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Treatment of oral mucocele - scalpel versus CO₂ laser

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08 **Jose Yagüe-García¹, Antonio-Jesus España-Tost², Leonardo Berini-Aytés³, Cosme Gay-Escoda⁴**

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11 ¹ DDS. Resident of the Master of Oral Surgery and Implantology. University of Barcelona Dental School12 ² DDS, MD, PhD. Associate Professor of Oral Surgery. Professor of the Master of Oral Surgery and Implantology. University of
13 Barcelona Dental School14 ³ DDS, MD, PhD. Assistant Professor of Oral Surgery. Professor of the Master of Oral Surgery and Implantology. Dean of the
15 University of Barcelona Dental School16 ⁴ MD, DDS, PhD. Chairman of Oral and Maxillofacial Surgery. Director of the Master of Oral Surgery and Implantology. Uni-
17 versity of Barcelona Dental School. Oral and maxillofacial surgeon of the Teknon Medical Center, Barcelona (Spain)

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20 *Correspondence:*21 *Centro Médico Teknon*22 *C/ Vilana 12*23 *08022 - Barcelona*24 *cgay@ub.edu*

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Abstract

Objective: To compare the results obtained after oral mucocele resection with the scalpel versus the CO₂ laser, based on the complications and recurrences after surgery

Patients and Methods: Of the 68 patients we studied who have mucocele, 38 were resected with a scalpel and the remaining 30 with the CO₂ laser (5-7 W). Patient sex and age were documented, along with location of the lesion as well as size, symptoms, duration, etiological factors, type of treatment, complications and recurrences after surgical removal.

Results: The sample comprised 40 males and 28 females, aged between 6-65 years. The histological diagnosis was extravasation mucocele in 95% of the cases. The most frequent location was the lower lip (73.5%). The mean lesion diameter was 9 mm, and in most cases no evident etiological factor was recorded. The mean duration of the lesion was 4 months. Among the cases of conventional surgical removal of mucocele, recurrence was recorded in 8.8% of the cases, and 13.2% of the patients suffered postoperative complications - the most frequent being the presence of fibrous scars. There were no complications or relapses after a minimum follow-up of 12 months in the cases subjected to CO₂ laser treatment.

Conclusions: Oral mucocele ablation with the CO₂ laser offers more predictable results and fewer complications and recurrences than conventional resection with the scalpel.

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Key words: *Mucocele, the CO₂ laser, treatment of mucoceles.*

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01 Introduction

02 Mucoceles (from the Latin terms mucus, or mucus, and
03 coele, or cavity) are defined as mucus-filled cavities that
04 can appear in the oral cavity, appendix, gallbladder,
05 paranasal sinuses or lacrimal sac (1,2). They are cha-
06 racterized by the accumulation of liquid or mucoid
07 material, giving rise to a rounded, well circumscribed
08 transparent and bluish-colored lesion of variable size.
09 The consistency is typically soft and fluctuant in res-
10 ponsibility to palpation. Mucoceles are painless and tend to
11 relapse (3,4).

12 The incidence is high, in the order of 2.5 lesions per
13 1000 individuals. Indeed, mucoceles are the most com-
14 mon minor salivary gland disorder, and represent the
15 second most frequent benign soft tissue tumors of the
16 oral cavity, following irritative fibromas (1,5,6).

17 Mucoceles normally appear in the glands that secrete
18 predominantly mucous saliva. It is therefore more fre-
19 quent to find these lesions in the minor salivary glands,
20 which are distributed throughout the oral submucosa,
21 except in the attached gingival regions and in the an-
22 terior portion of the back of the tongue (7). However,
23 such lesions can also be found with less frequency in the
24 major salivary glands. Mucoceles located in the floor
25 of the mouth in turn are referred to as “ranulas” (from
26 the Latin terms rana, or frog, and ula, or small), due
27 to the great similarity between these mucosal lesions
28 and the swollen mouth of a frog (1,8). In these cases the
29 sublingual glands are affected, and the saliva is mainly
30 composed of mucus. There also have been exceptional
31 reports of mucoceles of the submaxillary glands (2,9).

32 Etiologically, most mucoceles are considered to be se-
33 condary to traumatic or obstructive disorders of the
34 mainly minor salivary glands—the preferential location
35 being the humid mucosa of the lower lip (3,8).

