Treatment of midline diastema

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Introduction and background

Physiological transitory maxillary midline diastema is observed in children during the eruption of the maxillary anterior canines, but is unrelated to the eruption of teeth. In most cases, it self-corrects after the eruption of the maxillary canines (in 96 % it closes spontaneously). Midline diastema of teeth has been observed owing to various aetiological factors, such as supernumerary teeth, congenital absence of permanent teeth, deleterious oral habits, high frenal attachment and others, such as peg-shaped laterals and microdontia. The correct diagnosis should be established. If a high frenal attachment is the reason for a midline diastema, then a frenectomy is indicated as surgical procedure. Midline diastema persists when a maxillary labial frenum has papillary insertion (type III) or is penetrating at the palatal papilla (type IV).

The optimal time for frenectomy is after the maxillary canine teeth have erupted and diastema cannot self-correct. This advisable intervention should be performed in early childhood, between 7 and 9 years of age. At this time the postoperative recovery period is very short and requires minimal patient compliance. The surgical correction of a diastema can be successfully accomplished without orthodontic treatment. At a later stage, when active tooth eruption has finished, closure of the maxillary midline diastema with a prominent frenum is a more predictable approach with frenectomy and concomitant orthodontic treatment than with frenectomy alone. Some recommendations exist to perform frenectomy prior to orthodontic therapy, while some suggest between or after.

One of the explanations of the ideal time for this procedure says that it should be during an orthodontic therapy; if the procedure is done prior to closure (or near closure) of the diastema, the size of the scar will be larger; closing the space will involve an exaggerated amount of dense collagen (scar tissue) to bunch up, making space closure more difficult. The optimal time for the frenectomy is when there is still enough space to perform the surgical procedure and when the space is very nearly closed. Also, the appliances should be in place so that immediate force application will close the space and hold it closed while healing takes place. In this way the “scarring” will help to sustain the space closure, not prevent it. Finally, the procedure should be done with sufficient creativity so that the incisive papilla is enhanced, not destroyed.

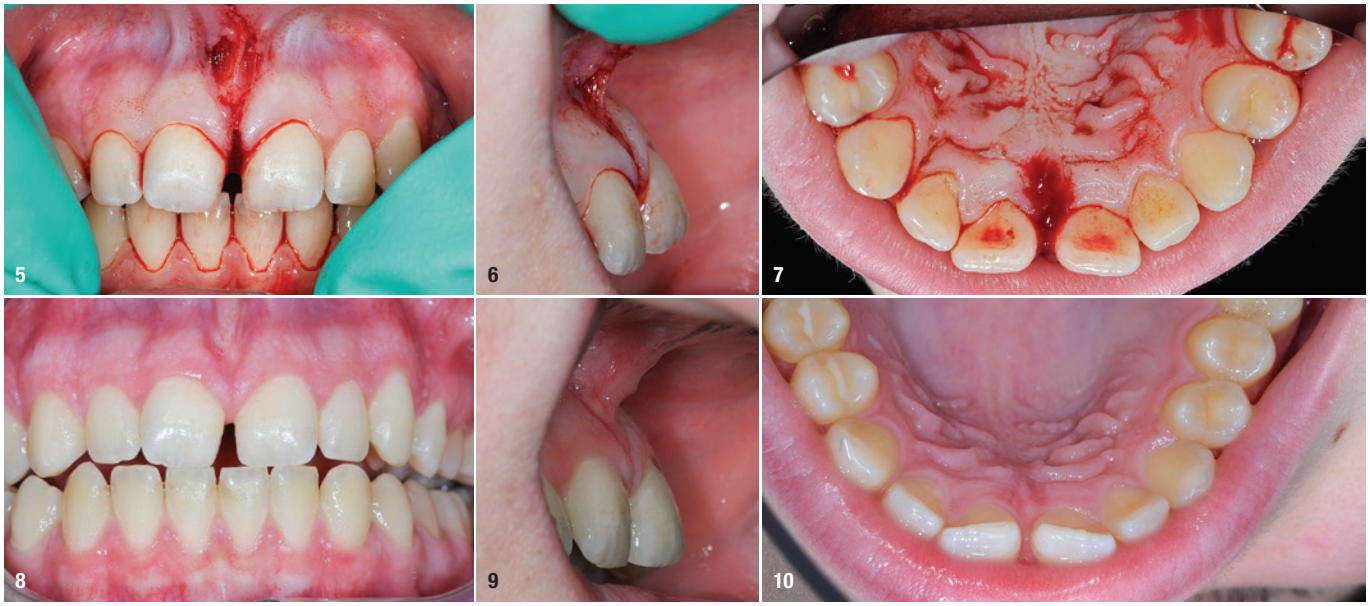
In this case, the patient came to our dental surgery with a labial frenulum type IV. Such a frenum prevented closure of the diastema and affected the anterior aesthetics of the mouth. Er:YAG laser (2,940 nm) was used to vaporise the mucous and collagen components of the frenum through its photothermal effect on water molecules. Er:YAG is completely absorbed in the superficial tissue layer, thereby preventing damage to the underlying and surrounding structures. This is especially important when removing deeper layers around nerves and vessels (incisive papilla).



