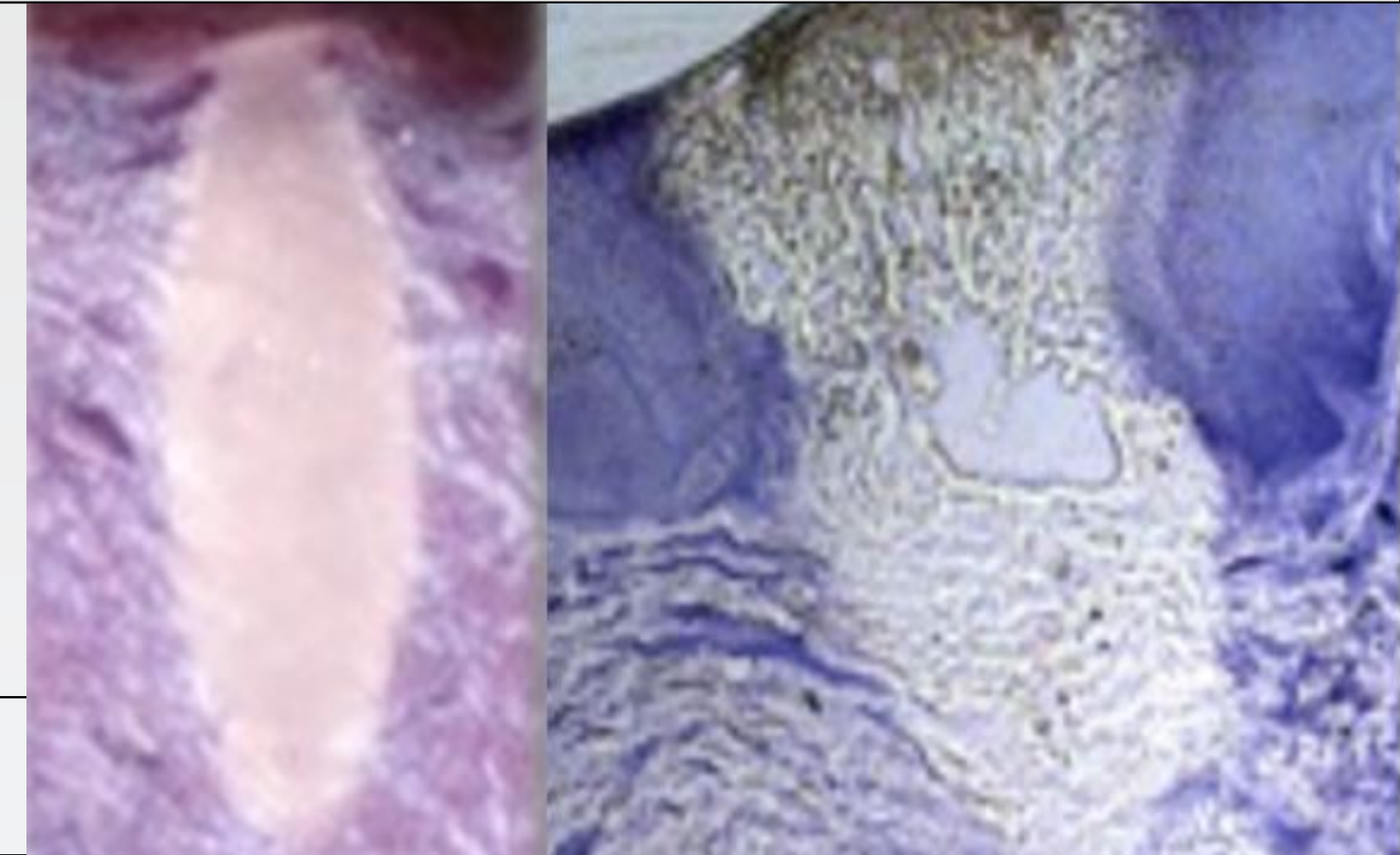


# Laser-patterned Microcoagulation Technology for Soft Tissues in the Implantation Zone

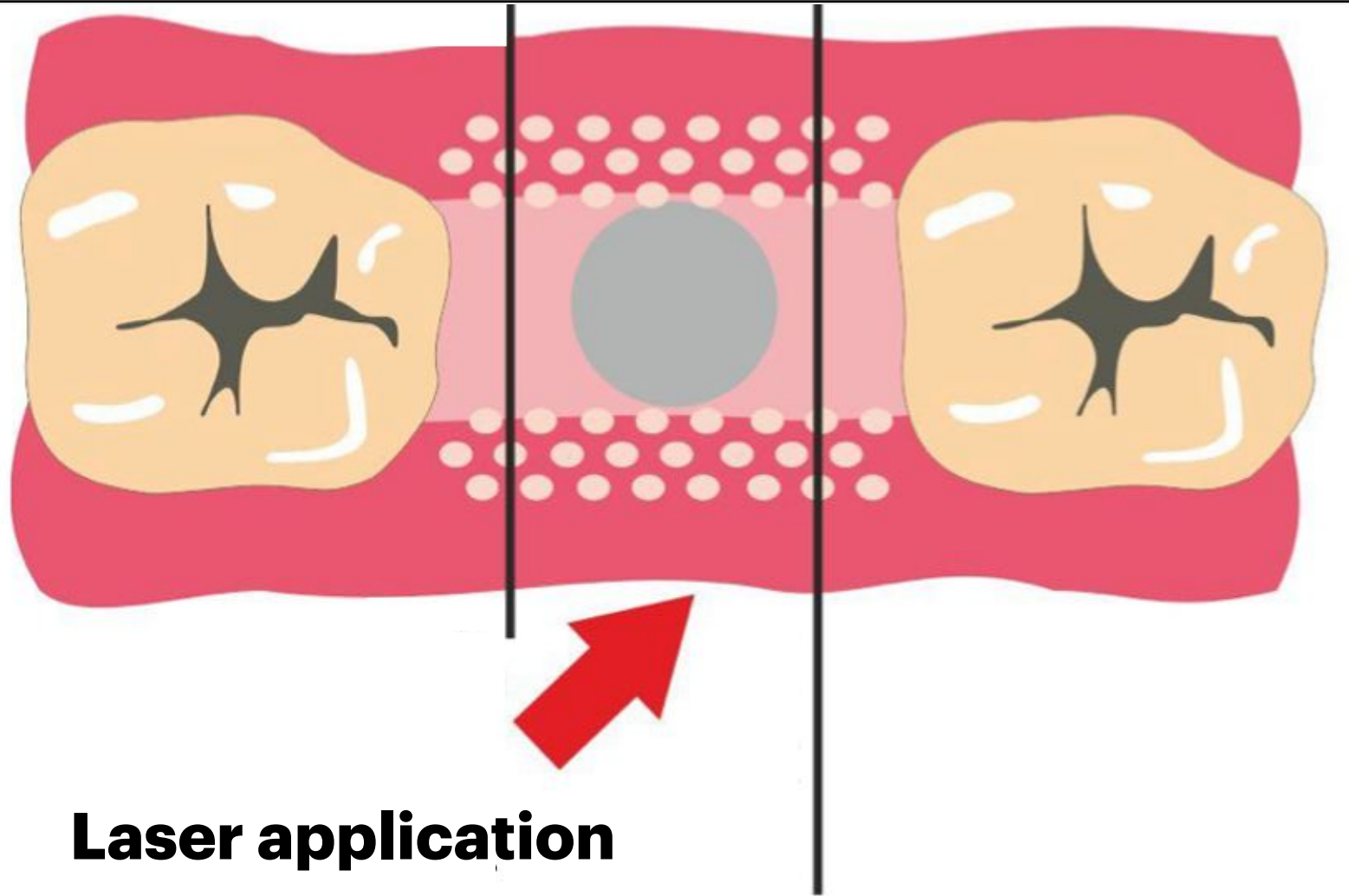
Eremina Alexandra, Zernitckaia Ekaterina, Vyzhu Serhii

Lasers have become an integral tool in modern medicine, offering alternatives and enhancements to traditional techniques. Recent years have seen growing interest in using laser radiation to stimulate tissue and organ regeneration, with fractional laser technologies gaining popularity. These technologies rely on creating microchannels in tissues through laser radiation, stimulating regeneration.



