **Duration of Study:** Six months following approval from the institutional ethical committee. **Data Collection:** A randomized controlled trial was conducted on 60 patients with grade 3 or 4 hemorrhoids, divided into two groups: LigaSure (Group A) and Milligan-Morgan (Group B). Operative time, intraoperative blood loss, and postoperative pain were measured using a stopwatch, gauze count, and the 0–10 Visual Analog Scale (VAS) at 6, 12, and 24 hours postoperatively. **Results:** The LigaSure group exhibited significantly shorter operative times (38.26±9.42 minutes vs. 56.11±10.90 minutes, p<0.001), lower intraoperative blood loss (53.01±20.69 mL vs. 72.35±22.99 mL, p=0.001), and reduced postoperative pain scores across all intervals (e.g., 3.79±0.84 at 6 hours vs. 5.57±0.79, p<0.001). These findings highlight the LigaSure technique's efficiency, hemostatic precision, and ability to reduce postoperative pain. **Conclusion:** LigaSure hemorrhoidectomy demonstrated superior outcomes compared to the Milligan-Morgan technique, offering reduced operative time, intraoperative blood loss, and postoperative pain. It provides a safer and more efficient alternative for hemorrhoid surgery, potentially reducing hospital burden and improving patient recovery.

INTRODUCTION

Hemorrhoids are masses or clusters of muscle and elastic fibers in an individual's anal canal, surrounded by supporting tissues and swollen, bulging blood vessels.[1] It is one of the most frequent anorectal disorders, particularly in Western countries, resulting in roughly 3.3 million ambulatory care visits in the United States and impacting all age groups and genders.[2] Long-term constipation, diarrhea, prolonged straining, pregnancy, heredity, prolonged upright posture, elevated intra-abdominal pressure with restriction of venous return, aging, and anomalies in the internal anal sphincter are among the etiologic causes of hemorrhoids.[3–4] Conservative or minimally invasive approaches are used in most patients during the initial stages. Injection sclerotherapy and rubber band ligation are two common non-surgical interventional procedures to treat first- and second-degree hemorrhoids. However, for grade 3 and grade 4 hemorrhoidal disease, the ideal therapy is surgery.[5] The gold standard and most widely practiced surgical procedure is conventional hemorrhoidectomy.[6-7] The open approach (Milligan-Morgan) and the closed method (Fansler-Ferguson) are two traditional hemorrhoidectomy techniques. However, this operation is linked with serious postoperative consequences such as discomfort, bleeding, mucous discharge, urine retention, and anal stenosis.[8] On the other hand, LigaSure hemorrhoidectomy with submucosal dissection is a faster and safer surgical procedure for achieving bloodless dissection of the hemorrhoidal tissues, with a lower complication rate.[9] Compared with conventional hemorrhoidectomy, the LigaSure method of dissection significantly reduces postoperative pain and the number of parenteral analgesic injections. This is attributed to minimal collateral thermal spread, limited tissue charring, and the absence of sutures, which may lead to less postoperative pain. Consequently, the LigaSure system facilitates earlier discharge from the hospital and an earlier return to normal work or activities.[10-11] Bakhtiari et al. found that the mean operating time for the LigaSure group was 36.6 ± 9.8 minutes, compared to 52.5 ± 11.9 minutes in the Milligan-Morgan group. The mean blood loss in the

LigaSure group was 51.92 ± 15.61 mL, while it was 70.34 ± 25.41 mL in the Milligan-Morgan group. Overall pain scores were lower in patients who underwent LigaSure hemorrhoidectomy (3.65 ± 0.79 vs. 5.41 ± 0.68; p = 0.001).[12]

Nagaty also reported similar results, finding that the mean operating time for the LigaSure group was 12.5 ± 3 minutes, compared to 23.3 ± 5.2 minutes in the Milligan-Morgan group. The mean blood loss was 14.5 ± 6.66 mL with LigaSure, compared to 25.17 ± 2.52 mL with the Milligan-Morgan technique. Additionally, the overall pain scores were lower in patients undergoing LigaSure hemorrhoidectomy (4.1 ± 0.8 vs. 6.8 ± 1.8; p = 0.001).[13]

This study aims to compare the outcomes of LigaSure and conventional Milligan-Morgan techniques. The technique that results in adequate postoperative pain relief, a lesser volume of blood loss during surgery, and shorter operative time will be adopted as it will significantly contribute to the earlier recovery of patients and their overall satisfaction. This will also reduce the inpatient burden on hospitals and improve local clinical practice by providing evidence-based guidelines for the management of hemorrhoidal disease.