36 Based on the underlying etiopathogenesis, these lesions
37 classically have been divided into retention mucoceles
38 and extravasation mucoceles (1,8,10). The former are
39 less frequent and are seen particularly in elderly patients.
40 Retention mucoceles consist of a well defined cystic ca-
41 vity presenting an epithelial wall lined with cuboid or
42 squamous cells. In contrast, extravasation mucoceles
43 account for over 80% of all mucoceles, and are more
44 common in individuals under 30 years of age. They
45 are in fact pseudocysts lacking a well defined wall, and
46 are composed of compressed elements of the surround-
47 ing connective tissue, and inflammatory components
48 (1,8,11). These two types of mucocele also show some
49 differences in anatomical location: retention mucoceles
50 are uniformly distributed throughout all the territories
51 that contain minor salivary glands, while extravasation
52 mucoceles are fundamentally located in the lower lip
53 (80%) (7,10).

54 Mucoceles are usually asymptomatic, though in some
55 patients they can cause discomfort by interfering with

speech, chewing or swallowing (1). However, in most
cases these lesions rupture spontaneously or traumati-
cally a few hours after being formed, with the release of
a characteristic viscous, mucoid fluid (4). This may give
the mistaken impression of healing, since the lesion de-
creases in size or disappears. However, once the small
perforation allowing release of the mucocele contents
has healed, the secretions accumulate again, and the le-
sion relapses (1,5,8). On the other hand, in the case of
repeated trauma, the lesion may become nodular and
firmer in response to palpation—rupture in this situation
being more difficult (7,12).

Mucocele do not cause direct obstruction of salivary
flow, and the amount of secretion that can be extrava-
sated is limited by the elasticity of the surround tissues.
As a result, although these lesions can become quite lar-
ge, they are usually of small size (8).

As regards treatment, resection is carried out when
the lesions that are multiple, recurrent or cause patient
discomfort. It must be taken into account that typical
minor salivary gland mucoceles rarely resolve on their
own, i.e., surgical removal is required in most cases
(5,12,13).

The main objective of this study was to compare the re-
sults obtained after oral mucocele resection with scalpel
versus the CO₂ laser, based on the recorded complica-
tions and relapses after surgery. Likewise, an analysis
was made of patient sex and age, the main etiological
factors, lesion location and size, the duration of the le-
sions, and the symptoms.

Patients and Methods

A retrospective study was made of 68 patients with
clinically and histologically diagnosed minor salivary
gland mucoceles, seen in the Service of Oral Surgery
(Dental Clinic of the University of Barcelona, Spain) in
the period 1990-2005. Of these patients, 38 were sub-
jected to conventional treatment (resection with scalpel),
while the remaining 30 were treated using a CO₂ laser
(Lasersat 20W, Sharplan 1020, Tel Aviv, Israel) with a
straight handpiece.

All the mucoceles were removed under infiltrating pe-
ri-lesional local anesthesia (4% articaine with 1:100,000
adrenalin). In those cases where the CO₂ laser was used,
the power was set to 5-7 W, focalizing for sectioning
of the mucosa and defocalizing for vaporizing remain-
ing pathological tissue and/or for controlling bleeding.
The teeth and adjacent tissues were protected with a
wooden spatula. In those cases where the mucocele
membrane was ruptured, the operation was continued,
defocalizing the laser over the entire surface until the
most superficial fibers of the lip muscle layer were seen
to be vaporized. The resulting surgical wounds were
allowed to heal by second intention, regardless of their
depth (fig.1). The specimens obtained were fixed in 10%

01 formalin solution for posterior histological study to es-
 02 tablish the definitive diagnosis. In general, no antibio-
 03 tics or antiinflammatory analgesics were prescribed.
 04 Chlorhexidine (Lácer®, Cerdanyola del Vallés, Spain)
 05 was applied both as a gel (0.2%) to the surgical zone,
 06 and as a rinse (0.12%) twice daily—stressing the need to
 07 maintain good postoperative oral hygiene.