Oral tissues, with their higher vascularization and metabolism compared to skin, possess exceptional regenerative potential. We hypothesized that gingival tissue could demonstrate rapid, scar-free regeneration and possible volume enhancement when treated with thermal microwounds, similar to the regeneration observed in skin. This study employed laser-patterned microcoagulation (LPM) to initiate gingival and oral mucosal regeneration. The creation of microscopic thermal wounds representing islets of tissue damage surrounded by spared normal tissue has been shown to greatly enhance the regenerative capacity of the tissue, resulting in completely scar-free tissue self-repair.

## METHOD

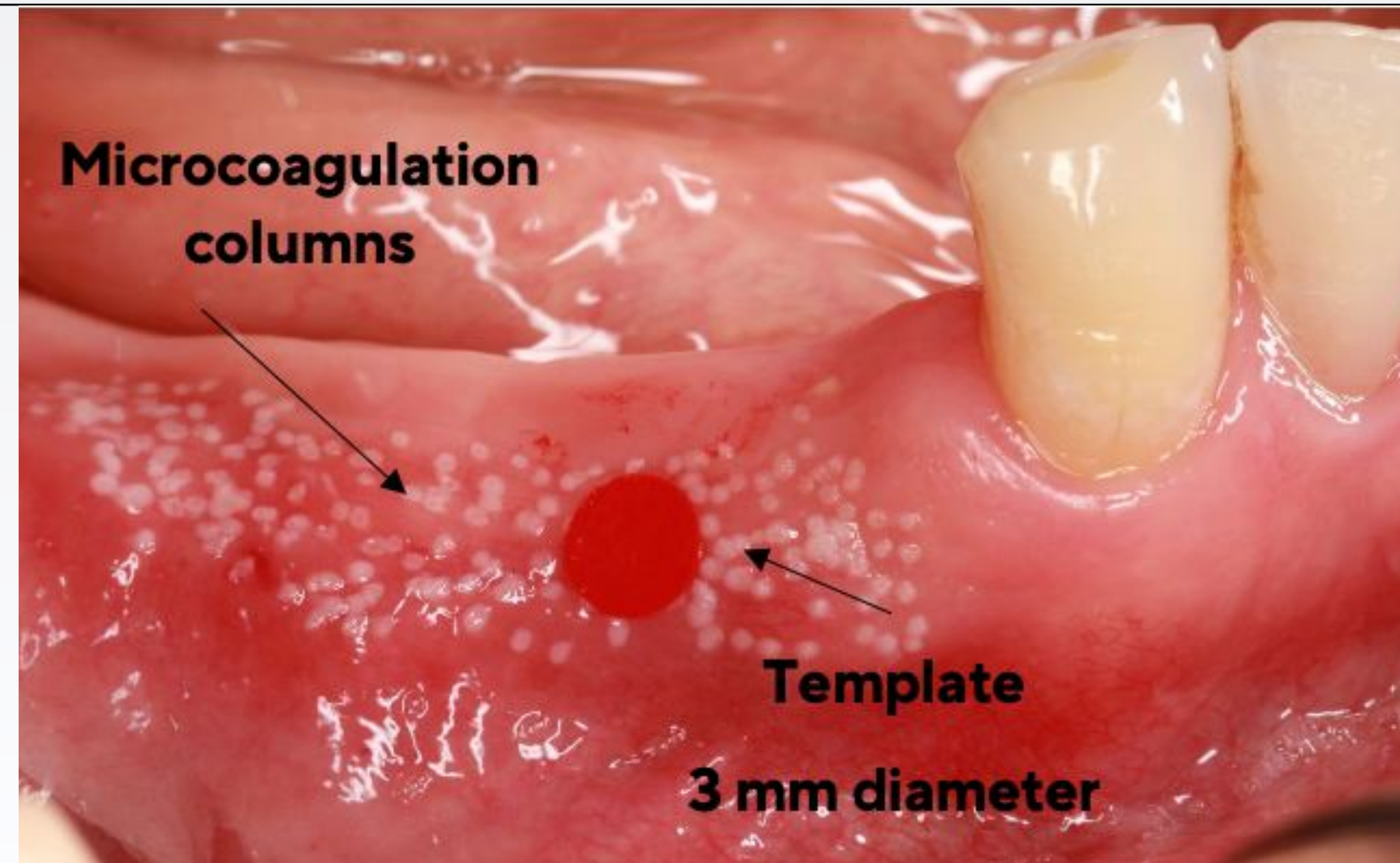


This study included 30 patients undergoing dental implantation combined with gingival grafting procedures. A diode laser with a wavelength