

Comparison between diode laser and scalpel for lip lengthening in patients with gummy smile

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ABSTRACT

Background: lip lengthening procedure is one of the surgical options for the correction of gummy smile in patients with short upper lip.

Methods: A comparative clinical study was conducted on 15 patients requiring lip lengthening procedure for the esthetic correction of excessive gingival exposure with gummy smile. Scalpel was used in seven patients and diode laser in the remaining eight patients. Under infiltration anesthesia, about one cm strip of mucosa was excised at the vestibular depth and the mucosa of the lip was sutured to the alveolar mucosa.

Results: The diode laser group demonstrated less postoperative pain and swelling. Regarding postoperative ecchymosis, three patients in the scalpel group developed ecchymosis and no cases were noted in the laser group, the difference was statistically significant. No patient in the laser group developed wound dehiscence and only one patient in the scalpel group had wound dehiscence at third postoperative day. Observed at one month postoperatively, the laser treated groups had less obvious scar than the scalpel group.

Conclusion: Diode laser is a valuable tool in performing lip lengthening for gummy smile.

Keywords: Gummy smile, Diode laser, Lip lengthening. . (Received: 15/2/2018; Accepted: 17/4/2018)

INTRODUCTION

Some gingival exposure in smiling gives the impression of youth, but excessive gingival display commonly referred to as "gummy smile" can be a source of embarrassment for some patients. (1) The smile is one of the key factors of a first impression. A multidisciplinary approach can be beneficial to enhance a balance harmony between all the components of the smile: Lips, teeth and gingival scaffold (2) Lips define the esthetic zone and the lip line can be defined, while smiling as low, medium, or high. The lip is considered low when only part of the teeth is visible below the upper lip, medium when 1 to 3mm of the marginal gingiva is exposed during a smile and high (gummy smile) when more than 3mm of gingiva is shown. It is an aesthetic issue that can affect a large portion of the population, with a reported prevalence between 10.5% (1) and 29%. (3) Studies showed predominance of gummy smile in female (2:1) and low lip line in male (2.5:1). (4) The etiology of excessive gingival display is various: plaque- or drug induced gingival enlargement, altered or delayed passive eruption, anterior dentoalveolar extrusion, vertical maxillary excess, short upper lip, a hyperactive upper lip, or a combination of these causes. (5) Proper diagnosis of the etiologic factor is essential for the selection of the right treatment protocol. Plaque- or drug-induced gingival enlargement and altered or delayed passive eruption are treated with periodontal surgery.

Esthetic crown lengthening is the recommended well documented treatment procedure to restore the normal dentogingival relationships. The procedure involves moving the gingival margins apically through soft and possibly hard tissue resection. (6-7)

Anterior dentoalveolar extrusion is treated with orthodontic intrusion. Orthodontic leveling of the gingival margins of the maxillary teeth may be considered in this situation. (8)

Vertical maxillary excess is treated with orthognathic surgery. And it's the treatment of choice to restore normal inter-jaw relationships and to reduce the gingival display; this involves hospitalization and significant side effects for patients. (9)

Hyperactive upper lip is treated by injections of botulinum toxin. It causes muscle paralysis by inhibiting acetylcholine release at the neuromuscular junction. The use of therapeutic doses allows partial paralysis of the muscles. The limitation of this technique is that it's not permanent; it needs frequent application every several months. (10)

Short lip is treated by lip Repositioning, The procedure is accomplished by removing a strip of mucosa from the maxillary buccal vestibule and creating a partial thickness flap between the mucogingival junction and the upper lip musculature, the lip mucosa is then sutured to the muco-gingival line, resulting in a narrower vestibule and restricted muscle pull, which reduces the gummy smile. This procedure was first described in the plastic surgery literature in 1973 by Robenstien and Kostainovsky. (11) and first published in the dental literature in 2006 by Risenblatt and Simon. (12)

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The acronym LASER stands for light amplification by stimulated emission of radiation. The usages of Lasers have been approved by FDA for endodontics, periodontics, oral surgery, restorations, lesion removal, and desensitization. (13)