08 In those cases where resection was carried out with the
 09 scalpel, we always used a number 15 blade mounted in
 10 a number 3 handle. An elliptic incision was made to fu-
 11 lly enucleate the lesion along with the overlying muco-
 12 sa and the affected glands. The operation proved more
 13 complicated when the lesion ruptured, since the loss of
 14 references made it more difficult to ensure complete eli-
 15 mination of the lesion. The wound was finally sutured.
 16 The postoperative patient instructions were the same as
 17 in the CO₂ laser treated group.

18 Controls were made after one week and 30 days to
 19 check healing and the evolution of the wound, with an
 20 evaluation of possible relapse after 12 months.

21 In order to compare the incidence of postoperative com-
 22 plications and recurrences between the two types of
 23 treatment, we selected 25 lower lip mucoceles removed
 24 with the scalpel, and the same number of mucoceles co-
 25 rresponding to the same location, treated with the CO₂
 26 laser.

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28 Results

29 The study sample comprised 68 mucoceles diagnosed
 30 in 40 males (58.8%) and 28 females (41.2%), aged be-
 31 tween 6-65 years (mean 26 years). Most of the lesions
 32 (34 cases) presented between 10-20 years of age, with
 33 22 mucoceles between 20-30 years of age, 4 in patients
 34 under 10 years of age, and 8 in patients over 40 years of
 35 age (fig.2).

36 Although about one-third of the patients reported pre-
 37 vious trauma in the region of the mucocele, in most of
 38 the cases there was no evident etiological factor. As re-
 39 gards location, the lower lip was affected in 73.5% of
 40 the cases (50 mucoceles), with few lesions in other parts
 41 of the oral cavity (fig.3).

42 While the mucoceles ranged from 0.4-3 cm in diameter
 43 (mean 0.9 cm.), the lesions most often measured be-
 44 tween 1-1.5 cm in size. The mean evolution was 4 mon-
 45 ths (range 1 month - 3 years).

46 Sixty-seven percent of the lesions were casually iden-
 47 tified by a dentist, without the patient being aware of
 48 their presence. The rest of the lesions were identified
 49 by the patients despite the absence of symptoms. Only
 50 22% of the patients reported discomfort associated with
 51 nibbling of the lesion, though in no case was pain re-
 52 ported.

53 The histological diagnosis was extravasation mucocele
 54 in 91.2% of the cases. Only 6 retention mucoceles were
 55 recorded.

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Among the mucoceles located in the lower lip, 5 that
 had been eliminated with the cold scalpel were seen to
 relapse, versus only 1 of those treated with the CO₂ las-
 er. All the recurrences occurred within 30 days after
 the operation, and were again treated with the CO₂ laser.
 No additional relapses were documented after a mini-
 mum follow-up of 12 months. No relapses were obser-
 ved after exeresis of the rest of mucoceles.

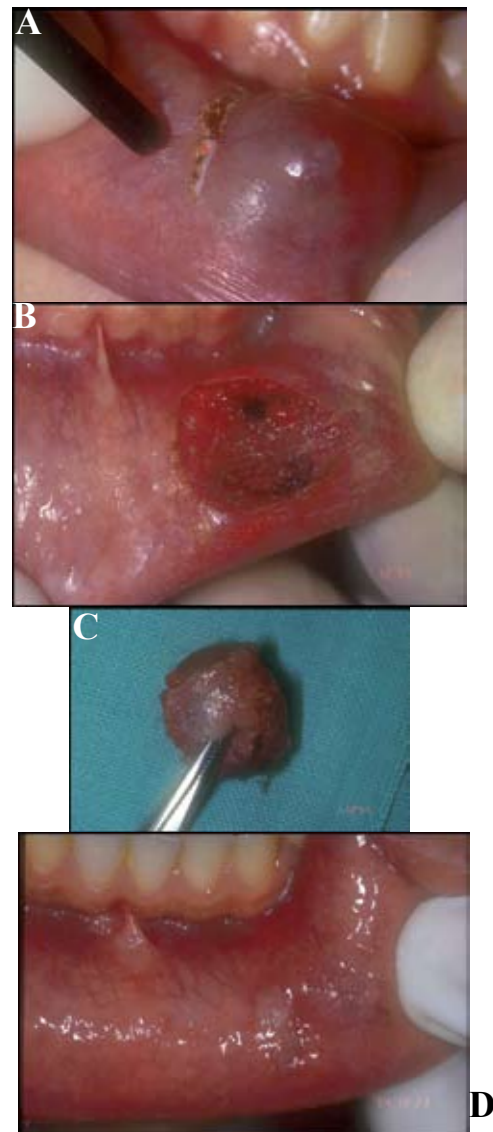


Fig. 1. A) Start of lesion ablation with the focalized CO₂ laser.

