Dental impression silicone putty in transoral laser laryngeal surgery: prevention of oral complications

Silicone da impronta dentale nella chirurgia laringea laser transorale: prevenire le complicanze sul cavo orale

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SUMMARY
Objective. To describe a new method to improve the exposure of the surgical field and to protect the oral cavity during transoral laser micro-surgery (TOLMS) of the larynx.

Methods. Dental Impression Silicone Putty (DISP) was employed as an alternative to traditional mouthguards.

Results. DISP mouthguards perfectly fit to each patient, reduce encumbrance in the mouth, and reduce pressure on the teeth; disadvantages are minimal.

Conclusions. Although clinical studies are necessary to demonstrate the efficacy of the method in reducing the incidence of oral complications, DISP mouthguards represent a significant aid for laryngeal exposure.

KEY WORDS: larynx, laser, microsurgery, oral complications, dental injury

RIASSUNTO
Obiettivo. Descrivere una nuova metodica per migliorare l’esposizione del campo operatorio e per proteggere il cavo orale durante la Microchirurgia Laser Transorale (TOLMS) della laringe.

Metodi. Il mastice siliconico per impronte dentali (DISP) viene utilizzato in alternativa ai paradenti tradizionali.

Risultati. I paradenti DISP si adattano perfettamente ad ogni paziente, riducono l’ingombro in bocca e riducono la pressione sulle denti; gli svantaggi sono minimi.

Conclusioni. Sebbene siano necessari studi clinici per dimostrare l’efficacia del metodo nel ridurre statisticamente l’incidenza delle complicanze orali, i paradenti DISP rappresentano un aiuto significativo per l’esposizione laringea.

PAROLE CHIAVE: laringe, laser, microchirurgia, complicanze orali, lesioni dentali

Introduction

Laser-assisted surgery is a well-established method to treat both benign and malignant lesions of the upper aero-digestive tract. The most employed technique for the treatment of laryngeal lesions, according with the new nomenclature proposed by the European Laryngological Society, is defined as CO2 transoral laser microsurgery (TOLMS). Many types of innovative and better performing instruments have been proposed and successfully employed over the years, in order to ensure the best exposure of the laryngeal surgical field. With the same purpose, an important study by Piazza and colleagues showed the importance of standardised pre-operative assessment. However, a transoral approach to the larynx still mandates the employment of rigid steel operating laryngoscopes. Therefore, despite the use of standard dental guards, the

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possibility to cause minor or major lesions to teeth or to the alveolar ridge during these procedures must be concretely considered. The literature documents only few studies reporting the incidence of surgical complications in the oral cavity during transoral laryngeal surgery, especially when laser techniques are employed.

Our centre performs about 30 laser-assisted laryngeal procedures per year. Many types of precautions have been adopted over the years to prevent dental and gum injuries (silicone or stainless-steel mouthguards, pre-operative dental evaluation). However, we recently developed a very promising method to protect both dental and periodontal apparatus, employing a dental impression silicone putty (DISP).

The primary aims of this paper is to present this technique and then to analyse the advantages and disadvantages of the method.

**Technique**

The material employed for this study is a nanotechnology-based silicone (“Elite HD+ Putty Soft” – Zhermack SpA – Badia Polesine, Italy), composed of a base (orange putty) and a catalyst (white putty) (Fig. 1). The set is stored in a dry and cool locker in our operating block. When the patient is under general anaesthesia, with the endotracheal tube correctly in place and cuffed, the surgeon opens both the plastic jars of the set (base and catalyst) and takes about 4 cc of both putties with a dedicated plastic spoon (Fig. 2a). The surgeon should wear clean and sterile surgical gloves to prevent dust, dirt, or organic material from contacting with the putty. The surgeon uses fingers to knead the impression material mixing base and catalyst, until the material assumes a uniform color (it takes about 2 minutes). The surgeon rolls the putty into the shape of a small log (Fig. 2b), and then distributes the DISP up to cover the teeth of the maxillary dental arcade, paying attention to leave a sufficiently thick layer on the incisal edge. In order to achieve the maximum hardness, the material should now remain in place for at least 5’30” at 23°C, according with the specifications given by the manufacturer; however, the higher temperature of patients’ mouth usually shortens the time needed. A “patient-shaped” DISP mouthguard is now ready, and the operating laryngoscope can be safely positioned (Fig. 3).

