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Bartholin Gland Cyst Treatment using Carbon Dioxide Laser (10600 nm)

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Abstract: ***Background:*** The Bartholin gland cyst is a condition that occurs in approximately 2% of women, most of whom are of reproductive age. Although benign pathology, it is associated with significant patient discomfort. This disorder is caused by the obstruction and consequent dilation of the cyst duct. Definitive treatment involves the surgical removal of the entire cyst. Other alternative treatments include Marsupialization, Word catheter, and the use of CO_2 laser. CO_2 laser can be used either to vaporize or to excise the Bartholin gland cyst. ***The Objectives***: The purpose of the study was to evaluate the efficacy and safety of (10600nm) CO_2 laser in the treatment of Bartholin gland cyst. ***Patients, Materials & Methods:*** This study was done in laser medicine research clinics from July 2015 to the end of December 2015; 10 female patients whose ages ranged from 25 years to 50 years and who have Bartholin cyst. The details of the procedure were explained verbally to the patients and consent was written. Patients were examined and evaluated clinically and prepared for surgery. A CO2 continuous wave 1-40W laser emitted at 10600 nm. The laser is delivered via an articulated arm and laser is used to incise the cyst wall and vaporize the inner surface of the cyst. ***Results****:* The preliminary clinical findings included sufficient hemostasis, vaporization properties and precise incision margin with all of the surgical procedure. The postoperative advantages, i.e., lack of pain, bleeding, infection, good wound healing and overall satisfaction were observed. ***Conclusion****:* The clinical application of the CO_2 (10600 nm) laser in surgical procedures can be considered practical, effective, easy to use and offers a safe, acceptable, and impressive alternative for conventional techniques of surgical treatment Bartholin gland cyst.

Keywords: *Bartholin Gland Cyst, Marsupialization, Word catheter*

Introduction

Bartholin gland cysts are the most common cystic growths occurring in either side of folds of skin(labia)that surround vagina, affecting approximately 2% of women, mostly in reproductive years.(Panici PB, et al. 2007)

The obstruction of Bartholin gland duct as a result of trauma (namely during a mediolateral episiotomy or a posterior
colporrhaphy) or of infection leads to cystic enlargement of these glands because of continued mucus secretion. (Marzano DA and Haefner HK. 2004 , Roch JA and Thompson JD. 2008)

Although many patients are asymptomatic, Bartholin gland cysts can be associated with significant discomfort and disruption of the sexual function and daily activities. Most common symptoms include pain, dyspareunia, fullness, and pressure or discomfort when sitting or walking. (Marzano DA and Haefner HK. 2004)

Definite treatment is required not only to provide relief of symptoms but also to avoid the

possibility of recurrent glandular abscesses. (Fambrini M., et al. 2008)

Although there are many treatment modalities are available for this condition, the best approach is yet to be established. (Wechter ME and Wu JM, Marzano D, 2009)

Conventional treatments, like surgical excision and marsupialization, are still the most commonly used. Complete surgical excision, the first treatment described in 1942 by Catell (Marzano DA and Haefner HK. 2004), requires general/regional anesthesia and is associated with a complication rate of approximately 24%. Its complications include, hemorrhage, infection of sutures, and damage of surrounding structures, cosmetic disfigurement, dyspareunia, and disturbed lubrication of the vagina. (Panici PB, et al. 2007)

Nevertheless, it remains the treatment of choice in two specific situations: recurrent cysts refractory to previous techniques and when there is a suspicion of adenocarcinoma of Bartholin gland. Marsupialization, first described in 1950 by Jacobson, is a surgical alternative to the excision; it can be performed under local anesthesia and has a lower risk of hemorrhage, scarring, postoperative pain and impaired sexual function. Once it preserves the secretory function of Bartholin glands for lubrication. However, it has been associated with higher recurrence rates (from 2 to 25%). (Marzano DA and Haefner HK. 2004, Ozdegirmenci O and Kayikcioglu F, 2009).