of 1550 nm, power of 25 W, and a pulse width ranging from 60 to 250 ms. The laser treatment was designed to induce controlled microcoagulation to stimulate tissue regeneration and accelerate healing.



## LASER TREATMENT PROTOCOL

- The laser was applied at the maximum energy tolerable by the patient, covering 10-30% of the affected area with coagulation columns (at least 8 columns per 1 mm<sup>2</sup>).
- The initial energy setting was 130 mJ per pulse. If the patient experienced discomfort, the energy was reduced by 10 mJ increments until a tolerable level was reached.



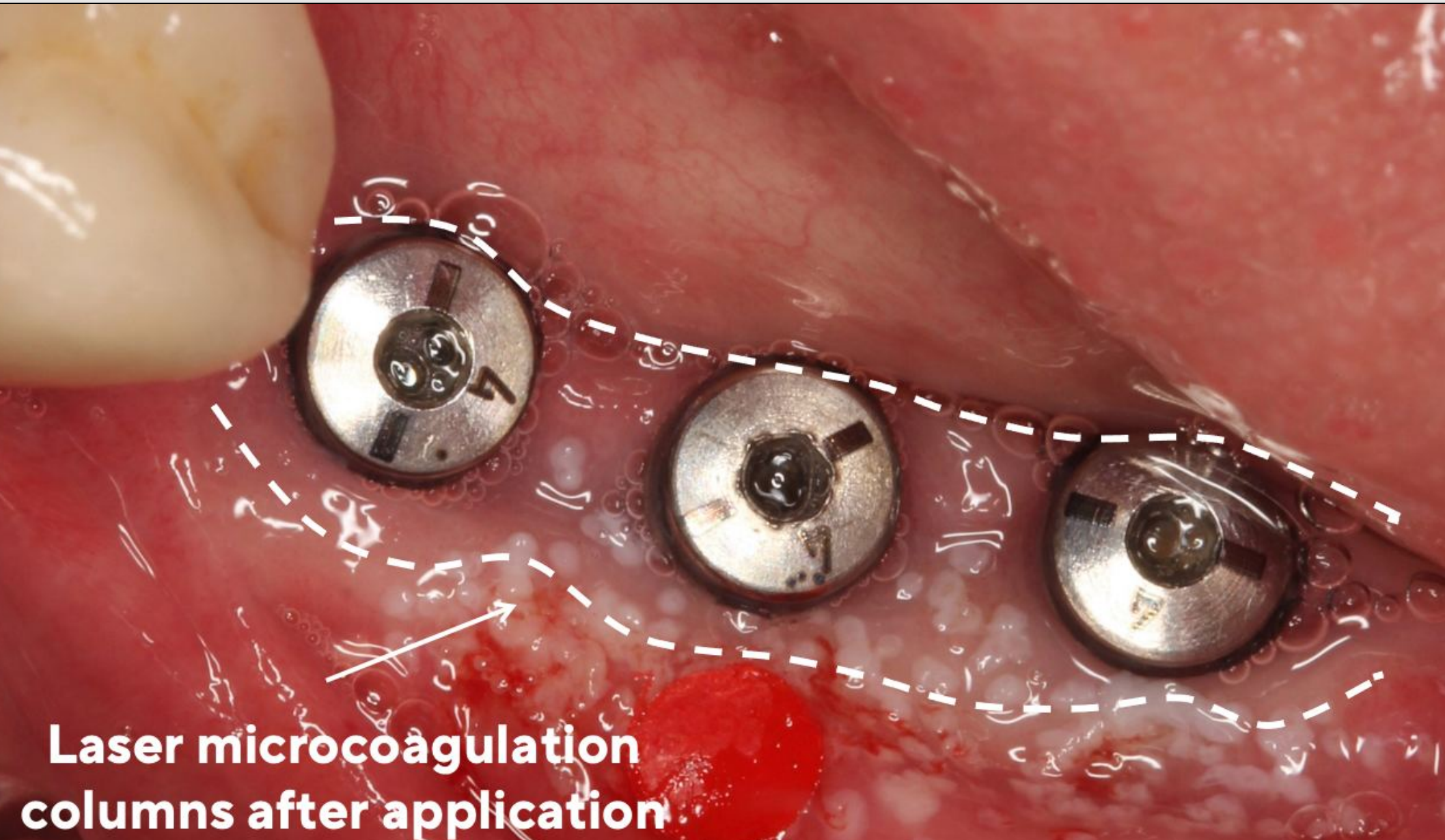
- The laser was operated in a pulse-periodic mode with a pulse frequency of 1-5 Hz.
- The movement speed of the laser handpiece was adjusted for clinician comfort while ensuring that patient discomfort did not exceed that of a single-point application.