B) Surgical wound after defocalized CO₂ laser irradiation. Hemostasia is effective, and no suturing is required.

C) Surgical specimen before immersion in 10% formalin solution for subsequent histological processing.

D) Appearance of the wound four weeks after surgery. Epithelization is correct, and no esthetic defect or fibrous scar is seen.

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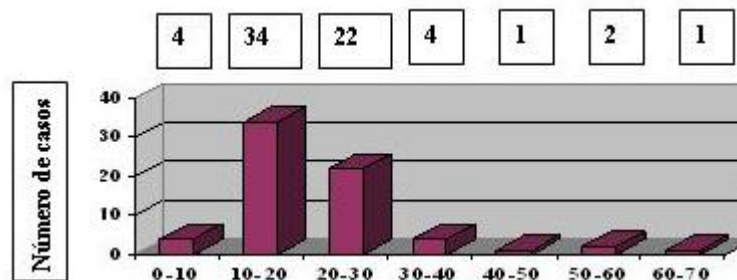


Fig. 2. Distribution of the mucoceles according to age groups.

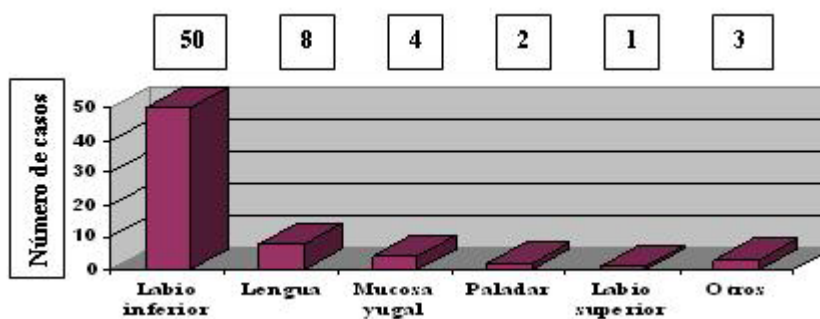


Fig. 3. Distribution of the mucoceles according to location.

Lastly, postoperative complications were recorded in 9 of the 25 cases of lower lip mucocele removed with the cold scalpel. This global 13.2% complications rate included 1 case of transient lip paresthesia, 3 cases of postoperative bleeding and 5 fibrous scars after the normal healing period. In contrast, no postoperative complications were seen in any of the lower lip mucoceles treated with the CO₂ laser.

Discussion

The incidence of mucoceles in the general population is 0.4-0.8% (6), with scant differences between males and females. Our own series coincides with this, since 55% of the lesions were found in males (1,4,14). As regards patient age, different authors report the peak incidence to be in the second or third decades of life (8,11,14). An interesting and controversial aspect of mucoceles is their origin. Bhaskar et al. (10) suggested obstruction of the salivary gland ducts as the cause of mucoceles, though this hypothesis has lost support in favor of a traumatic origin of the lesions (15). The literature contains a number of studies that confirm the traumatic etiology of these lesions (8,11,14). In our series we identified an antecedent of trauma or of nibbling in 34% of the patients – this figure being low in comparison to

the percentages reported in other studies (1,5,14). In any case, the typical location of these lesions in the lower lip (more susceptible to accidental traumatism or nibbling and suction habits), their presence in young patients, and the exceptional presence of calculi in the minor salivary glands (16), all support this etiopathogenic theory. As regards mucocele location in the oral cavity, most investigators consider the lower lip to be the most frequently affected location (40-80% of all cases) (7,8,14), followed by the cheek mucosa and floor of the mouth. The tongue, palate and upper lip are infrequent locations. The present study coincides with these observations, since 73.5% of the lesions were in the lower lip, with very little involvement of other locations. In addition, the lower lip mucoceles were predominantly located on one side—with very few medial lower lip locations (14). These data would be directly related to the greater capacity of certain teeth to exert trauma upon the lip, as a result of their spatial distribution. In this sense, there also have been reports of mucoceles produced as a result of the action of dental braces. In the present study mucocele growth was generally seen to be slow. According to Harrison (8), the lesions develop over a period of one week to five years, though the most common duration is three weeks to three months (somewhat shorter than the 4 months on average do-