In the past years, several authors have advocated the use of less-invasive but equally effective techniques for the treatment of this condition, like fistulization using Word catheter, alcohol sclerotherapy, and silver nitrate ablation (Wechter ME and Wu JM, Marzano D, 2009).

Recently, outpatient carbon-dioxide (CO_2) laser vaporization of Bartholin gland cysts has emerged as a safe and effective alternative, with several advantages over the conventional treatments. It has become the standard treatment approach of Bartholin gland cysts in our institution since 2000 (Fambrini M., et al. 2008).

Patients, Materials & Methods

A retrospective study including 10 patients , three of them (30 %) with mild infection and 7 of them (70 %) without infection, with symptomatic Bartholin gland cysts submitted to CO_2 laser vaporization at laser medicine research clinics of Institute of Laser for Postgraduate Studies beginning from July 2015 to the end of September 2015, Patients ages ranged from (25)-(55) years old. Each patient was prepared for the procedure after full explanation and discussion regarding the nature of the procedure, the possible advantages, disadvantages, and complications expected. Each patient was asked to sign an "informed consent" indicating her agreement.

Inclusive criteria:

All patients with Bartholin gland cyst of any size were included in this study. Patients with mild abscess were given antibiotics and then re-evaluated and included in this study.

Exclusive criteria

Patients with big Bartholin gland abscesses, those with neoplasia suspicion and patients who were pregnant all were excluded from the study.

Clinical assessment

Clinical records of all patients were reviewed. Data concerning patient's history included age, parity, contraceptive method, smoking habits, symptoms (pain, dyspareunia, and abnormal vaginal discharge), previous Bartholin's gland abscesses, and previous vulvar surgery (including episiotomy). Preoperative assessment included gynecologic examination with assessment of location and size of the cyst.

Materials

Equipment

A tray for the procedure placing the following items on a sterile drape:
Surgical gloves (Broche, Turkey).
syringe 1ml filled with 2% percent lidocaine.
Sterile Gauze Sponges (10cm×10cm, Medline, China).
Povidone-iodine solution(10% concentration)
Fenestrated drape.
2 Allis forceps
2 straight hemostats.
CO_2 ultradream laser.

CO_2 Laser specifications:

The device was made in Korea by *DAESHIN Company*
The systems body is equipped with CO_2 laser tube.
Wavelength 10600nm infrared ray.
Mode structure (divergence) TEM00.

Distance of focus: F100 mm or F50 mm, Size of focus: 0.1mm at hand piece
Output against tissue cell can always be modulated within following range
CW: 1-40W.
PULSE: 1-40 W.
Ultra pulse duration :90µs- 900µs
Peak power at ultra-pulse 188 W- 315 W.
Repeating time at ultra-pulse 2ms- 500ms
Operating mode: continuous wave, normal dream pulse, ultra dream pulse and super dream pulse.

Fig. (1): CO_2 Laser specifications

Treatment parameter used (Dosimetry)

The laser parameters used were CO_2 laser wavelength 10600nm, continuous, spot size 0.2mm, and power 15 watt, non-contact technique, exposure time was 5-15 second for mucosal incision depending on cyst size, length of incision and wall thickness.

The time required for vaporization of cyst cavity was an average of 30 seconds as shown in Figure (2)

Fig. (2): Laser parameters

Safety measures

In the present work, the laser employed is class IV laser which includes any continuous wave laser device with power outputs above 500mW.These types of laser can cause damage to eye and skin with direct intrabeam exposure and from specular or diffuse reflections.

All personnel were asked to wear protective glasses appropriate to CO_2 to eliminate the risk of eye damage. These glasses are designed with special wavelength and optical density for CO_2 laser. The patient's goggles were completely shielded; the doctor's goggles were transparent as shown in Figure (3).

The eyes of the patient were covered with mops of cotton or gauze plus eye wear, taking into consideration the elimination of any reflecting materials, metals and polished plastic in the laser room.

The smoke and vapor plume were carefully extracted using a vacuum system. This is necessary to minimize the hazards to the patient and staff as many types of infections can be present in the vapor of CO_2 laser.

