

**Original Article****Laser Hemorrhoidoplasty for Treatment of the Hemorrhoids in Eastern Nepal**

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Article Received: 17<sup>th</sup> August, 2023; Accepted: 20<sup>th</sup> October, 2023; Published: 31<sup>st</sup> December, 2023

DOI: <https://doi.org/10.3126/jonmc.v12i2.61093>

**Abstract****Background**

Millions worldwide are affected by hemorrhoids (prevalence 2.9%-27.9%), causing symptoms in over 4% of individuals. These anorectal disorders result from enlarged anal hemorrhoidal cushions, often due to constipation. Internal or external, they're graded by prolapse severity, with common symptoms including painless rectal bleeding. Treatment options range from conservative to surgical, with the gold standard, Milligan-Morgan hemorrhoidectomy, associated with postoperative pain. Laser hemorrhoidoplasty, a minimally invasive diode laser approach, shows promise, offering less postoperative pain, shorter hospital stays, and fewer complications than traditional surgical methods.

**Materials and Methods**

A prospective observational study of 40 adults undergoing laser hemorrhoidectomy for symptomatic Goligher's grade II and III hemorrhoids at Nobel Medical College Teaching Hospital, Biratnagar, Nepal, from June 2022 to June 2023. Outcomes included pain scores, bleeding, operative time, postoperative complications, hospital stay length, return-to-work time, and patient satisfaction measured by QOL SF36 scoring.


**Results**

Among 40 patients, 16 were male and 24 females, averaging  $42.32 \pm 12.26$  years. Grade III hemorrhoids were found in 31 patients, Grade II in 9. Operative time averaged  $17.22 \pm 2.14$  minutes, with one case of managed intraoperative bleeding. Postoperative symptoms included pain, skin tags, and wound infection, but no reactive bleeding, urinary, or stool/flatus incontinence. Two cases experienced recurrence. Patient satisfaction in general health evaluation scored  $65.11 \pm 10.35$ .

**Conclusion**

Laser hemorrhoidoplasty is associated with less complications, quicker operative time, quick recovery and similar patient satisfaction when compared to surgical methods of hemorrhoidectomy.

**Keywords:** Hemorrhoids, Hemorrhoidectomy, Laser, Rectal disease

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**Citation**

Bhattarai A, Adhikari D, Poudel S, Mehta AK, Yadav DK, Parajuli B *et. al.*, Laser Hemorrhoidoplasty for Treatment of the Hemorrhoids in Eastern Nepal, JoNMC. 12:2 (2023) 9-14. DOI: <https://doi.org/10.3126/jonmc.v12i2.61093>



## Introduction

Millions of individuals all around the world suffer from hemorrhoids, a common anorectal disorder. With an estimated global frequency ranging from 2.9% to 27.9%, of which more than 4% are symptomatic, it is a significant medical and socioeconomic issue that significantly affects patients' quality of life [1–4]. Enlargement and/or protrusion of the anal hemorrhoidal cushions causes symptomatic hemorrhoids. Constipation and continuous straining are two major etiologic factors that can lead to hemorrhoids. Increased intranal pressure causes abnormal vascular channel dilatation and engorgement, which is followed by long-term alterations in the connective tissue that supports the anal cushions [5]. Hemorrhoids can be internal or external depending on where they originate in relation to the dentate line. Based on the severity of the prolapse and the ease of reduction, internal hemorrhoids are further divided into grades 1 through 4 [6, 7]. The tissue that supports hemorrhoids can degrade or weaken with time, beginning as early as the second or third decade of life, causing the cushions to move distally and venous distention, erosion, hemorrhage, thrombosis, and/or tissue prolapse. The most frequent symptom of people with symptomatic internal hemorrhoids is painless bleeding associated with bowel movements; with or without occasional tissue protrusion. Symptomatic hemorrhoids have a variety of different treatments available today. Conservative medical management, non-surgical therapies, and various surgical procedures have all been used as measures. While some people may benefit from conservative therapy such as fiber supplements, sitz baths and topical lotions, surgery is typically necessary when the patient complains of bleeding and prolapse. Open (Milligan-Morgan) or closed (Ferguson) techniques may be used. The Milligan-Morgan hemorrhoidectomy is regarded as the best surgical method for treating hemorrhoids. In reality, despite several advancements and modifications to surgical methods, the primary drawbacks remain postoperative discomfort, limitations on everyday activities, serous-mucous discharge, and recurrence. Pain following a hemorrhoidectomy is the most frequent issue connected to surgical methods. Pain following a hemorrhoidectomy is the most frequent issue connected to surgical methods. Urinary retention (20.1%), secondary or reactive bleeding (2.4%–6%), and subcutaneous abscess (0.5%) are the additional early problems. Anal fis-

