



Hemorrhoidectomy Using (10600 nm) CO₂ Laser

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Abstract: Hemorrhoids are one of the most common surgical conditions. The hemorrhoid may cause symptoms that are: bleeding, pain, prolapse, itching, spoilage of feces, and psychological discomfort. There are many methods for treatment of hemorrhoid like, medical therapy, rubber band ligation, electrocoagulation, stapled hemorrhoidectomy, photocoagulation, sclerotherapy, doppler guided artery ligation, Cryosurgery, and surgery. All methods for treatment of hemorrhoids have advantages, disadvantages, and limitations. Conventional haemorrhoidectomy was the traditional operation for the treatment of hemorrhoids. But recently other modalities of treatment had been used as an alternative operations including CO₂ laser haemorrhoidectomy. This work aims to evaluate the efficacy of CO₂ laser for treatment of hemorrhoids. This study was carried out on 25 patients complaining from symptomatic hemorrhoids for many years. Laser hemorrhoidectomies were done for them in Baghdad City for a period of one year. There were 19 males (76%) and 6 females (24%) with age range of 25-65 years. The laser used in this procedure is CO₂ laser (10600nm) continuous wave mode and non-contact method. Patients were discharged home and were followed for 4 months for healing progress and complications. The following criteria are taken in consideration for assessment: (Pain, Bleeding, Infection, Ambulation, Anal stenosis, Incontinence, Recurrent). All cases were treated as day case. 18 patients (72%) underwent laser hemorrhoidectomy under spinal anesthesia while other 7 patients (28%) under general anesthesia. The operative time ranged from 10 to 30 minutes with an average of 22 minutes. The postoperative hospital stay ranged from 3 to 9 hours. Only few of cases showed complication after treatment by CO₂ laser. No pain (64%), mild to moderate pain (28%), severe in (8%), Mild Bleeding occurred in 3 cases (12%), infection: only 2 patients (8%), retention of urine: four patients (16%), mild anal stenosis 3 patients (12%), Mild temporal incontinence occurred in 2 patients (8%), and recurrence zero. It is concluded that CO₂ laser hemorrhoidectomy is a safe and effective procedure associated with low incidence of post-operative complications.

Introduction

Hemorrhoids are one of the most common benign anorectal problems worldwide, which affects more than one million individuals per year (Holzheimer (2004)). The incidence could be as high as 36.4%. (Alatise, et al., (2010)). Hemorrhoidal veins normally occur in the human body. When these veins become dilated they turn to a morbid condition called hemorrhoidal disease. Straining promotes the congestion of these veins and speeds the development of the hemorrhoids; heredity also plays an important role and it is common to

observe many cases in a same family. Pregnancy, weightlifting, and anything that increases intra-abdominal pressure contribute to vein dilation. (Keighley, and Williams, 1993). They are useful for anal canal physiology, especially on the time of defecation. They have two useful functions, first for protection of anal canal mucosa, second for anal continence at rest by complete closure of anal canal. Hemorrhoid disease, describe to situation that causes symptom and troubles to the patient. The complains are, bleeding, nodule, spoilage, itching, pain, pruritis, and symptomatic prolaps

(Sneider, and Maykel, (2010)). Hemorrhoids are divided clinically into 1st degree: bleeding only, no prolapse; 2nd degree: prolapse but reduce spontaneously; 3rd degree: prolapse and have to

be manually reduced; and 4th degree: hemorrhoids which are permanently prolapsed as shown in figure 1.