01 cumented in our study). In turn, lesion size reportedly
02 varies between 0.2 mm and 2 cm in diameter (1,4,14),
03 in coincidence with our own observations, where the
04 mean size was 0.9 cm. As a result, mucoceles usually
05 produce no symptoms, since the patients seek medical
06 treatment in the early stages of development, i.e., when
07 the mucoceles are still small (1,8).

08 Histologically, two types of mucoceles are distinguis-
09 hed: retention mucoceles and extravasation mucoceles.
10 In our series, and in coincidence with other studies
11 (8,10,14,15), the great majority of lesions (91.2%) were
12 extravasation mucoceles. As an example of the great
13 difference in frequency between the two types of mu-
14 cocceles, Cataldo et al. (11) identified only 24 retention
15 mucoceles in a large series of 594 cases.

16 The literature describes different treatment options,
17 including cryosurgery (17), intralesional corticosteroid
18 injection (13), micro-marsupialization (18), marsupial-
19 ization of the mucocele (1,11), conventional surgical re-
20 moval of the lesión (1,8,11), and laser ablation (19-22).

21 Some authors recommend an initial cryosurgical appro-
22 ach (17) or the intralesional injection of corticosteroids
23 (13). However, the number of relapses associated with
24 these techniques is very high, and most cases therefore
25 require reintervention in the form of conventional sur-
26 gery to ensure complete resolution of the lesions.

27 On the other hand, Botazzo et al. (18) propose micro-
28 marsupialization as an ideal treatment alternative for
29 mucoceles in pediatric patients, since the technique is
30 rapid, simple, and offers good results. This is the least
31 traumatic of all the described management options, and
32 involves traversing the lesion along its maximum dia-
33 meter with suture thread that is left in place for at least
34 7 days.

35 Another option is the marsupialization of large muco-
36 celes, with the purpose of making surgery less invasive,
37 and thus preventing damage to neighboring anatomical
38 structures such as the labial branch of the mental nerve
39 (1,11).

40 Using the scalpel, Baumash (1) proposes complete re-
41 section of the mucocele through careful dissection, and
42 ensuring that both the affected and neighboring glands
43 are removed, along with the pathological tissue, before
44 primary closure of the wound. This minimizes the risk
45 of relapse. In addition, special care is required to avoid
46 damaging other glands or ducts with the suture needle,
47 since this may become a cause of recurrence. In order
48 to apply this technique, the lesion must have a relati-
49 vely thick connective tissue wall. In effect, too thin a
50 wall would imply a risk of rupturing the mucocele, and
51 leakage of its contents would cause soft tissue collapse-
52 with loss of the anatomical references needed for resec-
53 tion. This would make the procedure more complicated,
54 and it would be difficult to ascertain whether the entire
55 lesion has been removed (including the causal minor sa-

livary gland tissue). As a result, lesion relapse would be
the norm.

Lastly, the CO₂ laser often has been used in oral soft
tissue surgery. However, it has been little used to date
for treating oral mucoceles (20).

This laser is strongly absorbed by water, as a result of
which its effect is scantily penetrating, and action is es-
sentially confined to the surface of the soft tissues. Mo-
reover, the device is very potent, and can offer power
settings of between 1-100W (23). According to Espa-
ña et al. (23), the recommended power setting for the
treatment of oral soft tissues is 5-10W in most cases,
since higher settings produce fibrous scars or destruc-
tion of the adjacent tissues. For this reason we used the
Lasersat 20W, at a power setting of 5-7W.

Of the 50 mucoceles of the lower lip, 25 were removed
with the scalpel, and the rest with the CO₂ laser. This
allowed direct comparison between the results obtained
with the two surgical instruments.