tures (1%-2.6%), anal stenosis (1%), incontinence (0.4%), fistula (0.5%), and recurrence of hemorrhoids are among the long-term complications [8, 9].

A novel minimally invasive and painless therapy for hemorrhoids that causes the hemorrhoidal piles to contract using a diode laser is called laser hemorrhoidoplasty [4, 10]. An innovative method that is increasingly being used for benign anal problems is laser energy [11]. Short, very energetic light pulses are generated by probes and converted into heat energy when they are absorbed by the tissues in the immediate vicinity. Carbon dioxide, argon, and Nd:YAG laser energies are the most frequently utilized laser energies in medicine. The depth of tissue deterioration and shrinking is dependent on the laser's power and duration of treatment.

In comparison to conventional excision, laser hemorrhoidoplasty results in less substantial postoperative pain and reduced morbidity since it is less aggressive on the anoderm and the anal canal mucosa. Laser hemorrhoidoplasty when compared with other treatment modalities has been associated with less operative time, postoperative pain, duration of hospital stays, and complications.

We present our experience of LHP at a teaching hospital in the Eastern Region of Nepal. The rationale of this study is to find the complication and acceptance rate of this procedure at our center.

## Materials and Methods

This is a prospective observational study conducted at Nobel Medical College Teaching Hospital in Biratnagar, Nepal in patients undergoing elective hemorrhoidsurgery from June 2022 to June 2023. Ethical approval was obtained from the IRC of Nobel Medical College and the teaching hospital. Consent was obtained before surgery regarding the procedure and the use of data for research purposes. All patients over the age of 18 years, with a symptomatic hemorrhoid of grade II to III according to Goligher's classification, and failure of conservative medical management were included in the study. Patients with a history of bleeding disorders, anal fissures or fistula, inflammatory bowel disease or colorectal cancer, a history of prior hemorrhoid surgery, immunocompromised patients or patients with any chronic illness that compromise wound healing, patients who have a contraindication to use of laser therapy, pregnant or breastfeeding women, patients who are unable to complete fol-



low-up visits were excluded from the study. All the patients who underwent LHP in the study duration were included in the study. Only those who fulfilled the criteria were analyzed. The sample size was calculated using the formula,  $n = (z)^2 p (1 - p) / d^2$ . Given, the confidence level (z) at 95% is 1.96; prevalence of symptomatic hemorrhoids is 4% [4]. So, estimated proportion (p) = 0.04 (4%), the margin of error (d)=0.06 (6%), Substituting these values into a formula gives the value of 40.64. So, the desired sample size is 40. The outcomes were measured in terms of pain scores by the visual analog scale every 6 hours during the postoperative stay, bleeding, operative time, postoperative complications, length of hospital stay, time to return to work, and patient satisfaction by QOL SF36 scoring evaluating general health score.

Statistical analysis was done using SPSS software version 26. Results on continuous measurements were presented with mean and standard deviation and results on categorical measurements were presented in numbers and percentages.