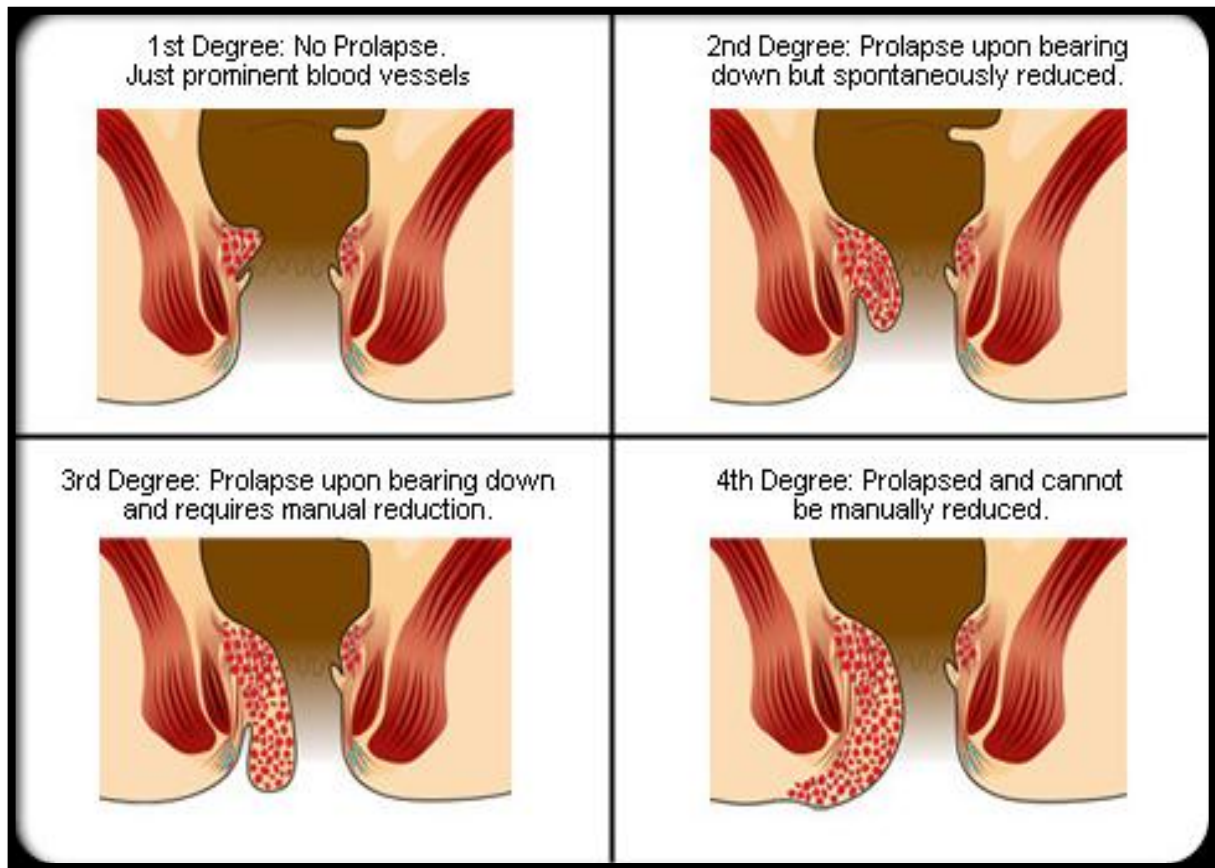


Fig. (1): Grades of Hemorrhoids

In most cases, hemorrhoids are treated conservatively, and the surgeon is contacted when conservative measures have failed, or complications such as thrombosis have occurred (Holzheimer (2004)). There are many treatments for hemorrhoids from medical to band ligation, electrocoagulation, stapled hemorrhoidpepy, photocoagulation, infrared laser, sclerotherapy, doppler guided artery ligation, cryosurgery, and ultimately surgery ((Sneider and Maykel (2010), Pandini, Nahas, Nahas et al., (2006), Plapler, Hage, Duarte et al., (2009), Katdare and Ricciardi (2010), Giamundo, Cecchetti, Esercizio et al., (2011), Zaman Ranjah, et al., (2001), Long man and Thomson, (2006) and Macleod (1982)). Surgical excision (Milligan and Morgan) reported a surgical procedure for hemorrhoids (Milligan, et al., (1937)), which had been passed, down to the present time which is the basis of conventional

hemorrhoidectomy (Parks (1956) and Goligher (1980)), this procedure was found to be followed post operatively by severe pain, bleeding, infection, stenosis and recurrence. CO₂ laser hemorrhoidectomy is one of the popular alternative methods of treatment, it allows vaporization or excision of the hemorrhoid, it seals small blood vessels allowing a bloodless field, it seals superficial nerve endings giving the patient no or minimal post-operative discomfort (Hodgson and Morgan, (1995), and Chir (1990)). CO₂ laser energy is absorbed by water at the surface of soft tissue resulting in vaporization of that tissue with conduction of heat into surrounding tissues allowing surgical precision and unimpaired healing ((Mihashi (1976), Wright (1981) and Jako (1972)).

The aim of the study was to evaluate the efficacy of CO₂ laser for treatment of hemorrhoids.