METHODOLOGY

This randomized controlled trial was conducted in the General Surgery Department at the Pakistan Institute of Medical Sciences (PIMS), Islamabad, over six months 20 August 2004 to 20 February 2025 following approval from the institutional ethical committee. The sample size was calculated using OpenEpi.com, ensuring a 95% confidence level and a study power of 90%. A total of 60 patients, 30 in each group, were included. The sample size calculation was based on mean blood loss values of 51.92 ± 15.68 mL for the LigaSure technique and 70.34 ± 25.59 mL for the Milligan-Morgan technique.[12] A non-probability consecutive sampling method was employed to recruit patients.

Patients aged 18–75 years of either gender, presenting with 3rd or 4th degree hemorrhoids, and scheduled for hemorrhoidectomy were included in the study. Exclusion criteria comprised immunosuppressed individuals, those on steroid or anticoagulant therapy, patients with hemorrhagic disorders (PT >15 seconds), prior complicated anal surgeries, liver disease (ALT or AST >40 IU, hepatitis B or C, or cirrhosis), end-stage kidney disease (serum creatinine >2 mg/dL or on dialysis), or pregnancy. Patients fulfilling the inclusion criteria were randomly assigned to one of two groups using the lottery method. Group A underwent hemorrhoidectomy using the LigaSure technique, while Group B underwent the procedure using the conventional Milligan-Morgan technique.

All surgeries were performed under spinal anesthesia by the same surgical team with assistance from the researcher. In the LigaSure group, the device was used to seal hemorrhoidal tissue with minimal thermal spread. The jaws of the handset were applied to the pedicle, and the device was activated via a foot pedal. A digitally managed feedback circuit ensured the cessation of energy flow upon achieving coagulation and mucosal fusion. No sutures were required in this technique. In the Milligan-Morgan group, hemorrhoids were surgically excised, including both the skin-covered external and mucosal elements, and the hemorrhoidal pedicle was transfixed using 0 Vicryl sutures, preserving the intervening mucosal bridges.

Data collection was conducted using a structured proforma. Demographics, including age, gender, BMI, duration and degree of hemorrhoids, history of diabetes (BSR >200 mg/dL), hypertension (BP >140/90 mmHg), smoking (>5 pack-years), alcohol consumption (>20 mL/day), diet history, lifestyle, occupation, residence, and socioeconomic status, were recorded. Operative time was measured in minutes, from the start of surgery to shifting the patient to the ward, using a stopwatch. Blood loss during surgery was quantified by counting the number of soaked 4x4 gauze pieces, with each piece considered equivalent to 10 mL of blood loss. Postoperative pain was assessed using the 0–10 Visual Analog Scale (VAS) at 6, 12 and 24 hours post-surgery, where 0 represented no pain and 10 the worst imaginable pain.

Postoperatively, all patients were administered prophylactic antibiotics, including Ceftriaxone (1 g twice daily) and Metronidazole (500 mg thrice daily), along with injectable Ketorolac (30 mg thrice daily) for the initial 24 hours. Pain assessments were conducted as per the operational definitions at the specified intervals.

Data were analyzed using SPSS version 25. The Shapiro-Wilk test was applied to assess data normality. Quantitative variables such as age, BMI, duration of hemorrhoids, operative time, blood loss, and pain scores were expressed as mean ± standard deviation (SD). Qualitative variables such as gender, degree of hemorrhoids, diabetes, hypertension, smoking, alcohol consumption, diet history, lifestyle, occupation, residence, and socioeconomic status were presented as frequencies and percentages. An independent t-test was applied to compare the mean operative time, blood loss, and pain scores between the two groups, with a p-value of <0.05 considered statistically significant. To assess the potential influence of demographic and clinical variables, data were stratified by age, gender, BMI, duration and degree of hemorrhoids, history of diabetes, hypertension, smoking, alcohol consumption, diet history, lifestyle, occupation, residence, and socioeconomic status. Post-stratification comparisons were also performed using an independent t-test.