The CO₂ laser was seen to offer a range of advantages
with respect to the scalpel (23). Firstly, the CO₂ laser
allowed rapid and simple mucocele ablation. In coin-
cidence with the observations of Huang et al. (22) we
found the total treatment time with the laser to be 3-5
minutes. This was less than with the scalpel, which re-
quires a meticulous technique and also suturing of the
lesion at the end of the operation. For this reason, re-
section using the CO₂ laser also would be indicated in
pediatric and geriatric patients, who are less able to to-
lerate long procedures.

Another advantage of the CO₂ laser is the minimiza-
tion of complications and relapses. However, few stu-
dies have been published on this subject. A review of
the literature yielded only two studies involving a small
number of mucoceles treated with the CO₂ laser (19,20),
and a publication by Huang et al. (22), in which 82 lower
lip mucoceles were treated with this type of laser. The-
se latter authors recorded no postoperative bleeding or
healing problems. One case of lower lip paresthesia was
observed that lasted two weeks. On the other hand, only
two relapses were recorded among the 82 lower lip mu-
coceles treated with the CO₂ laser. Our own findings co-
incide with those of Huang et al. (22) where postopera-
tive complications and relapses were minimal following
ablation of the lower lip mucoceles with the CO₂ laser.
Moreover, we recorded no bleeding or lip paresthesias,
and only one recurrence was documented.

On comparing these results with those of the lower lip
mucoceles treated with the scalpel, we observed a greater
incidence of complications and relapses with the
latter technique. We recorded a case of lower lip pares-
thesia after scalpel removal of a large mucocele meas-
uring 2.4 cm in diameter—this indicating damage to some
terminal branch of the mental nerve as a consequence
of the aggressiveness of the procedure. In addition, we

01 registered five relapses. This comparatively greater re-
 02 lapse rate could be attributable to damage to the neigh-
 03 boring minor salivary glands, caused by the scalpel
 04 during removal of the mucocele, or by the needle upon
 05 suturing. Failure to eliminate the glands giving rise to
 06 the mucocele would also be a cause of relapse.

07 According to Basu et al. (24), healing of the wounds
 08 caused by the CO₂ laser involves the appearance of a fi-
 09 broserous membrane after 72 hours that replaces the su-
 10 perfiacial necrotic layer of the irradiated tissue. Epithelial
 11 covering of the wound begins from the periphery after
 12 two weeks, and is thinner and parakeratotic in compa-
 13 rison with the epithelium that appears after scalpel re-
 14 section. Probably for this reason, the esthetic outcome
 15 of all the CO₂ laser interventions was excellent, with
 16 no fibrosis or scarring, while the scalpel left small resi-
 17 dual esthetic defects after the usual healing period, in 5
 18 of the 25 lower lip mucoceles treated with this surgical
 19 instrument.

20 Other advantages of the CO₂ laser versus the cold scal-
 21 pel are minimal damage to the neighboring tissues, a
 22 bloodless and highly decontaminated surgical bed,
 23 lessened swelling and pain during the postoperative
 24 period, and the appearance of fewer myofibroblasts
 25 –resulting in comparatively lesser wound contraction
 26 (19,20,23,25,26). Our observation of only minimal
 27 postoperative pain and swelling coincides with the fin-
 28 dings of other authors (14,21,22) –no medication being
 29 needed in any of the patients subjected to CO₂ laser
 30 treatment, compared with the need for analgesia in over
 31 half of all scalpel-treated patients.

32 Finally, we must stress the importance of subjecting the
 33 resected specimen to histological study, regardless of
 34 the technique used to remove the lesion. This serves to
 35 confirm the diagnosis and ensure that elimination of the
 36 gland tissue implicated in the process has been comple-
 37 te—thereby preventing possible recurrence.

38

39 Conclusions

40 Mucoceles of the oral cavity are more common in young
 41 males. Traumatism is the usual cause, and the most
 42 frequent location is the mucosa of the lower lip.

43 The CO₂ laser is rapid (operating time 3-5 minutes) and
 44 simple for resecting oral mucoceles. Its advantages in-
 45 clude a reduction in the number of relapses in compari-
 46 son with the scalpel. On the other hand, the treatment of
 47 these lesions with the CO₂ laser offers a better esthetic
 48 outcome, with less postoperative bleeding and paresthe-
 49 sias than conventional surgical removal of the lesion.

50 Lastly, ablation with the CO₂ laser offers a more comfor-
 51 table postoperative course for the patient.

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