Patients and Methods

This study was carried out on twenty five patients complaining from symptomatic hemorrhoids (third and fourth degree hemorrhoids or second degree which has failed to respond to conservative management). Laser hemorrhoidectomy were done for them in private hospitals in Baghdad City for a period of one year (from 1st January 2013 to 1st January 2014). There were 19 males (76%) and 6 females (24%) with age range of 25-65 years and a mean age of 41 years. In general the most common clinical presentations of patients were bleeding per rectum, anal mass (mucosal prolapsed), difficult defecation (constipation) for many years in spite of that they used many conservative treatments but without improvement.

Laser Specification

The laser used in this procedure is CO₂ laser (Invisible far-infrared wavelength :10600nm, maximum power output 30 watt) continuous wave mode using non contact method through seven articulated arm as delivery system, while the low power red diode laser (5 mW) with wavelength :650nm is used as aiming beam.

The laser beam was directed to the target tissue by focusing hand piece with 100 mm focal length with spot size 0.2 mm. Before laser shooting all the staffs wear specific anti CO₂ laser eyewear's (goggles). Figure 2 and 3 show the CO₂ laser panel and focusing hand piece used in the current study.



Fig. (2): CO₂ laser panel.



Fig. (3): Focusing hand piece (100 mm)

Procedure

Preoperatively, all patients had blood investigation, stool microscopy, per rectal examination (PR), proctoscopy while 10 patients (age ≥ 40 years) required sigmoidoscopy or colonoscopy to exclude other causes of bleeding not associated with hemorrhoids and the presence of rectal lesions resulting in secondary hemorrhoids. Before the operation, a specific informed consent was signed by all patients and they agreed to undergo CO₂ laser hemorrhoidectomy and to participate in the follow-up. Under general or spinal anesthesia and lithotomy position, all cases underwent anal dilatation for anorectal examination to exclude another anorectal disease like cancer, fistula, fissures, or rectal prolapse, and so on.

The hemorrhoid is grasped by tissue forceps, 2-3 mm from the mucocutaneous junction and pulled downwards to bring the internal hemorrhoid into prominence outside the anal verge, and a hemostat is applied to the pedicle of the hemorrhoid, and a V shaped incision is made in the skin and extended into the mucosa covering the hemorrhoid with CO₂ laser radiation. The laser is aimed directly and perpendicularly to the surface of the pathology (avoiding the reflecting smooth surface of the forceps and hemostat, the tip of the laser focusing hand piece is kept approximately 2-3 cm away from tissues to allow perfect visualization. The laser emission mode is set as continues wave and the power is set at range 10 to 15 watts (Power density: 7961-11942 W/cm²)

for cutting, and then the pile is excised completely. Complete hemostasis is achieved by defocusing beam of the CO₂ laser with decreasing the output power to (7-8 watts) and no suturing and no anal pack, just dressing was used in all patients. All patients received antibiotic (Cefotaxime 1gram I.V for one day and Metronidazole tablet 500 mg for 3 days post operatively while simple analgesic drugs prescribed to be given on need. Patients were discharged home within 3 to 7 hours postoperatively, and were followed for 4 months (scheduled at 4, 14 day, then at 1st, 2nd, 3rd, 4th month postoperatively) for healing progress and complications. The following criteria are taken in consideration for assessment: (Pain, Bleeding, Infection, Ambulation, Anal stenosis, Incontinence, Recurrent).

Results

The total series of 25 CO₂ laser Hemorrhoidectomy have been done in this study, included 19 males (76%) and 6 females (24%) and, with age varied from 25 years to 65 years and maximum number of patients were seen between the age group of 35 to 49 years with mean age of 41 years, as shown in (Table 1). The duration of the symptoms of hemorrhoids before presentation was between 8months to 16years (median 7 years). More than 22 patients (88%) having third and fourth degree (Table 2). The presenting complains in all cases are tabulated in Table 3.

Table (1): Age and Sex distribution among cases

Age (year)	25-34	35-49	50-65	Total (%)
Male	7	9	3	19 (76%)
Female	1	4	1	6 (24%)
Total	8	13	4	25 (100%)

Table (2): Grades of hemorrhoids

Grade	No. of Patients	Percentage (%)
1 st degree	--	--
2 nd degree	3	(12)
3 rd degree	7	(28)
4 th degree	15	(60)
Total	25	(100)

Table (3): Distribution of symptoms in all cases

Symptoms	No. of Patients	(%)
Bleeding only (No mass)	3	(12)
Bleeding+ mucosal prolapsed	6	(24)
Bleeding + mucosal prolapsed + constipation	16	(64)
Total	25	(100)

18 patients (72%) underwent laser hemorrhoidectomy under spinal anesthesia while other 7 patients (28%) refuse spinal anesthesia (specially females) because of embarrassment so the procedure in these patients done under general anesthesia.