# CLINICAL CASE

← BEFORE laser application

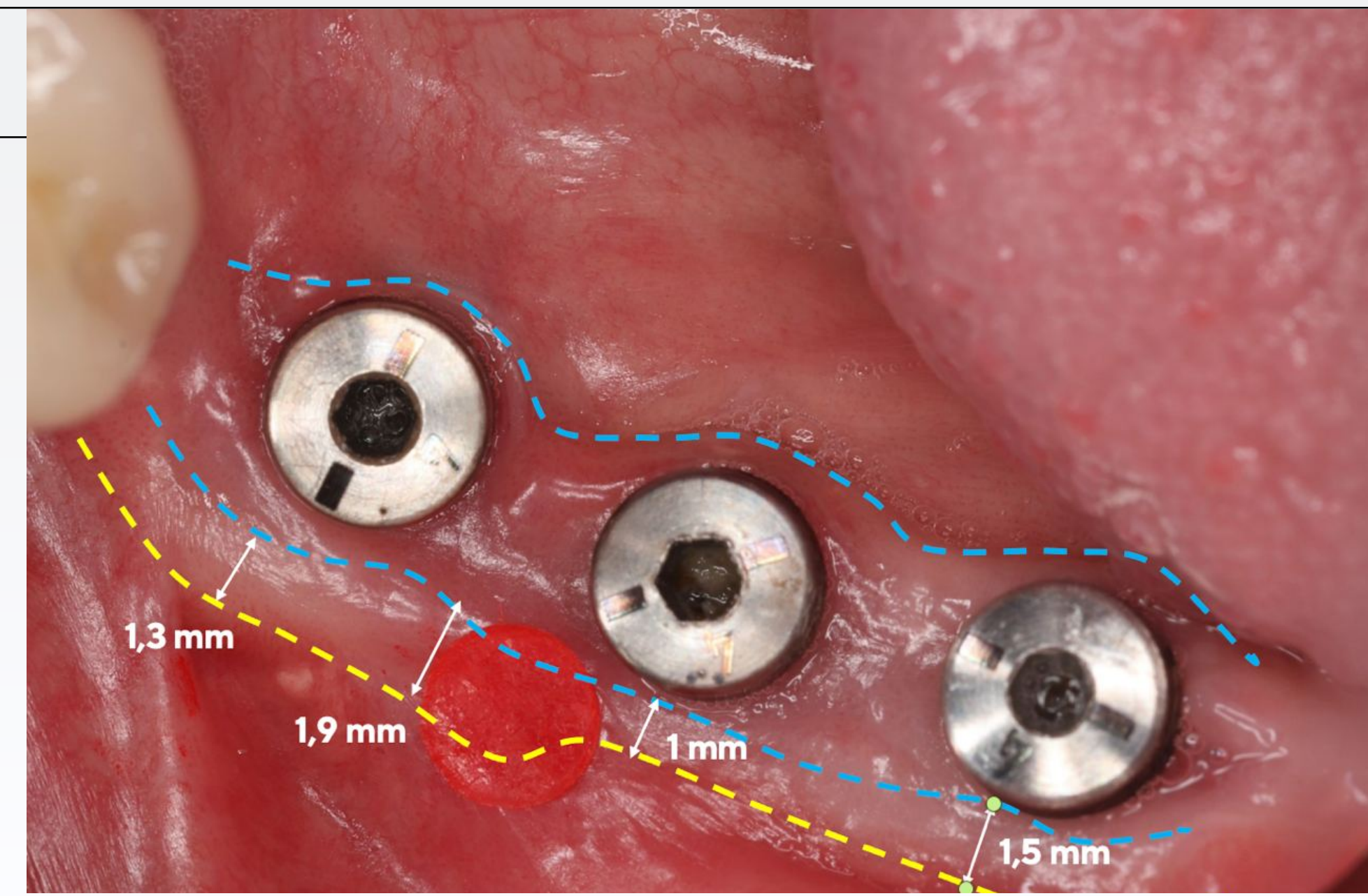
## Treatment Course:

- The average number of treatment sessions was four, with 1.5 to 2 weeks between sessions.