With the patients in lithotomy position, the proctoscope was inserted into the rectum, and the arteries were sealed by means of a 980-nm diode laser optic fiber (five, 13 W pulses of 1.2 s each, with a 0.6 spause) that replaced the Doppler probe in the same canal. The actual closure of each artery was double-checked with the Doppler transducer, and a further sequence of three spots was delivered if required (Fig. 2). Two enemas (250 mL) were administered preoperatively (on the evening before surgery and early on the morning of the procedure). Antibiotic prophylaxis with 500 mg metronidazole was routinely given 30 min before the procedure.

Two enemas were administered preoperatively (on the evening before surgery and early on the morning of the procedure). Antibiotic prophylaxis with 500 mg metronidazole was routinely given 30 min before the procedure. With the patients in a lithotomy position under intravenous anesthesia, the windowed proctoscope was inserted into the rectum. The procedure used a diode laser generator (Leonardo 1470 from Biolitec), set between 12 and 15 watts in pulsed mode which delivers laser energy through a radial fiber (figure 2). The hemorrhoidal plexus was sealed using a 980-nm diode laser optic fiber (five, 13 W pulses of 1.2 s each, with a 0.6 spause) as shown in Figure 1. Post-procedure ice cubes were applied and adrenaline-soaked gauze pieces were packed into the anal canal.

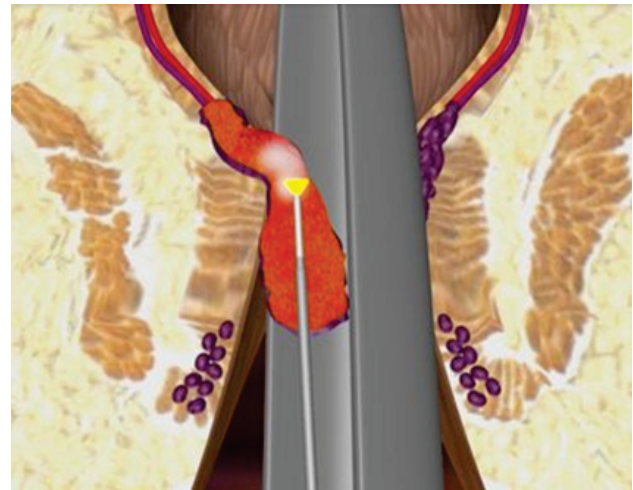


Figure 1: Laser application in hemorrhoid Source: [www.biolitec.com](http://www.biolitec.com)



Figure 2: Laser generator, radial fiber and accessories

## Results

LHP was performed on a group of 40 consecutive patients who were affected by II-III grade hemorrhoids. Out of these patients, 24(60%) were females and 16(40%) were males, with an average age of  $42.32 \pm 12.26$  years (ranging from 22 to 70 years) at the time of presentation. The chief symptoms were bleeding in 40 (100%) patients, prolapse in 40 (100%) patients, constipation in 26 (65%) patients, and itching in 17 (42.5%) patients. The most common grade of hemorrhoids observed was grade III: 31(77.5%) patients, followed by grade II:9(22.5%) patients. (Table 1)

During the surgical procedure, 1 (2.5%) patient had bleeding. Other intraoperative complications were not observed during our study period. The mean operative time was  $17.22 \pm 2.14$  minutes, and the average hospitalization duration was  $2.31 \pm 0.46$  days. (Table 2)

After the LHP procedure, the postoperative pain levels were evaluated using the visual analog scale (VAS). The results showed that the mean VAS was  $6.2 \pm 1.4$ ,  $4.7 \pm 1.2$ ,  $3.1 \pm 1.3$ , and  $2.2 \pm 1.5$  at 6, 12, 18, and 24 hours post-surgery



respectively. 2 patients (5%) experienced severe pain. Skin tags were seen in 11 (27.5%) patients. There were no cases of stool or flatus incontinence, and no urinary outflow complications were reported. While 3 (7.5%) patients who underwent LHP reported infection post-procedure, 2 (5%) patients reported recurrence. In terms of recovery, 16 (40%) patients returned to their daily activities after one day, and the remaining 24 (60%) patients resumed daily activities after two days of surgery, the mean day to return to work was  $1.6 \pm 0.49$  days. The patient satisfaction according to the QOL SF36 – general health score was  $65.11 \pm 10.35$ . (Table 3)