Most of the patients (19 cases) had hemorrhoids were located at the classical position of 3,7,11 o'clock, the operative time ranged from 10 to 30 minutes (depend on the number and the size of the hemorrhoids) with an average of 22 minutes. The postoperative hospital stay ranged from 3 to 9 hours with a mean time of 5 hours as all cases were treated as day case.

Post-operative complications / follow up: Patients were followed on the 4th, and 14th Post-operative day, then once at 1st, 2nd, 3rd, 4th months.

1- Pain was mild to moderate in 7 patients (28%) and sever in 2 patients (8%) in the first postoperative day and required simple analgesia for treatment while 64% had no pain so no need for analgesia at all.

2- Bleeding: No patient had significant primary bleeding. Mild reactionary bleeding occurred in 3 cases (12%) manifested by soaked dressing and continues for one day postoperatively and was treated conservatively.

3- Infection: only 2 patients (8%) developed wound infection which required continuation of antibiotics for seven days.

4- Ambulation: All patients were ambulate on postoperative day (day case clinic, discharged home the same day of operation), 16 patients (64%) started their routine work after 3 days and all 25 patients (100%) after 5 days.

5- Retention of urine: Four patients (16%) complaining from difficulty to urinate, one of them (4%) required catheterization while the

rest three patients (12%) were treated by fluid restriction and encouraging urination.

6- Anal stenosis: 3 patients (12 %) developed mild anal stenosis that responded to finger dilatation.

7- Fecal incontinence: Mild incontinence that returned to normal within 10 days occurred in 2 patients (8%) while major incontinence not seen in the current study.

8- Recurrence: No recurrence found in the current study during the follow up period.

Table (4): Postoperative complications / follow up

Post operative complications / follow up	No. of Patients	Percentage (%)
Pain (1 st day)		
No pain	16	(64%)
Mild to Moderate	7	(28%)
Sever	2	(8%)
Bleeding (Mild)	3	(12%)
Infection	2	(8%)
Early ambulation		
3 rd day	16	(64%)
7 th day	25	(100%)
Retention of urine		
Need catheterization	1	(4%)
Treated by encouraging urination	3	(12%)
Mild anal stenosis	2	(8%)
Fecal incontinence		
Mild	2	(8%)
Major	0	(0%)
Recurrence	0	(0%)

Discussion

All method for treatment of hemorrhoid has advantages, disadvantages, limitations and complications. Pain is the most common complication of hemorrhoidectomy ((Vinson-Bonnet, et al., (2002), Ong, et al., (2005) and Kim, et al., (2005)). Generally an uncomplicated hemorrhoidectomy is a satisfactory operation for both patient and surgeon. The findings of this study show that the treatment of hemorrhoids with carbon dioxide laser results in much lower incidence of complications compared to the traditional excision and suture ligation methods of hemorrhoidectomy. Since Milligan et al. described their open surgical technique;

surgeons have disagreed about the best method to treat hemorrhoids. Surgical techniques have included rubber band ligation, stapling, infrared light, ultrasonic scalpel, conventional surgery, and laser therapy.

All aim to decrease pain and to improve healing in the postoperative period (Milligan, et al., (1937)). In current study, only few of cases showed complication after treatment by CO₂ laser. No pain (64%) mild to moderate (28%) sever in (8%), Mild bleeding occurred in 3 cases (12%), infection 2 patients (8%), retention of urine four patients (16%), mild anal stenosis 3 patients (12%), Mild incontinence that returned to normal within 10 days occurred in 2 patients (8%), and recurrence zero.