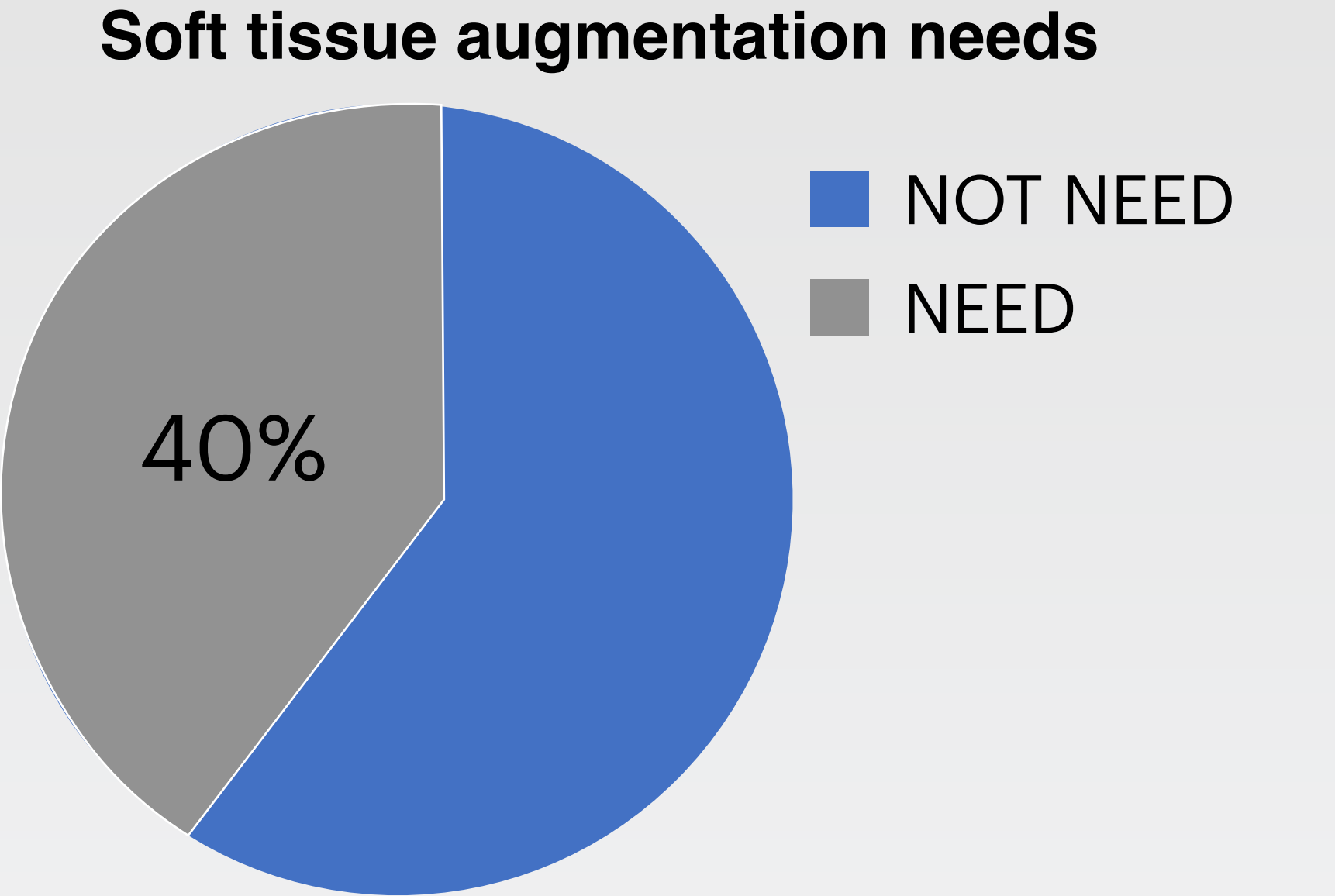