Figs. 1–4: Initial clinical situation showing the midline diastema.

Anamnesis and treatment plan

A 16-year-old female patient came to our office with labial frenulum type IV, anomalous frenum with fibrotic attachment penetrating at the palatal papilla, preventing the closure of the midline diastema (Figs. 1–4). She had been generally healthy, with no serious illnesses,



Figs. 5–7: Situation post-op immediately after labial frenectomy. **Figs. 8–10:** Clinical situation at the follow-up after 3 months, showing complete healing.

no observed allergies or use of medication. The patient had good oral health. Teeth 16, 24, 25, 34, 35, 36 and 44, 45, 46 had fissure sealant restorations. Tooth 26 had a composite filling. The third molars hadn't erupted yet. Gingival tissue was healthy. Plaque control and oral hygiene was good. Palpation of both temporomandibular joints (TMJ) showed no evidence of pathology, with normal jaw movements. The occlusal relationship was Angle's Class I. A local anaesthetic was infiltrated into the soft tissue surrounding the frenum and incisive papilla after topical anaesthesia (0.5 ml of 3 % Scandonest, mepivacaine HCl injection, Xylocaine Spray 50 ml topical). An Er:YAG laser system (LightWalker AT, Fotona) was used with a H14 handpiece and a chisel fibre tip 12/0.5 x 1.5 mm. The laser was set at 155 mJ energy, 15 Hz frequency, 2.3 W power, water level 3, air level 2, in SP mode.

The laser handpiece was positioned in contact with the frenum. First, a vertical incision of the upper frenum was made, followed by a horizontal incision to create the mucogingival line. When the collagen fibres were vaporised, a light incision of the periosteum was made along the mucogingival junction using a higher percentage



Figs. 11–14: Clinical situation at the follow-up after 7 months, showing small spontaneous closing of the diastema.


15


16

Figs. 15 & 16: Clinical situation 2.5 years after the operation.

of air–water spray to better control thermal damage (water 5, air 3). For the final interdental vaporisation of the collagen fibres in the papilla and palate, slightly higher energy was employed: 165 mJ energy, 15 Hz frequency, 2.47 W power, water level 5, air level 3, in SP mode. Subsequently, Nd:YAG was used (LightWalker AT) to control the bleeding due to its coagulating properties, with a R21-C3 handpiece with non-initiated 300 µm fibre, 30 Hz frequency, 4 W power, in VLP mode. The procedure was finished with biomodulation using Nd:YAG with a Genova handpiece in MSP mode with 0.5 W power, 10 Hz frequency, at one spot on the buccal side and one on the palatal side, for 60 seconds per spot to achieve pain reduction and faster healing. Biomodulation was performed twice, every second day. The total time of the procedure was approximately 14 minutes.

Discussion and results

Mild bleeding persisted at the start of the treatment, followed by moderate bleeding with no pain, which then ceased completely after using Nd:YAG and applying pressure with a gauze for 10 minutes (Figs. 5–7). No complications (such as pain, swelling, or bleeding) were encountered immediately after the laser procedure. It is important to use a shorter pulse duration with Er:YAG (SP–MSP mode) for removal of the collagen fibres from the bone and incision on the periosteum; a longer pulse (VLP mode) can present a higher risk of thermal damage, but can be a suitable alternative for Nd:YAG with coagulation at the end. The patient was instructed to use chlorhexidine gel 0.5 % (Curasept, Curaden) and to avoid eating hot, acidic or hard food during the first few days after the surgery. There were no complications resulting from the procedure.

At the 3-month recall, a completely healed wound was observed (Figs. 8–10). Seven months after the surgical procedure a slight spontaneous closure of the diastema seemed to be observed (Figs. 11–14). The patient was referred to a specialist for orthodontic therapy but did not want to undertake it. She was still satisfied with the result at 2.5-year follow-up (Figs. 15 & 16).

Conclusion

The Er:YAG laser with a wavelength of 2,940 nm has been successfully used for carrying out the here described labial frenectomy, with complication-free subsequent healing. For complete closure of the diastema, it is important that—when a frenectomy is indicated—the timing should be agreed between the orthodontist and surgeon.

about the author



In 1996 **Dr Nataša Prebil** graduated in Stomatology from the University of Ljubljana, Slovenia, and subsequently started her career as a paediatric dentist. In 2003 she started focusing on patients with special needs. She later opened a private clinic for children and adults in 2006 and another clinic for adult patients in 2013. She began working with dental lasers in 2009 and completed the LA&HA Dental Master's Program in Laser Dentistry in 2018. She mainly uses lasers in oral surgery, periodontics and endodontics, as well as in facial aesthetics.

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