Table 1: Patient Demographics

Variables	Values
<b>Age</b>	42.32 $\pm$ 12.26 years
<b>Sex</b>	
Male	16 (40%)
Female	24 (60%)
<b>Grade of hemorrhoids</b>	
Grade II	9 (22.5%)
Grade III	31 (77.5%)
<b>Chief Complains</b>	
Bleeding	40 (100%)
Prolapse	40 (100%)
Constipation	26 (65%)
Itching	17 (42.5%)

Table 2: Intraoperative Findings

Variables	Values
<b>Operative duration</b>	17.22 $\pm$ 2.14 minutes
<b>Duration of hospital stay</b>	2.31 $\pm$ 0.46 days
<b>Intraoperative complication</b>	
Bleeding	1 (2.5%)

Table 3: Postoperative Findings

Variables	Values
<b>Postoperative pain using VAS</b>	
6 hours	6.2 $\pm$ 1.4
12 hours	4.7 $\pm$ 1.2
18 hours	3.1 $\pm$ 1.3
24 hours	2.2 $\pm$ 1.5
<b>Postoperative complications</b>	
Skin tags	11 (27.5%)
Severe pain	2 (5%)
Wound infection	3 (7.5%)
Stool or flatus incontinence	0
Urinary retention	0
Reactive bleeding	0
<b>Duration to resume daily activities</b>	1.6 $\pm$ 0.49 days
<b>Recurrence of symptoms</b>	2 (5%)
<b>Patient Satisfaction by QOL SF36</b>	
General health	65.11 $\pm$ 10.35

## Discussion

The treatment of hemorrhoids ranges from conservative to surgical interventions. The choice of intervention is heavily influenced by the severity of the hemorrhoid and the patient's satisfaction [4]. Various non-excision interventions include trans-anal artery ligation or intra-luminal artery ligation [11]. Non-surgical interventions include rubber band ligation (RBL), injection sclerotherapy, cryotherapy, diathermy coagulation, infrared coagulation, and more recently laser hemorrhoidoplasty [12]. Conservative treatment or Rubber band ligation can be useful in up to 90% of cases of symptomatic hemorrhoids, and major surgical intervention should be reserved in severe cases of hemorrhoids [8]. Surgical procedures are usually reserved for advanced hemorrhoids. Surgical procedures such as open methods (Milligan-Morgan) or closed (Ferguson) are the most widely used. Milligan-Morgan hemorrhoidectomy is considered to be the gold standard technique for the management of hemorrhoids [4]. It is the traditional open-surgical excision method for hemorrhoids [13]. However, the Milligan-Morgan technique causes increased postoperative pain, urinary incontinence, constipation, bleeding, longer healing time, and rarely anal stenosis and anal incontinence [4, 8, 9].

Laser hemorrhoidoplasty (LHP) was first used in a case series by Karahaliloğlu in 106 cases of grade I and II hemorrhoids in 2007 [14]. The most frequently reported complications of LHP in the review of literature is early or delayed bleeding, persistent skin tags, and thrombosis [10–12, 15]. There were 40 patients that underwent LHP, with a mean age of 42.32  $\pm$  12.26 years. The age of the patients had a very wide range from 22 years to 70 years. The widespread age distribution of hemorrhoids was statistically insignificant to the occurrence of various complications that arise from LHP. The mean operative time during our study was 17.22  $\pm$  2.14. This is similar to the findings seen in the study by Maloku et al. (15.94  $\pm$  3.5 mins), Crea et al. (18 minutes), and Poskus et al. (15  $\pm$  5.6 minutes) [3, 4, 16]. This is significantly better than the Milligan-Morgan procedure whereby an average of 31 minutes is required to complete the surgical procedure [17]. Rubber band ligation is the most popular non-surgical approach but it requires multiple sessions, which is generally not necessary for LHP [18]. The postoperative pain was analyzed using the VAS system. The results showed that the mean VAS was 6.2  $\pm$  1.4, 4.7  $\pm$  1.2, 3.1  $\pm$  1.3, and 2.2  $\pm$  1.5 at 6 hours, 12 hours, 18 hours, and 24 hours post-procedure respectively. The choice of anal-



