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Research Article

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The Clinical Efficiency of 980 nm Diode Laser in Management of Labial Mucocele: Case Report

Mortada Balkit Khudair [1,*], Hanan J. Taher [1], Afrah A Khalil[2]

[1]*Institute of Laser for Graduate Students, University of Baghdad, Baghdad, Iraq*
[2]*College of Dentistry, University of Anbar, Ramadi, Iraq*
** Email address of the Corresponding Author:* mortada.balkit2201m@ilps.uobaghdad.edu.iq

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Abstract:

Introduction: A mucocele is a noncancerous abnormality of the mouth that develops when small salivary gland ducts become clogged or when the mouth is traumatized. Due to its many benefits, including less postoperative pain and bleeding and faster recovery, diode laser therapy has grown in popularity. In this particular instance, a 980 nm diode laser was used during a surgical procedure to remove a mucocele from the lower lip.

Case Presentation: The patient was a 23-year-old guy who complained of occasional, painless swelling of the lower lip. Officially, a mucocele was determined. Under local anesthetic, the lesion was removed using a 980 nm diode laser. This procedure allowed for the exact excision of tissue with little damage to adjacent structures. The patient experienced no major side effects or discomfort after the treatment, which indicates that it was well-tolerated. There were no indications of impaired healing during the following appointment.

Conclusion: This case study proves that the 980 nm diode laser is more effective than conventional surgical methods for treating mucoceles. Quick healing, less discomfort, and no incisions are all benefits of the diode laser. It provides a new option for treating oral mucoceles that has shown remarkable improvements in patient outcomes.

Keywords: Mucocele, lower lip, diode laser, 980 nm, oral lesion.

1. Introduction

Many diseases, both benign and cancerous, can impact the mouth. Different triggers, such as poor oral health, tobacco use, ill-fitting dentures, and certain daily habits, can cause reactionary problems and tumors. An accurate diagnosis can only be made with a thorough understanding of the patient's medical history as well as their symptoms and signs, such as the precise location, size, color, and morphology of the oral mucosal lesion [1]. The ducts of tiny salivary glands are the usual targets of mucocele, which is a common oral disease. It arises as a result of the “retention” of mucus or “extravasation” [2].

Trauma or blockage of the ducts of minor salivary glands causes an accumulation of saliva in the adjacent tissue, leading to the appearance of a mucocele. Nodules that are painless, round, soft, smooth, and translucent blue to pink are the clinical manifestations of oral mucoceles [3]. A mucocele happens in about 2.5 out of every 1,000 cases, which is a slightly high rate. They are most common in people in their 20s and 30s, especially kids and teens. They are very rare in kids younger than one year old [4].

In 90% of mucoceles, pseudocysts called mucus extravasation cysts are due to the absence of the epithelial layer. Saliva diffuses into tissues after salivary gland injuries, and an epithelial-lined cyst named a mucus retention cyst occurs 10% of the time when debris or calculi block the salivary duct or when the duct is twisted [5]. Among the several techniques used for treatment are “cryosurgery, sclerotherapy, micro-marsupialization, laser surgery, intralesional injection of corticosteroid or sclerosing agent,” and surgery. Though the most often employed technique is surgery, it has many drawbacks, including lip deterioration and injury to surrounding ducts with additional satellite lesion development [6].
The standard treatment typically involves surgical excision of the adjacent mucosa and glandular tissue down to the muscular layer. Even though the mucocele can be drained by making a small incision, the lesion has a chance for relapse after the wound healing. Treatment is unnecessary if superficial extravasation mucoceles resolve on their own. Small mucoceles can be entirely excised together with the adjacent glandular tissue prior to suturing. The marsupialization technique would protect vital structures from damage in case of big-sized mucoceles [7].

Usually, dental lasers are used in many different areas of dentistry. Patients and doctors both use lasers as standard tools for therapy and care because they are so effective at cutting out maxillofacial tumors while preserving as much of the healthy tissue as possible [8]. Laser therapy is an innovative technique for managing soft tissue lesions, especially diode lasers (with wavelengths between 800 and 980 nm), which are considered an effective alternative to a surgical procedure that can eliminate the lesion and reduce its chance for recurrence. [9]. Nowadays, lasers are incredibly useful for treating soft tissues. Several advantages of laser surgery over traditional scalpels include the ability to sterilize the surgical incision in an instant (bactericidal action), the creation of a hemostatic field (blood-free), effective tissue ablation, and satisfactory visual access. An additional benefit of laser treatment is reduced post- and during-ablation pain for soft tissues [10]. Accordingly, this study was designed to show whether the 980 nm diode laser provides superior clinical efficiency compared with conventional surgery in the management of labial mucocele.

The aim of this study is to evaluate the clinical efficiency of the 980 nm diode laser in the management of labial mucocele and to compare its clinical outcomes with those achieved by conventional surgical excision.