Cutting hard/soft tissue is a complex interaction of laser energy with water and tissues (hydrophotonics). When tissues interact with laser energy, the effect is influenced by emission wavelengths, tissue optical properties, time of exposure, laser energy, and absorption of the laser energy into the tissues. The absorptive effect is the key to how the target tissue's atoms and molecules convert laser light energy into heat, chemical, acoustic, or non laser light energy. Thus, the amount of laser energy needed to produce desired results varies depending on the tissue involved. (14)

Absorption in the target tissue may result in either a direct tissue cut (cold cut) or vaporization of the water within a cell. This vaporization causes a rupture (thermal cut), a process known as thermal-mechanical tissue ablation. There is also reportedly less histamine release in tissues treated with a laser device, which accounts for the lessening or absence of intraoperative and postoperative pain and inflammation. Furthermore, there has been virtually no scarring and minimal tissue shrinkage on crestal, sulcular incisions. (15). This study was conducted to compare the laser to scalpel in performing lip lengthening regarding pain, swelling, ecchymosis and healing.

MATERIALS AND METHODS

Sample of the study included 15 patients (12 females and 3 males) complaining from excessive gingival exposure during smile (Gummy smile), during a period of 2 years from April 2014 to April 2016.

Criteria for selection of patients for surgery were short lip with no vertical maxillary excess, no muscle hyperactivity, and normal crown length and no periodontal diseases. The patients were allocated into either laser or scalpel surgical lip lengthening using complete random design.

Anesthesia was achieved by infiltration to the vestibule from right to left first permanent molars. The incision outline was marked with a sterile indelible pencil on the dried tissues.

A partial thickness incision is made by no. 15 scalpel blade along the mucogingival junction. A second parallel incision is made at the labial mucosa at approximately 10-mm apical to the first incision. The two incisions are then connected at the mesial line angle of the first molars and the strip of the incised mucosa is removed, finally the

wound was closed with 3/0 silk simple interrupted suture (Fig.1.)

For the LASER group surgery was conducted with diode laser Quick lase adjusted on 10 watts using the same incision design performed in scalpel surgery group.

Post-operative analgesic (olfen 50 mg QTD) and antibiotics (Amoxicalv 625 mg QTD) are prescribed and the patients are instructed to apply extraoral ice packs for several hours and minimize lip movement when smiling and talking for one week. Sutures were removed two weeks after surgery

The postoperative pain was assessed using visual analogue scale and the patients were instructed to write down a number indicating the severity of the pain, where 0 indicates no pain and 10 the most severe pain

Swelling was categorized into

Mild: slight swelling of the lip

Moderate: swelling extending into the nose obliterating the nasolabial fold

Severe: swelling extending into the cheek and infraorbital region

Data were analyzed using SPSS software version 21. Student t test was used to assess the pain score. Ecchymosis and swelling were assessed using Chi square test. A p- level less than 0.05 was considered significant.





Figure 1: Lip lengthening procedure. (A) Preoperative view. (B) Excision of a strip of lip mucosa, (C) Suturing of the wound, (D) Postoperative view.

RESULTS

The pain after surgery was significantly less in the laser group than scalpel group at first three days postoperatively. (Table 1)

Table 1: Postoperative pain in the first 3 days in the scalpel and laser lip lengthening groups

Days	Technique	No.	Mean	S.D	t-value	P-value
Day 1	Scalpel	7	6.29	1.113	5.7	≤ 0.005*
	Laser	8	2.50	1.414		
Day 2	Scalpel	7	4.57	0.976	6.39	≤ 0.005*
	Laser	8	1.25	1.035		
Day 3	Scalpel	7	2	0.816	4.266	≤ 0.005*
	Laser	8	0.5	0.535		

* Significant.

Table 2: Facial ecchymosis in the first three postoperative days in the scalpel and laser lip lengthening groups

Technique	No.	Echymosis	No ecchymosis
Scalpel	7	3	4
Laser	8	0	8

Chi square= 4.286, DF=1, P = 0.0384 (Significant)

The postoperative swelling was significantly greater in the scalpel group, as compared to the laser group (Table 3). In the first postoperative day, 86% of patients in the scalpel group developed moderate swelling and 75% of laser treated group developed no swelling.