gesic was intravenous ketorolac. Severe pain was managed using intravenous ketorolac and tramadol. The result is similar to the study done by Naderan et al, Aditya et al, and Maloku et al. [4, 11, 19]. There was no statistical significance in the pain and grade of hemorrhoids. Bleeding is one of the most common operative complications of LHP [11]. We observed bleeding in 1 (2.5%) case. It was a minor bleed and was successfully treated with a laser. Bleeding rates of LHP are observed to be fewer than in open surgical procedures [16, 20].

Residual skin tags were observed in 11 (27.5%) cases, which is similar to the findings by Diop et al. (28.5%) and Plapler et al. (33.3%) [15, 21]. "Lifting" procedure or intraoperative skin excision prevents the formation of skin tags at the cost of increased wound size [15]. The duration of hospital stay during our study was  $2.31 \pm 0.46$  days, which is similar to the duration of stay for various other procedures, [12, 22]. The duration of hospital stay was statistically insignificant when compared to other surgical or non-surgical procedures. This is similar to the study done by Shabahanget al [22]. Other studies such as by Sankar and Masson showed a statistically significant decrease in hospital stay during laser hemorrhoidoplasty compared to surgical procedures [23, 24]. Time to return to work was reported to be 2 days for most patients: 24 (60%), and 1 day for 16 (40%) patients. The mean time was  $1.6 \pm 0.49$  days. The time to return to work is better when compared with surgical procedures such as the Milligan-Morgan or the Ferguson technique, while the time to return to work is similar when compared with non-surgical techniques such as RBL, sclerotherapy, etc [16, 20, 25]. Similar results were present in the study by Poskus et al. and Jain et al [16, 25].

Wound infection was observed in 3 (7.5%) cases after LHP. The occurrence of wound infection is similar to the study by Abdulkarim et al. (4.5%). The presence of increased humidity or poor wound care by the patient will increase the risk of wound infection. Recurrence after the Milligan-Morgan or Ferguson technique is significantly lower than LHP [26, 27]. However, the recurrence after other non-surgical techniques like rubber band ligation and sclerotherapy is similar to the recurrence after LHP [12]. In our study we found the recurrence of hemorrhoids to be at 10% following LHP. This finding is similar to the study done by Poskus et. al. (10%) and Crea et al (5%) [3, 16]. Patient satisfaction was measured according to the QOL SF36 survey evaluating general health. We found the general health to be

at 65.11  $\pm$  10.35. This is similar to the study by Poskus et. al. and Shabahanget et. al. [16,22]. As this is a single-center study, findings could not be generalized.

## Conclusion

Laser hemorrhoidoplasty is associated with fewer complications, quicker operative time, quick recovery and similar patient satisfaction when compared to surgical methods of hemorrhoidectomy.