2. Case presentation

A 23-year-old male patient, who was admitted to Basra Teaching Hospital's Oral and Maxillofacial Surgery Department, complained of a soft, painless swelling on his lower lip. According to the patient, the lesion had been becoming bigger over the past several weeks. Lip biting was reported by the patient, which is considered one of the causes for lip mucocele. A dome-shaped, translucent, soft swelling was seen on the inside of the lower lip during the clinical examination. It was blue in color. With no evidence of infection, ulceration, or cancer, the non-tender lesion had a diameter of about 1.5 cm. A mucocele, which can be defined by the lesion's features, is most often produced by trauma that blocks or ruptures the small salivary gland ducts, as shown in Figure 1. We decided to use a 980 nm diode laser (Quicklase diode laser—UK) for laser excision after talking to the patient about their treatment possibilities.

A local anesthetic was used to carry out the operation. The patient was placed in a supine posture while a 0.12% chlorhexidine solution was used to sterilize the operative region. To ensure proper pain control and to decrease intraoperative bleeding, a local anesthetic was delivered using a mixture of 2% “lidocaine” and 1:100,000 “epinephrine.” The incision was performed around the lesion boundary using the Quicklase 980 nm diode laser set at 2 W in continuous mode with the 400-micron fiber tip in contact with the tissue. To reduce the likelihood of a recurrence, the laser enabled exact excision of the mucocele, removing all of the affected small salivary glands. No bleeding occurred during the process, and the whole procedure took around 15 minutes to finish, as shown in Figure 2. Surgical sites were irrigated with sterile saline after excision. No sutures were needed since the diode laser accomplished such remarkable hemostasis; this added to the advantages of a quicker and more comfortable healing process. Avoiding foods that are too hot or spicy, keeping up with satisfactory dental hygiene, and using chlorhexidine mouthwash twice a day to prevent infection were all part of the patient's comprehensive postoperative

recommendations. Furthermore, in order to avoid recurrence, the patient was instructed not to bite her lips.

Figure 1: Lower lip mucocele before excision.

Figure 2: immediately after mucocele excision.

A: one week after operation

B: 20 days after operation C: after one month

Figure 3: A. There was no evidence of infection or problems at the one-week follow-up, and the patient reported little discomfort at the surgery site, which had already begun to epithelialize. Proof of the benefits of laser-assisted surgery was the lack of substantial swelling and discomfort. **B.** Wound healing had progressed further, and there had been no return of swelling during the 20-day follow-up. No functional impairment, trouble speaking, or difficulties eating were reported by the patient. **C.** At the one-month follow-up, the mucosal healing had been fully accomplished. There was no recurrence or residual scarring in the treated area, and the patient was pleased with the results.

3. Discussion

Oral mucoceles arise in different sites on the oral mucosal surfaces overlaying accessory minor salivary glands. They manifest with greater frequency in specific locations. Mucoceles typically manifest on the bottom lip. In rare cases, mucoceles have been found in the "buccal mucosa, lingual frenum, dorsal tongue, retromolar region, upper lip, and palate." Ranula denotes mucoceles placed on the floor of the mouth [11]. Oral mucoceles can manifest at any age. It predominantly occurs in children and young adults (i.e., individuals under 30 years old), with a peak prevalence around the ages of 10 and 29. Individuals of this age are thought to be more susceptible to mechanical trauma, seen as the primary etiological reason underlying the phenomenon of mucus extravasation. Trauma causes the rupture of a salivary gland's excretory duct, leading to the extravasation of saliva into the surrounding connective tissue and the initiation of an inflammatory response [12]. In most cases, mucoceles do not result in substantial complications; however, they can make it difficult to speak, have difficulty chewing, and swallow. Some people may experience discomfort as a result of the mucocele, depending on its size and location [13].

This lesion can be removed using a variety of surgical techniques, such as micro marsupialization, conventional scalpel surgery, CO_2 laser ablation, or marsupialization. Considering potential complications including discomfort, lip deformation, postoperative bleeding, nerve damage, and harm to other anatomical structures, standard scalpel surgery remains the most commonly used method for treating this lesion. [14].

Dental lasers have been increasingly popular since their introduction in the 1990s. In dentistry, they are utilized either as a complementary or independent therapy technique. Using lasers as an alternative to traditional treatment is mostly done with the intention of overcoming the drawbacks that are associated with conventional treatment procedures [15].

Different laser kinds have been produced over time and applied in many branches of dentistry. Among the several types of lasers, the 980 nm diode laser is the most often utilized one. Indium, gallium, and arsenide make a solid-state semiconductor used as the active medium of the diode laser [16].

Diode lasers in oral surgery work in either continuous or pulsing mode, with wavelengths between 810 and 980 nm. By excision or ablation/vaporization, diode laser photothermal activity eliminates oral

mucosa lesions. In photothermal, tissue absorbs radiant light and transforms it to heat energy, therefore changing tissue structure. An appropriate dose of laser energy in contact with the tissue can cause responses ranging from coagulation to vaporization and incision. 980 nm Diode laser wavelengths are absorbed strongly by hemoglobin and melanin chromophores. It thus has selective action and can be used safely in “cutting, blood coagulation, ablation, or vaporizing” soft tissue near the dental structure with minimal injury and better recovery [17]. In this case, the lesion was removed using a diode laser that had a wavelength of 980 ± 10 nm and operated in continuous wave mode. A minimal infiltration of local anesthesia, with a concentration of 1:2,000,000 lidocaine, was administered, and a circumferential incision was made around the swelling, removing it [18].