RESULTS

Demographic Variables of the Patients

Table 1 compares demographic variables between the Ligasure group (n=30) and Milligan Morgan group (n=30) undergoing hemorrhoid surgery. Variables include age, gender, BMI, hemorrhoid characteristics, comorbidities, smoking habits, diet, lifestyle, residential status, and socioeconomic class. Statistical significance was assessed using p-values. The majority of patients (56.7%) were aged 18–50 years, with a higher proportion in the Ligasure group (63.3%) compared to the Milligan Morgan group (50.0%,p=0.297). Gender distribution was identical in both groups (60% male, p=1.00), and BMI distribution showed no significant differences (p=0.602). Most patients had hemorrhoids for 1–2 years (45.0%), with no notable differences in symptom duration or degree (p=0.380, p=0.136). Comorbidities, including diabetes (50%) and hypertension (36.7%), were similarly distributed between groups (p=0.606, =0.592). However, smoking showed a significant difference (p=0.020), with more smokers in the Ligasure group (40.0%) than in the Milligan Morgan group (13.3%). Lifestyle differences approached significance (p=0.058), with a more active lifestyle in the Ligasure group (46.7%) compared to the Milligan Morgan group (23.3%). Residential status differed significantly (p=0.042), with rural residency more common in the Milligan Morgan group (33.3%) and urban residency higher in the Ligasure group (80.0%). Socioeconomic status was predominantly middle-class (55.0%) in both groups, with no significant differences (p=0.35). Significant findings include higher smoking prevalence in the Ligasure group and differences in residential status between the two groups. Other demographic variables were largely comparable.

Table 1

Comparison of Demographics of the Patients(n=60)

Variable	Categories	Ligasure Group (n=30)	Milligan Morgan Group (n=30)	Total	P-value
Age (years)	18-50	19 (63.3%)	15 (50.0%)	34 (56.7%)	0.297
	51-75	11 (36.7%)	15 (50.0%)	26 (43.3%)	
Gender	Male	18 (60.0%)	18 (60.0%)	36 (60.0%)	1.00
	Female	12 (40.0%)	12 (40.0%)	24 (40.0%)	
BMI	18-25	12 (40.0%)	14 (46.7%)	26 (43.3%)	0.602
	>25	18 (60.0%)	16 (53.3%)	34 (56.7%)	
Duration of Hemorrhoids	<1	8 (26.7%)	6 (20.0%)	14 (23.3%)	0.380
	1-2	15 (50.0%)	12 (40.0%)	27 (45.0%)	
	2-3	7 (23.3%)	12 (40.0%)	19 (31.7%)	
Degree of Hemorrhoids	3rd degree	20 (66.7%)	25 (83.3%)	45 (75.0%)	0.136
	4th degree	10 (33.3%)	5 (16.7%)	15 (25.0%)	
Diabetes Mellitus	Yes	16 (53.3%)	14 (46.7%)	30 (50.0%)	0.606
	No	14 (46.7%)	16 (53.3%)	30 (50.0%)	
Hypertension	Yes	12 (40.0%)	10 (33.3%)	22 (36.7%)	0.592
	No	18 (60.0%)	20 (66.7%)	38 (63.3%)	
Smoking	Yes	12 (40.0%)	4 (13.3%)	16 (26.7%)	0.020
	No	18 (60.0%)	26 (86.7%)	44 (73.3%)	
Diet History	Home-made	21 (70.0%)	19 (63.3%)	40 (66.7%)	0.782
	Street-food	8 (26.7%)	9 (30.0%)	17 (28.3%)	
	Mess/Hostel	1 (3.3%)	2 (6.7%)	3 (5.0%)	
Lifestyle	Active	14 (46.7%)	7 (23.3%)	21 (35.0%)	0.058
	Sedentary	16 (53.3%)	23 (76.7%)	39 (65.0%)	
Occupation	Employed	21 (70.0%)	21 (70.0%)	42 (70.0%)	1.00
	Unemployed	9 (30.0%)	9 (30.0%)	18 (30.0%)	
Residential Status	Rural	3 (10.0%)	10 (33.3%)	13 (21.7%)	0.042
	Urban	24 (80.0%)	15 (50.0%)	39 (65.0%)	
	Semi-Urban	3 (10.0%)	5 (16.7%)	8 (13.3%)	
Socioeconomic Status	Low	11 (36.7%)	11 (36.7%)	22 (36.7%)	0.355
	Middle	15 (50.0%)	18 (60.0%)	33 (55.0%)	
	High	4 (13.3%)	1 (3.3%)	5 (8.3%)	