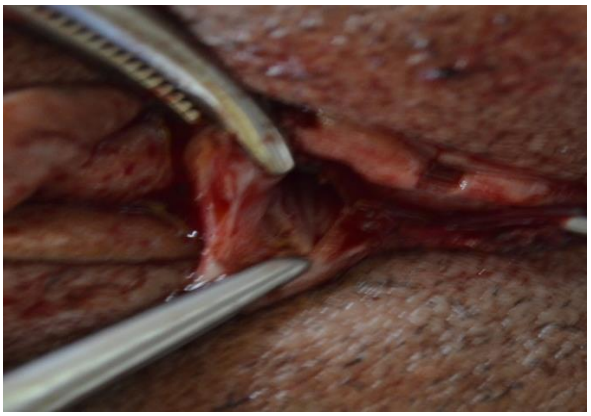
Fig. (3): The Doctor's goggles for CO_2 laser

Method

In lithotomy position and after applying 10% of povidone iodine solution as an antiseptic, a 5 mL solution composed of 2% lidocaine without epinephrine was administered through multiple injections in the skin overlying the cyst. After applying the local anaesthesia, a safety precaution was applied through the use of the goggles for the patient and surgeon. With a continuous CO_2 laser on focus 15W was used and found to be of sufficient power. A 1.5 cm longitudinal incision with the laser beam near the place where the cyst wall was closer to the vulvar epithelium was performed. The lateral edges of the incision were grasped and held in tension with Allis forceps by assistants to help the evacuation of the internal content during the opening of the cyst capsule and washing of the inner surface with sterile saline solution. A complete eversion of the inner surface of the cyst's capsule was performed grasping its walls from the fringes to the center with small mosquito forceps until the bottom of the cavity appeared. The CO_2 laser vaporization of the cyst capsule was performed with a depth of destruction of 2 to 3 mm starting from the center

of its bottom and proceeding outward with a spinning movement of the laser beam. After the complete destruction of the capsular tissue, laser vaporization of the edges of the mucosal incision was performed to avoid external bleeding. The method is shown in Figure (4). Patients were discharged with a vaginal packing pressing the vaporized cavity, which was removed 2 hours after the end of the procedure.

Prelaser



Post laser treatment

Laser treatment

Fig. (4): method of laser treatment

Postoperative Instructions

After surgery, all the patients were given instructions that included

1- Commitment to follow up appointments in the exact date.

2- Daily change of dressing with sterile gauze and 10% of povidone iodine solution.

3- Daily intake of analgesia on need like acetaminophen in case of pain.

Follows- up (Clinical Observation and Evaluation)

All patients were examined in 3days, 1 week, 2 weeks, and 4 weeks after surgery to assess pain, bleeding, edema, infection, recurrence and overall satisfaction. In the follow-up appointments, clinical observations were performed each time and symptoms were assessed by personal history interview. Recurrence was defined as the occurrence of gland cyst or abscess observed during follow-up in the treated vulvar region**.**

Assessment of pain, bleeding, and infection

Subjected assessment of pain and objective assessment of bleeding and infection were done using the scale shown in Table (1)

Table (1): Scale to assess pain, bleeding and infection

Pain	*No pain*	*Mild pain*	*Moderate pain*	*Sever pain*
	0	*1*	*2*	*3*
Bleeding	*No bleeding*	*Mild bleeding*	*Moderate bleeding*	*Sever bleeding*
	0	*1*	*2*	*3*
Infection	*No infection*	*Mild infection*	*Moderate infection*	*Sever infection*
	0	*1*	*2*	*3*

Results

Pain All surgical procedures were done under local anesthesia with xylocain 2%. Most patients experienced no pain during the surgical operation apart from some burning during application of laser. Three (30%) patients experienced mild pain during the first postoperative day; those three patients complained from symptoms of a mild infection preoperatively. Systemic analgesic was prescribed on need only; otherwise no patient experienced pain during one week, two weeks and four weeks postoperatively. So in this clinical study, the surgical procedure was well

tolerated by all the patients who were very cooperative during laser treatment as illustrated in Figure (5) and Table (2).