Postoperative pain is the most important complication that worries our patients and makes them reluctant to surgery. In current study CO₂ laser hemorrhoidectomy post-operative pain was either absent in 64% of cases and mild to moderate in the other 28% and sever in (8%) of cases only as compared with conventional hemorrhoidectomy where all patients have severe pain this had been found to be statistically significant (P value of 0.0001) this is supported by another study carried out in London which suggested that CO₂ laser hemorrhoidectomy is a safe procedure associated with reduced requirement for post-operative analgesics and cause no alteration in anorectal physiology. Another study of the university of Sao Paulo, Brazil, they stated that CO₂ laser hemorrhoidectomy had the advantages of being haemostatic, bactericidal, fast healing, does not affect neighboring structures, less post-operative complications as 94% of patients required no or simple post op. analgesic, only 1.4% needed narcotics, hemorrhage and stenosis were about 1%. (Chia, et al., (1995)). Ferguson reported complications of conventional hemorrhoidectomy as pain 100%, recurrence 2%, retention of urine 15% (Ferguson (1988)). In current study, only few of cases showed complication after treatment by CO₂ laser. Our complication rate was less than Wang et al. study (Wang, et al., (1989)), which showed that 11% required narcotic analgesia in group A (CO₂ laser hemorrhoidectomy) vs.56% in group B (conventional), urinary retention 7% in group A, 39% in group B. 84% of patients in group A were discharged within 24 hours vs. 84% of group B patients who were discharged 1 to 5 days post operatively (Wang, et al., (1989)). In the study by Giamundo et al, they concluded

the hemorrhoid laser procedure was more effective than rubber band ligation in reducing complication and improving quality of life following treatment (Giamundo and Salfi, Geraci et al., (2011)). The unique thing in current study is that CO₂ laser radiation is used as a cutting and as a haemostatic tool at the same time without using any suture materials which is commonly used by other studies, and also this study further corroborated the fact that laser hemorrhoidectomy under spinal anesthesia is not only well tolerated but practicable and feasible in our locality where this concept has not been widely practiced. It is hoped that this work, though with a small number of patients may prompt more surgeons to offer spinal anesthesia to patients undergoing laser hemorrhoidectomy, as this may encourage early ambulation and subsequent discharge from the hospital. Follow-up duration was the main limitation in current study.

Conclusions

CO₂ laser hemorrhoidectomy is a safe and effective procedure associated with low incidence of post-operative complications but requires availability of expensive instruments (CO₂ laser system) and skilled well trained surgeons.

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استئصال البواسير باستخدام ليزر ثنائي أوكسيد الكربون (10600 نانومتر)

لطفي غلام عوازي

معهد الليزر للدراسات العليا ، جامعة بغداد ، بغداد ، العراق

الخلاصة: تعتبر البواسير من العمليات الجراحية الشائعة، وقد تؤدي الى أعراض مثل النزف، الألم، تدلي بطانة الشرج، الحكة هناك عدة طرق لعلاج البواسير مثل: العلاج التحفي، العقد بالرباط المطاطي، التخثير الكهربائي، التثبيت بواسطة المشبك، الليزر ذو الأشعة تحت الحمراء، التخثير الضوئي، العلاج التصليبي، ربط الشريان بواسطة الدوبلر، الجراحة بالتجميد، وأخيرا الجراحة التقليدية. تقييم كفاءة ليزر ثنائي أوكسيد الكربون في استئصال البواسير. شملت الدراسة خمسة وعشرون مريضا يعانون من أعراض البواسير منذ عدة سنوات. أجريت العمليات في مستشفيات خاصة في بغداد. عدد الذكور 19 (76%)، عدد الإناث 6 (24%) تتراوح أعمارهم بين 25 و 65 سنة. الليزر المستعمل هو ثنائي أوكسيد الكربون (10600 نانومتر) ذو نمض شعاعي مستمر مع استعمال طريقة عدم الملامسة، تم أخراج المريض من المستشفى للبيت في نفس يوم العملية وتمت متابعة المرضى لمدة 4 أشهر وتم الاعتماد على المضاعفات التالية بعد العملية لأغراض التقييم (الألم، النزف، الالتهابات، التحرك، تضيق الشرج، عدم السيطرة على الخروج). اجمع الحالات تمت إجراء العمليات كجراحة يومية، ثمانية عشرة مريضا خضعوا للعملية تحت التخدير النصفي بينما سبعة مرضى تحت التخدير العام. تراوحت أعمارهم من 25- 65 سنة. استغرقت فترة العملية من 10 الى 30 دقيقة وبمعدل 22 دقيقة، قليل من المرضى عانوا من بعض المضاعفات بعد العملية مثل: بدون ألم (64%) ، ألم بسيط الى متوسط (28%). ألم شديد (8%): نزيف دموي بسيط (12%)، التهابات (4%)، احتباس أدرار (12%)، تضيق الشرج (12%)، عدم السيطرة الوتقي على الخروج (8%)، عودة البواسير صفر (0%). استئصال البواسير باستخدام ليزر ثنائي أوكسيد الكربون. تعتبر طريقة سليمة وفعالة مع نسبة مضاعفات قليلة ما بعد العملية.