Table 3: Facial swelling in the first postoperative day in the scalpel and laser lip lengthening groups

Technique	No.	No swelling	Mild swelling	Moderate swelling	Severe swelling
Scalpel	7	0	0	6	1
Laser	8	6	2	0	0

Chi square=, df=1, P = 0.001817 (significant)

No patient in the laser group developed wound dehiscence and only one patient in the scalpel group had wound dehiscence at third postoperative day. Observed at one month postoperatively, the laser treated groups had less obvious scar than the scalpel group.

DISCUSSION

Correction of gummy smile can be achieved by various techniques, including crown lengthening by gingivectomy and gingivoplasty with or without osteoplasty, Orthognathic surgery maxillary Lefort I impaction is indicated in cases of vertical maxillary excess.

Lip repositioning is an excellent alternative to more costly procedures with higher morbidity rates. (16) The procedure includes excising a strip of vestibular mucosa with or without myotomy of the levator labii superioris muscles (17)

Excision of mucosa can be performed with scalpel, electro surgery and LASER. Although scalpel surgery is faster and favorable, but it can cause intra operative bleeding, post-operative pain and swelling or ecchymosis, although healing of laser wound is slower than healing scalpel wounds Laser wounds are sterile and less likely to be inflamed (18).

The observations of this study showed that patients in the laser group had less postoperative pain and consumed a smaller number of analgesic tablets. The laser group also developed less swelling than scalpel group and no one had ecchymosis whereas 3 out of 7 patients had ecchymosis the explanation of less complication in laser group may be attributed to the laser soft tissue interaction. The laser seal off the soft tissue in contact, establishing an effected hemostasis by enhancing factor VII for clotting (19, 20). Less pain score in the laser group may be attributed to the stimulation of the production of natural pain killers; B- endorphins and decreasing the activity of c factor, thus providing pain relieve (21).

The result of result of this study comes in accordance to many other studies. Kalkonda et al (22) compared scalpel with diode laser in vestibuloplasty and found that pain and discomfort were significantly less in the laser group in addition, healing was better in the laser group.

Wound scarring in the present study was less evident in the laser group at one month postoperatively; the fewer scars in laser group may be attributed to few number of myofibroblast resulting in minimal wound contraction compared with the scalpel wound. (23) The present study comes in agreement with kalakonda (22) and Nommour et al (24).

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الخلاصة

مقدمه: عملية تطويل الشفة هي واحدة من الخيارات الجراحية لتصحيح الإبتسامة الغامضة في المرضى الذين يعانون من قصر الشفة العليا. المواد والطرق: تم إجراء دراسة سريرية مقارنة على 15 مريضا تتطلب إجراء تطويل الشفة لتصحيح الجمالي من التعرض اللثوي المفرط مع إبتسامة غائر. تم استخدام مشرط في سبعة مرضى و ليزر ديود في المرضى الثمانية الباقين. تحت التخدير التخدير ، تم سحبها حوالي 1 سم شريط من الغشاء المخاطي في عمق الدهليزي وتم خياطة الغشاء المخاطي للشفة إلى السخية

النتائج: أظهرت مجموعة ليزر ديود أقل الألم بعد العملية الجراحية وتورم. فيما يتعلق بالكدمات بعد العملية الجراحية ، طور ثلاثة مرضى في مجموعة المشرط الكدمات ولم يلاحظ أي حالات في مجموعة الليزر ، وكان الفرق ذو دلالة إحصائية. لم يصاب أي مريض في مجموعة الليزر بتفكك الجرح ، وقد أصيب مريض واحد فقط في مجموعة المشرط بفك جرح في اليوم الثالث بعد العملية الجراحية. لوحظ في شهر واحد بعد العمل الجراحي ، وكانت المجموعات المعالجة بالليزر ندية أقل وضوحاً من مجموعة المشرط..

الاستنتاجات: الليزر ديود هو أداة قيمة في إجراء إطالة الشفة لاإبتسامة.