Bleeding: Intraoperative field was bloodless and there was no need to use sutures after laser-treatment which gives us clear surgical field. The wound was left open (to be healed by secondary intention),and the raw area was contracted from the margins of the surgical wound to its center gradually, closing inward until the wound surface was clinically healed within 10-14 days as shown in Figure (5) and Table (2).

Infection: Three cases of mild infection (cellulitis) were noticed before treatment with laser and the infection subsided within one week as illustrated in Figure (5) and Table (2).

Overall Satisfaction: All patients reported that symptoms had disappeared or had reduced significantly, and they resumed daily living activities in one or two days after laser surgery. At the end of healing period, all patients showed a complete restitution of vulvar tissue .In general, patients were comfortable with no pain, either intra-operatively or post-operatively with no functional complications. No case of dyspareunia or sexual dysfunctions was described during post treatment follow-up as shown in Figure (5), Figure (6), and Table (2)

Table (2): Patients follow-up

Patients. No.	*Age*	*Pain*				*Bleeding*				*infections*				*Overall satisfaction*			
		3dy	*1wk*	*2wk*	*4wk*	*3dy*	*1wk*	*2wk*	*4wk*	*3dy*	*1wk*	*2wk*	*4wk*	*3dy*	*1wk*	*2wk*	*4wk*
1	**30**	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*3*	*3*	*3*
2	**31**	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*3*	*3*	*3*
3	**30**	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*3*	*3*	*3*
4	**33**	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*2*	*3*	*3*	*3*
5	**28**	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*2*	*3*	*3*	*3*
6	**35**	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*3*	*3*	*3*
7	**28**	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*2*	*3*	*3*	*3*
8	**40**	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*3*	*3*	*3*
9	**26**	*1*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*1*	*0*	*0*	*0*	*3*	*3*	*3*	*3*
10	**25**	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*0*	*3*	*3*	*3*	*3*

Discussion

Photo thermal interaction with tissue is the basic concept of CO_2 surgical laser. In this process, radiant light is absorbed by the tissue and transformed to heat energy changing tissue structure. Thermal effects generally tend to be nonspecific according to Parrish and Deutsch (1984); however, depending on the duration and peak value of the tissue temperature achieved, different effects like coagulation, vaporization, carbonization, and melting may be distinguished. (Markolf H., 2007).

Previously the use of CO_2 laser either for vaporizing or excising the gland cyst indicated a higher successful rate and a low complication (4.5%) rate. However, excision was associated with longer operative time and more patient discomfort; this was probably a result of technical difficulties to perform a clear and a

vascular dissection of the plane between cyst's capsule and sub glandular connective tissue. For this reason most surgeons abandoned excisional procedure, applying exclusively laser vaporization as standard choice of treatment. (Penna C and Fambrini M, 2002)

In this study the use of CO_2 laser for vaporization of Bartholin cyst effectively reduced the operating time. In this study, maximum operating time was 10-15 minutes. It is very fast and easy to destroy a cyst wall, and vaporize it. The selective destruction of the cyst is carried out by defocusing the laser beam, a very easy and rapid operation. Shortened operating time due to minimal bleeding and this was noticed in Panici. The surgical procedures were all performed in extremely short length of time (median: 7 minutes; range 5–15 minutes).

CO_2 laser is very useful for bartholin cyst treatment. It allows vaporization of tissues, it coagulates small vessels and it prevents bleeding, as notice by Panici and Fambrini.

In case of infection, the CO_2 laser sterilizes the wound. During the post-operative phase, the risk of infection is low. In this study only three cases of infection were noticed before treatment with laser and it subside within one week due to the thermal effect of the CO_2 laser. It acts as antibiotics so the infection is minimal as noticed by Panici , Wechter and Heinonen et al.

Immediate post-operative pain is mild because the laser seals the sensory nerve endings, (it seals the exposed nerve endings). So laser treatment is particularly useful in cases of big cyst. Symptoms will disappear or reduced significantly. All patients returned to daily activity within 3 days, Dyspareunia was resolved in all cases, as noticed by Panici, Manci, Bellati, et al., that all patients were satisfied with the procedure.