**Discussion**

The literature reports different percentages of oral complications after TOLMS. An important study on a large series of patients reported that minor mucosal lesions can occur in 75% of patients; dental injuries are much less frequent, occurring in 6.5%; the study also reported that these complications were more frequent in therapeutic procedures, and there was a significant correlation between dental injury rate and pre-operative dental and periodontal disease. One recent retrospective study by Larner et al. reported 1 dental injury out of 174 cases.

Even if the incidence of oral complications is relatively low and not life-threatening, the percentage of refunding requests in consequence to dental lesions is generally high. A recent study by Feng and colleagues showed the advantages of employing a laryngeal force sensor for suspension microlaryngoscopy in mitigating maximum forces and preventing post-operative complications.

Although our new technique has been successfully employed in our hospital for the past two years without reporting any case of gum or dental injury, the main purpose of this paper is merely to illustrate the procedure in detail; specific case-control studies will be necessary to compare the efficacy of the method compared to employment of traditional mouth guards.

The advantages of the employment of DISP in TOLMS are the following. The material is low-cost; with a single set of
Avoiding gum and dental injuries in transoral laser laryngeal surgery with dental silicone patty

silicone putty it is possible to treat up to 60 patients; traditional silicone mouthguards are generally more expensive, and their performance can decrease after several sterilisation procedures. The DISP can also be positioned only where necessary; this aspect is a clear advantage in order to reduce the encumbrance of instruments (i.e., steel mouthguards) inside the mouth. The material perfectly follows the profile of the dental ridge; therefore, once hardened, the putty never moves. The DISP also prevents excessive pressure on rotten teeth: optimal positioning of the material also allows to distribute the pressure on neighbouring teeth, but mostly on gum and bone structures (Fig. 4). Furthermore, there are cases in which the operating laryngoscope, due to lack of teeth, is forced to lie directly on the bone of the maxillary alveolar ridge (even when correctly positioned, it risks slipping down on the bone); this may cause injuries to the mesial or distal faces of the crown and/or the neck of neighbouring teeth (Fig. 5a); in these cases, the DISP can fill the space determined by missing teeth, keeping the laryngoscope in an optimal position (Fig. 5b). Finally, the surgeon can also prepare the DISP mouthguards before inducing general anesthesia, preventing dental injuries during oro-tracheal intubation.

However, the procedure has also the following disadvantages. Firstly, operating time increases by about 10-15
minutes, because the surgeon needs two separate scrubbing sessions. Secondly, it is necessary to pay attention to apply the material as a single block to avoid the risk of dispersing silicone fragments in the oral cavity or in the oropharynx. Furthermore, some skill is required in order to not make the DISP mouthguard too thick or too thin. Due to its advantages, we believe that these mouthguards made of DISP represent a significant aid for CO2 TOLMS, facilitating laryngeal exposure and reducing encumbrance inside the oral cavity. Consequently, we can hypothesise that this technique could also be applied in all types of laryngeal microsurgery. Further studies are necessary to demonstrate the superiority of the method in reducing the incidence of oral complications.

Conflict of interest statement
The authors declare no conflict of interest.

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Author contributions
NC: manuscript redaction, figure drawing; VM: clinical data collection, critical revision; MP: submission of the manuscript; GM: critical revision; LM: critical revision; PI: clinical data collection, critical revision; GL: article idea, clinical supervision.

Ethical consideration
The research was conducted ethically, with all study procedures being performed in accordance with the requirements of the World Medical Association’s Declaration of Helsinki. Written informed consent was obtained from each participant patient for surgical procedure and data publication.

References