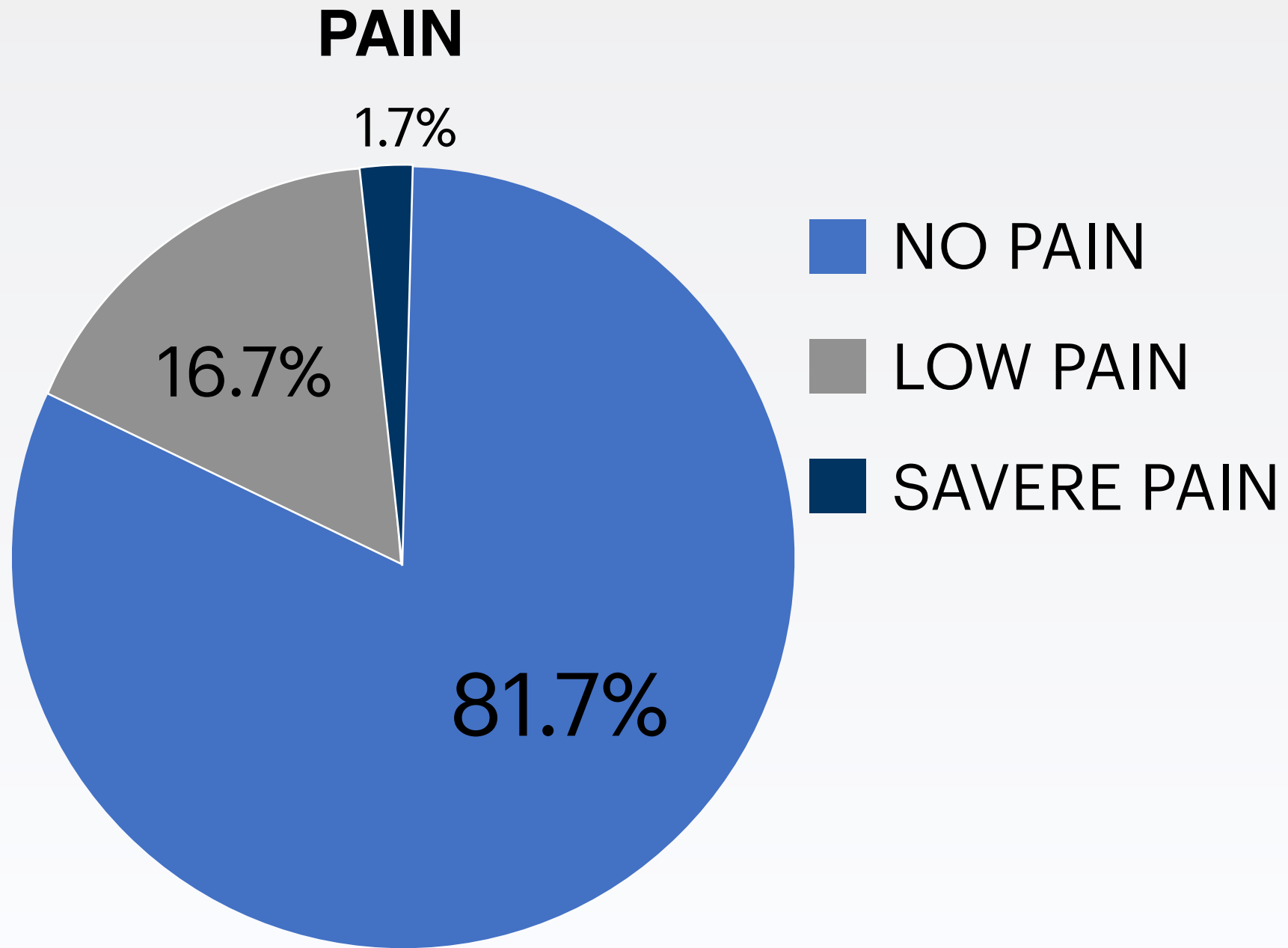
AFTER laser application →