Comparison of Outcomes for LigaSure vs. Milligan-Morgan Techniques (n=60)

Table 2 presents a comparison of surgical and postoperative outcomes between the LigaSure and Milligan-Morgan techniques in patients undergoing hemorrhoidectomy. The outcomes assessed include operative time, blood loss, and postoperative pain at 6, 12, and 24 hours. Statistically significant differences were observed across all parameters, favoring the LigaSure technique. The operative time was significantly shorter for the LigaSure group, with a mean of 38.26 ± 9.42 minutes compared to 56.11 ± 10.90 minutes for the Milligan-Morgan group (p<0.001). This indicates that the LigaSure technique is more time-efficient, potentially reducing operating room utilization and patient exposure to prolonged anesthesia. Blood loss during surgery was also significantly lower in the LigaSure group, with a mean of 53.01 ± 20.69 mL

compared to 72.35 ± 22.99 mL in the Milligan-Morgan group (p=0.001). This suggests that the LigaSure technique provides better hemostasis, reducing the risk of intraoperative complications related to excessive bleeding. Postoperative pain scores were consistently lower in the LigaSure group across all time points. At 6 hours post-surgery, patients in the LigaSure group reported a mean pain score of 3.79 ± 0.84, significantly lower than the 5.57 ± 0.79 reported in the Milligan-Morgan group (p<0.001). Similar trends were observed at 12 hours (2.92 ± 0.82 vs. 4.57 ± 1.14, p<0.001) and 24 hours (2.67 ± 0.57 vs. 3.94 ± 0.78, p<0.001). These findings highlight the LigaSure technique's ability to minimize postoperative pain, likely due to its precision and reduced tissue trauma. The data is further highlighted in graphical presentation in Fig. 1

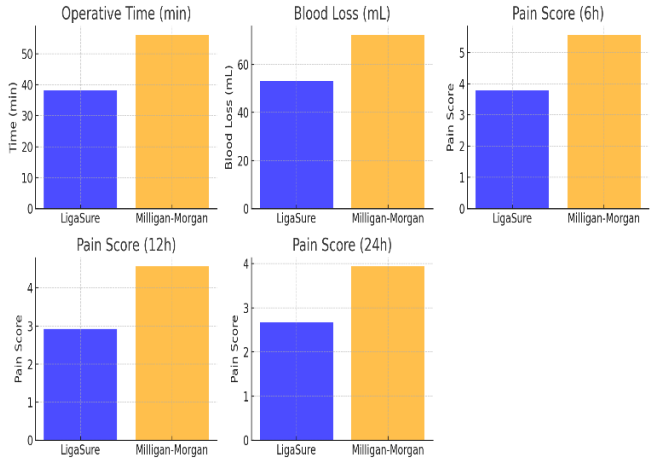
Table 2

Comparison of Outcomes of Liga Sure versus Conventional Milligan-Morgan Technique in Patients Undergoing Hemorrhoidectomy(n=60)

Group		N	Mean	Std. Deviation	P value
Operative Time (min)	LigaSure	30	38.26	9.42	0.000
	Milligan-Morgan	30	56.11	10.90	
Blood Loss (mL)	LigaSure	30	53.01	20.69	0.001
	Milligan-Morgan	30	72.35	22.99	
Pain Score (6h)	LigaSure	30	3.79	0.84	0.000
	Milligan-Morgan	30	5.57	0.79	
Pain Score (12h)	LigaSure	30	2.92	0.82	0.000
	Milligan-Morgan	30	4.57	1.14	
Pain Score (24h)	LigaSure	30	2.67	0.57	0.000
	Milligan-Morgan	30	3.94	0.78	

Figure 1

Comparison of Outcome of Both Techniques



DISCUSSION

This study compared LigaSure hemorrhoidectomy with the conventional Milligan-Morgan technique for managing grade 3 and grade 4 hemorrhoids. Our results showed significant advantages for the LigaSure technique, including shorter operative time, reduced intraoperative blood loss, lower postoperative pain, and faster recovery. These findings align with and extend the conclusions of several previous studies.