**Acknowledgment:** None

**Conflict of interest:** None

## References

- [1] Johanson JF, Sonnenberg A, The prevalence of hemorrhoids and chronic constipation, An epidemiologic study, *Gastroenterology*. 98:2 (1990) 380-6. DOI: 10.1016/0016-5085(90)90828-o. PMID: 2295392
- [2] Rogozina VA, Hemorrhoids, *EkspKlin Gastroenterol*. 4 (2002) 93-6. PMID: 12503286
- [3] Crea N, Pata G, Lippa M, Chiesa D, Gregorini ME, Gandolfi P, Hemorrhoidal laser procedure: short- and long-term results from a prospective study, *Am J Surg*. 208:1 (2014) 21-5. DOI:10.1016/j.amjsurg.2013.10. PMID: 24507943.
- [4] Maloku H, Gashi Z, Lazovic R, Islami H, Juniku Shkololli A, Laser Hemorrhoidoplasty Procedure vs Open Surgical Hemorrhoidectomy: a Trial Comparing 2 Treatments for Hemorrhoids of Third and Fourth Degree, *Acta Informatica Medica*. 22:6 (2014) 365-7. DOI: 10.5455/aim.2014.22.365-367. PMID: 25684841
- [5] Loder PB, Kamm MA, Nicholls RJ, Phillips RK, Haemorrhoids: pathology, pathophysiology and aetiology, *Br J Surg*. 81:7 (1994) 946-54. DOI: 10.1002/bjs.1800810707. PMID: 7922085
- [6] Davis BR, Lee-Kong SA, Migaly J, Feingold DL, Steele SR, The American Society of Colon and Rectal Surgeons Clinical Practice Guidelines for the Management of Hemorrhoids, *Dis Colon Rectum*. 61:3 (2018) 284-292. DOI: 10.1097/DCR.0000000000001030. PMID: 29420423
- [7] Wald A, Bharucha AE, Cosman BC, Whitehead WE, ACG clinical guideline: management of benign anorectal disorders, *Am J Gastroenterol*. 109:8 (2014) 1141-57; 1058. DOI: 10.1038/ajg.2014.190. PMID: 25022811
- [8] Bleday R, Pena JP, Rothenberger DA, Goldberg SM, Buls JG, Symptomatic hemorrhoids: current incidence and complications of operative therapy, *Dis Colon Rectum*. 35:5 (1992) 477-81. DOI: 10.1007/BF02049406. PMID: 1568400.
- [9] Sardinha TC, Corman ML, Hemorrhoids, *Surg Clin North Am*. 82:6 (2002) 1153-67. DOI: 10.1016/s0039-6109(02)00082-8. PMID: 12516845.
- [10] Wilhelm A, A new technique for sphincter-preserving anal fistula repair using a novel radial emitting laser probe, *Tech Coloproctol*. 15:4 (2011) 445-9. DOI: 10.1007/s10151-011-0726-0. PMID: 21845480
- [11] Naderan M, Shoar S, Nazari M, Elsayed A, Mahmoodzadeh H, Khorgami Z, A Randomized Controlled Trial Comparing Laser Intra-Hemorrhoidal Coagulation