- The treatment zones were carefully monitored throughout the study period to assess healing progression, tissue response, and potential complications. n to stimulate tissue regeneration and accelerate healing.



# RESULTS:

|                                 | 1 treatment –<br>before<br>treatment | Δ 2<br>treatment –<br>before<br>treatment | Δ 3 treatment<br>–before<br>treatment | Δ 4<br>treatment –<br>before<br>treatment | Δ healing<br>abutments –<br>before<br>treatment |
|---------------------------------|--------------------------------------|-------------------------------------------|---------------------------------------|-------------------------------------------|-------------------------------------------------|
| Δ width, mm:<br><u>M±m</u>      | 0,22±0,03<br>(0,16-0,27)             | 0,38±0,04<br>(0,31-0,45)                  | 0,60±0,04<br>(0,51-0,68)              | 0,74±0,05<br>(0,64±0,83)                  | 0,86±0,05<br>(0,75-0,96)                        |
| Δ width, mm:<br>Me;<br>Q25, Q75 | 0,20<br>(0,10-0,20)                  | 0,30<br>(0,30-0,50)                       | 0,55<br>(0,50-0,70)                   | 0,70<br>(0,60-0,81)                       | 0,90<br>(0,80-0,90)                             |



## **CONCLUSIONS :**

- Fraction laser application is a practically painless method for affecting the oral mucosa. Only 1 case out of 30 needed in local anesthesia.
- There is no complications because of the laser applications affecting the oral mucosa.
- In 60% cases there is performed visually detectable increase of the attached keratinized gingiva or attachment of the mobile mucosa to the alveolar part.
- The healing abutment installation after the laser exposure was performed without extra surgical procedure.
- The results give the reason for further study of the laser effects on the oral mucosa regeneration in general and keratinized gingiva in particular