Our study demonstrated a significantly shorter operative time for LigaSure (38.26 ± 9.42 minutes) compared to Milligan-Morgan (56.11 ± 10.90 minutes, p < 0.001). This result is consistent with Nagaty et al[13] who reported mean operative times of 12.5 ± 3 minutes for LigaSure and 23.3 ± 5.2 minutes for Milligan-Morgan. Mustafa Celalettin Haksal's[14] findings also support this hypothesis, with median operative times of 15 minutes (range: 4–60 minutes) for LigaSure and 20 minutes (range: 6–40 minutes) for Milligan-Morgan. These results reflect the efficiency of LigaSure, which eliminates the need for suture ligation, reducing procedural complexity.

LigaSure significantly reduced blood loss in our study (53.01 ± 20.69 mL vs. 72.35 ± 22.99 mL, p = 0.001). Saadia Aslam and others[15] reported an even more pronounced difference, with mean blood loss of 2.47 ± 1.22 mL for LigaSure compared to 4.83 ± 4.44 mL for Milligan-Morgan (p = 0.0001). Nagaty et al.[13] observed similar trends (14.5 mL for LigaSure vs. 25.17 mL for Milligan-Morgan). These findings highlight LigaSure's superior hemostatic capabilities, which minimize vascular injury and collateral thermal damage.

LigaSure was associated with significantly lower postoperative pain scores in our study (3.79 ± 0.84 at 6 hours vs. 5.57 ± 0.79 for Milligan-Morgan, p < 0.001). Saadia Aslam's[15] study similarly noted lower pain scores for LigaSure (5.39 ± 2.51) compared to Milligan-Morgan (8.53 ± 3.78, p = 0.0001). These results align with Nienhuijs et al.'s[16] meta-analysis, which reported a weighted mean difference of -2.07 in first-day VAS scores favoring LigaSure. Mustafa Celalettin Haksal[14] also observed reduced postoperative analgesic requirements for LigaSure (67.3% vs. 88.3% in the conventional group). The reduced pain is attributed to LigaSure's minimal thermal spread, precise vessel sealing, and avoidance of sutures, which mitigate tissue trauma and inflammation.

Although hospital stay was not assessed in our study, previous research highlights LigaSure's benefits in this regard. Nagaty et al[13] reported shorter stays (1.4 days for LigaSure vs. 3.2 days for Milligan-Morgan), consistent with Saadia Aslam's[15] findings (1.47 ± 0.50 days vs. 2.20 ± 0.79 days). Mustafa Celalettin Haksal further supported these findings, noting faster return to normal activities (6 days for LigaSure vs. 7 days for Milligan-Morgan). Such outcomes are critical for patient satisfaction and healthcare efficiency, as shorter stays and quicker recoveries reduce resource utilization and improve quality of care.

Our study did not measure postoperative complications, but previous research suggests fewer complications with LigaSure. Nienhuijs et al[16] reported fewer urinary retention cases and delayed wound healing with LigaSure. Mustafa Celalettin Haksal[14] observed reduced

postoperative bleeding and shorter convalescence, suggesting LigaSure's safety and efficacy. These advantages are likely due to LigaSure's precision in sealing vessels without excessive thermal spread, which reduces collateral damage.

The cumulative evidence strongly supports LigaSure as a superior technique for hemorrhoidectomy. Its advantages in operative time, blood loss, postoperative pain, and recovery have been consistently documented in this study, Saadia Aslam's trial,[15] Mustafa Celalettin Haksal's[14] retrospective review, and meta-analyses such as Nienhuijs et al.[16] The reproducibility of these results across diverse settings, patient populations, and study designs underscores LigaSure's reliability and efficacy.

The findings of this study are strengthened by its randomized controlled design and detailed stratification of data by demographic and clinical variables. However, the study's limitations include a relatively small sample size and a lack of long-term follow-up to evaluate recurrence and other late complications.