In this study a minimal invasive procedure for Bartholin gland cyst treatment is reported it consists of drainage with a CO_2 laser used to create a new stoma on the original duct orifice. With this technique, the Bartholin gland is conserved, and the original function is maintained.

In one study Fambrini et al., found that cure rate after a single laser treatment was 95.7%. In case of re intervention, no additional difficulties appeared to be present in the second or third surgery. However, because recurrence can occur up to 2 years after the initial procedure, further analysis with longer follow-up times is required to establish the long-term effectiveness of the treatment.

A series of 19 patients was described by Panici et al., with a conservative procedure for Bartholin gland cyst and abscesses treatment. It consist of a drainage with CO_2 laser used to create a new glandular stoma associated with an aggressive antibiotic treatment. The recurrence rate in this study was 2-fold higher than that of Fambrini et al., (10.5% vs 4.3%) and this difference may be explained by two main reasons. First, the study of Panici et al., included abscesses, introducing a disease that is itself characterized by a higher possibility of relapses compared with uncomplicated cysts. The second reason is the lack of identification; incision of hidden cavities in case of multiloculated cyst may increase the risk of recurrence. For these two main reasons, although incision and drainage is invariably the gold standard treatment for pain relief in bartholin gland abscess, destructive procedures such as vaporization are an appropriate choice for cyst.

Conclusion

The clinical application of the CO_2 (10600 nm) laser in bartholin gland cyst is considered to be practical, effective, and easy to use, and it offers a safe, acceptable, and impressive alternative for conventional techniques of surgical treatment even with mild infection.

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معالجة كبس غدة البارثولين بأستخدام ليزر ثنائي اوكسيد الكاربون (10600 نانومتر)

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الخلاصة :الخلفيه :كيس غدة البارثولين حاله تحدث لحوالي 2%من النساء اغلبهم في عمر الانجاب .بالرغم من كون الحاله حميده الا انها مصحوبه بعدم ارتياح شديد .سبب هذه الحاله هو انسداد ومن ثم توسع في قناة الغده.والعلاج النهائي لهذه الحاله المرضية يشمل رفع الكيس كليا والخيارات الاخرى للعلاج تشمل فتح الكيس مع خياطة الجوانب قسطرة وورد واستعمال الليزر من نوع ثنائي اوكسيد الكاربون لتبخير او رفع الكيس. **اهداف الدراسه**: تقييم كفاءه وسلامه ليزر ثنائي اوكسيد الكاربون (10600) في علاج كيس غدة البارثولين. **طريقة الدراسه**: اجريت هذه الدراسة في عيادات الليزر الطبيه والبحثيه بمعهد الليزر للدراسات العليا من بدايه شهر تموز 2015 ولغايه نهايه شهر كانون الاول 2015 شملت الدراسه عشرة نساء لديهن اعراض كيس غدة البارثولين تتراوح اعمارهم ما بين 25 سنه الى 40 سنه،تفاصيل العمليه شرحت شفهيا للمرضى وتم فحصهم وتقييمهم سريرياواخذ الموافقه ورقيا ومن ثم تحضيرهم للتداخل الجراحي باستخدام ليزر ثنائي اوكسيد الكاربون وبقوه 15 واط وطول موجي 10600 نانو ميتر ،الليزر استخدم لفتح كيس غده البارثولين ومن ثم تبخير السطح الداخلي للكيس. **النتائج** :اثبتت النتائج السريريه القدره العاليه لليزر ثنائي اوكسيد الكاربون على ايقاف النزيف والقطع الدقيق خلال التداخل الجراحي كما من مميزاته عدم وجود نزف والم ومنع رجوع الكيس مع التأم جيد للجرح ،سجل معظم المرضى رضى عالي في استخدام الليزر في هذه العمليه . **الأستنتاج**:التطبيق السريري لليزر ثنائي اوكسيد الكاربون في العمليات الجراحيه يمكن اعتباره عملي وفعال وسهل الاستعمال وسليم ومقبول وبديل للعمليات التقليديه لعلاج كيس غدة البارثولين .