- and Milligan-Morgan Hemorrhoidectomy, *J Invest Surg.* 30:5 (2017) 325-331. DOI: 10.1080/08941939.2016.1248304. PMID: 27806213
- [12] MacRae HM, McLeod RS, Comparison of hemorrhoidal treatment modalities. A meta-analysis, *Dis Colon Rectum.* 38:7 (1995) 687-94. DOI: 10.1007/BF02048023. PMID: 7607026
- [13] Milligan ETC, Naunton Morgan C, Jones Lionel E, Officer R, *Surgical Anatomy Of The Anal Canal, And The Operative Treatment Of Hæmorrhoids,* *Lancet.* 230:12 (1937) 1119-24. DOI: 10.1016/S0140-6736(00)88465-2.
- [14] Karahalilo?lu AF, ErsteErgebnisse der Laserobliteration von erst- bis zweitgradigenHämorrhoiden, *Coloproctology.* 29 (2007) 327-36. DOI: 10.1007/s00053-007-7029-y.
- [15] Diop B, Ba PA, Diouf A, NDiaye B, Phiri A, Sylla C, Treatment of Haemorrhoidal Disease by Laser Haemorrhoidoplasty at Dakar Preliminary Study of 21 Patients, *J West Afr Coll Surg.* 11:4 (2021) 33-37. DOI: 10.4103/jwas.jwas\_97\_22. PMID: 36188055
- [16] Poskus T, Danys D, Makunaite G, Mainelis A, Mikalauskas S, Poskus E, et al, Results of the double-blind randomized controlled trial comparing laser hemorrhoidoplasty with sutured mucopexy and excisional hemorrhoidectomy, *Int J Colorectal Dis.* 35:3 (2020) 481-490. DOI: 10.1007/s00384-019-03460-6. PMID: 31912268
- [17] Gravié JF, Lehur P-A, Hutten N, Papillon M, Fantoli M, Descottes B, et al, Stapled Hemorrhoidopexy Versus Milligan-Morgan Hemorrhoidectomy, *Ann Surg.* 242:1 (2005) 29-35. DOI: 10.1097/01.sla.0000169570.64579.31. PMID: 15973098
- [18] Nakeeb AM El, Fikry AA, Omar WH, Fouda EM, Metwally TAEI, Ghazy HE, et al, Rubber band ligation for 750 cases of symptomatic hemorrhoids out of 2200 cases, *World J Gastroenterol.* 14:42 (2008) 6525-30. DOI: 10.3748/wjg.14.6525. PMID: 19030206
- [19] Aditya, Raj K, Agarwal PN, Nasar MA, A comparative study to evaluate milliganmorgan hemorrhoidectomy versus pile suture method in management of haemorrhoids. *Int Surg J.* 8:2 (2021) 664-7. DOI: 10.18203/2349-2902.isj20210381.
- [20] Alsisy A, Alkhateep Y, Salem I, Comparative study between intrahemorrhoidal diode laser treatment and Milligan-Morgan hemorrhoidectomy, *Menoufia Medical Journal.* 32:2 (2019) 560-5. DOI: 10.4103/mmj.mmj\_101\_18.
- [21] Plapler H, Hage R, Duarte J, Lopes N, Masson I, Cazarini C, et al, A new method for hemorrhoid surgery: intrahemorrhoidal diode laser, does it work?, *Photomed Laser Surg.* 27:5 (2009) 819-23. DOI: 10.1089/pho.2008.2368. PMID: 19715465
- [22] Shabahang H, Nooghabi MJ, Maddah G, Mofidi A, Khaniki SH, A Randomized Clinical Trial of Laser Hemorrhoidoplasty vs Milligan and Morgan Hemorrhoidectomy, *World J Lap Surg.* 12:2 (2019) 59-63. DOI: 10.5005/jp-journals-10033-1373.
- [23] Masson JL, Outpatient hemorrhoidectomy using the CO2 laser, *J Chir (Paris).* 127:4 (1990) 227-9. PMID: 2361971.
- [24] Sankar MY, Joffe SN, Laser Surgery in Colonic and Anorectal Lesions, *Surg Clin North Am.* 68:6 (1988) 1447-69. DOI: 10.1016/S0039-6109(16)44700-6. PMID: 3057668.
- [25] Jain A, Lew C, Aksakal G, Hiscock R, Mirbagheri N, Laser hemorrhoidoplasty in the treatment of symptomatic hemorrhoids: a pilot Australian study, *Ann Coloproctol.* (2022). DOI: 10.3393/ac.2022.00164.0023.
- [26] Gambardella C, Bruscianno L, Brillantino A, Parisi S, Lucido FS, del Genio G, et al, Mid-term efficacy and postoperative wound management of laser hemorrhoidoplasty (LHP) vs conventional excisional hemorrhoidectomy in grade III hemorrhoidal disease: the twisting trend, *Langenbecks Arch Surg.* 408:1 (2023) 140. DOI: 10.1007/s00423-023-02879-4. PMID: 37020091.
- [27] Bhatti MI, Sajid MS, Baig MK, Milligan-Morgan (Open) Versus Ferguson Haemorrhoidectomy (Closed): A Systematic Review and Meta-Analysis of Published Randomized, Controlled Trials, *World J Surg.* 40:6 (2016) 1509-19. DOI: 10.1007/s00268-016-3419-z. PMID: 2681354.