CONCLUSION

LigaSure hemorrhoidectomy consistently demonstrates superior outcomes compared to the Milligan-Morgan method across multiple studies, including our own. Its advantages in reducing operative time, blood loss, postoperative pain, and recovery time make it a preferable option for managing grade 3 and 4 hemorrhoids. Future research should focus on long-term outcomes to further substantiate these findings and evaluate the cost-effectiveness of adopting LigaSure as a standard practice.

REFERENCES

1. Margetis N. Pathophysiology of internal hemorrhoids *Annals of Gastroenterology* 2019;32(3):264. https://doi.org/10.20524/aog.2019.0355
2. Ravindranath G, Rahul B. Prevalence and risk factors of hemorrhoids: a study in a semi-urban center *International Surgery Journal* 2018;5(2):496-9. https://doi.org/10.18203/2349-2902.isj20180339
3. Kibret AA, Oumer M, Moges AM. Prevalence and associated factors of hemorrhoids among adult patients visiting the surgical outpatient department in the University of Gondar Comprehensive Specialized Hospital, Northwest Ethiopia *PLoS One* 2021;16(4):e0249736. https://doi.org/10.1371/journal.pone.0249736
4. Mott T, Latimer K, Edwards C. Hemorrhoids: diagnosis and treatment options *American Family Physician* 2018;97(3):172-9.
5. Ray-Offor E, Amadi S. Hemorrhoidal disease: Predilection sites, pattern of presentation, and treatment *Annals of African Medicine* 2019;18(1):12-6. https://doi.org/10.4103/aam.aam_4_18
6. Aslam S, Mujahid MD, Ali S, Asif M, Irdi MFB, Choudhry ZA. Comparison of LigaSure versus conventional (Milligan-Morgan) hemorrhoidectomy for the treatment of 3rd degree hemorrhoids *Annals of Punjab Medical College (APMC)* 2019;13(2):117-20.
7. Amir A, Nazir A, Umair A, Kian MA, Maqbool S, Anwar MI, et al. Comparison of pedicle coagulation hemorrhoidectomy with LigaSure versus conventional Milligan-Morgan hemorrhoidectomy in reducing post-operative pain: A randomized controlled trial *Cureus* 2023;15(9). https://doi.org/10.7759/cureus.45015
8. Ghannam WM. Prospective, randomized controlled trial of LigaSure versus conventional hemorrhoidectomy for grade III and IV hemorrhoids *International Journal of Surgery and Medicine* 2017;3(1):8-13. https://doi.org/10.5455/ijsm.hemorrhoids-ligasure
9. Haksal MC, Ciftci A, Tiryaki C, Yazıcıoğlu MB, Özyıldız M, Yıldız SY. Comparison of the reliability and efficacy of LigaSure hemorrhoidectomy and conventional Milligan-Morgan hemorrhoidectomy in the surgical treatment of grade III and IV hemorrhoids *Turkish Journal of Surgery* 2017;33(4):233. https://doi.org/10.5152/turkjsurg.2017.3493
10. Vinayaka N, Prajwal R, Sudhir M. A comparative study between LigaSure hemorrhoidectomy and conventional hemorrhoidectomy *Journal of Medical Science and Clinical Research* 2018;6(9):754-61. https://doi.org/10.18535/jmscr/v6i9.132
11. Noori IF. LigaSure hemorrhoidectomy versus excisional diathermy hemorrhoidectomy for all symptomatic hemorrhoids *Medical Journal of Babylon* 2018;15(1):83-8. https://doi.org/10.4103/mjbl.mjbl_21_18
12. Bakhtiar N, Moosa FA, Jaleel F, Qureshi NA, Jawaid M. Comparison of hemorrhoidectomy by LigaSure with conventional Milligan-Morgan hemorrhoidectomy *Pakistan Journal of Medical Sciences* 2016;32(3):657-61. https://doi.org/10.12669/pjms.323.9976
13. Nagaty ME. A comparison between the outcome of LigaSure hemorrhoidectomy versus conventional Milligan-Morgan's technique *Al-Azhar International Medical Journal* 2022;3(1):52-6. https://doi.org/10.21608/aimj.2022.108381.1694

14. Nienhuijs SW, de Hingh IH. Pain after conventional versus Ligasure haemorrhoidectomy. A meta-analysis. International journal of surgery. 2010 Jan 1;8(4):269-73. https://doi.org/10.1016/j.ijsu.2010.04.001