Dentistry has developed less invasive techniques to lessen patients' pain and discomfort before, during, and after dental procedures. Lasers have thus far proven to be a safe and effective alternative in dental surgery. One of the main benefits of using a high-intensity laser for oral surgery operations is the reduction in the requirement for sutures. Another advantage is the ability to cut while coagulation and hemostasis are being performed. In all instances, this method completely eradicated transoperative bleeding and the necessity for sutures in the research that was part of this evaluation [19].

A diode laser effectively occludes small lymphatic vessels with a penetration depth of 2 mm in the tissue, hence diminishing postoperative edema. Due to the ability of lasers to enhance wound healing by forming a denatured protein coagulum referred to as "eschar" or a "biological bandage," we opted not to utilize sutures or surgical packs in our cases. the protein coagulum protects the wound against germs and friction [20].

Thermal injury to tissues can be caused by lasers. These effects on the target and adjacent tissues can be avoided or eliminated by fine-tuning parameters like power output, optic fiber type, emission patterns, and wavelength. Emission modalities, especially pulsed or continuous wave [CW] emission, must be carefully considered [21, 22]. The laser is well-suited for use with pediatric patients because of its many advantages, such as faster surgery times, better hemostasis, less inflammation, easier access, decontamination of the surgical site, precise incisions, less damage to surrounding tissues, faster healing, less pain, and overall patient satisfaction [23]. Since most laser light falls within the 600–1000 nm range of the red and near-infrared portions of the electromagnetic spectrum, the "Quicklase" 810–980 nm diode laser device was employed for this study [24]. Photo-thermal interaction between fibers allows a diode laser to deliver energy to soft tissues. To accelerate tissue incisions, the fiber optic tip needs to be activated so that the laser energy can be concentrated at the tip of the fiber optic and converted into thermal energy [25]. In this instance, we see how a 980 nm diode laser a minimally invasive method with better clinical results to remove mucoceles. Confirming the benefits of 980 nm diode laser technology in oral soft tissue procedures, the technique provided a speedy recovery, no bleeding during the operation, minimum postoperative discomfort only during the first two days, and great wound closure without suturing material.

4. Conclusion

A lower lip mucocele was removed less invasively and effectively with the 980 nm diode laser. The operation's key benefits were a bloodless surgical region, less postoperative pain, no suture, and a quick recovery. Follow-up showed no recurrence. According to these data, the 980 nm diode laser with 2W power may be an effective alternative to invasive surgery for mucocele lesion removal.

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الكفاءة السريرية للدايود ليزر 980 نانومتر في معالجة الكيس المخاطي الشفوي: تقرير حالة

مرتضى بلكت خضير [1]، حنان جعفر طاهر [1] ، افراح عدنان خليل [2]

[1] معهد الليزر للدراسات العليا، جامعة بغداد، بغداد، العراق
[2] كلية طب الاسنان، جامعة الانبار، الرمادي، العراق

البريد الالكتروني للباحث: *Mortada.balkit2201m@ilps.uobaghdad.edu.iq*

الخلاصة : الكيس المخاطي هو آفة فموية حميدة غالبًا ما تتطور بعد التعرض للصدمة أو عندما تصبح الغدد اللعابية الصغيرة مسدودة. أصبح العلاج بواسطة الليزر مؤخرًا أكثر شيوعًا بسبب فوائده العديدة، مثل تقليل الألم والنزيف بعد العملية، والتعافي الأسرع. مثال على استخدام دايود ليزر 980 نانومتر لمعالجة كيس مخاطي في الشفاه السفلية في هذه الحالة. **عرض الحالة** : مريض يبلغ من العمر 23 عامًا يعاني من تورم متناوب الظهور والاختفاء غير مؤلم في الشفاه السفلية. كان التشخيص هو الكيس المخاطي. تحت تأثير التخدير الموضعي للمريض، تم استخدام الدايود ليزر 980 نانومتر لإزالة الآفة. ساعد ذلك بإزالة الأنسجة بدقة مع التسبب في الحد الأدنى من الضرر للأنسجة المحيطة. بعد الإجراء، أفاد المريض بعدم وجود أي إزعاج أو مشاكل كبيرة، وبالتالي كان التحمل واضحًا. في موعد المتابعة، لم تكن هناك أي علامات على أن عملية الشفاء قد تأثرت. **الاستنتاج** : يوضح هذا المثال كيف يعالج الدايود ليزر 980 نانومتر الاكياس المخاطية بشكل جيد، مما يثبت فوائده مقارنة بالتقنيات الجراحية التقليدية. يوفر الدايود ليزر تعافيًا أسرع وراحة أفضل للمريض بالإضافة إلى كونه تقنية غير ضارة. و يوفر حلاً بديلاً جيدًا لعلاج الاكياس المخاطية الفموية مع نتائج سريرية ممتازة.