Case report:

Bone Regeneration After Laser Therapy Through Fistula in a Severely Mobile Maxillary Implant Without the Use of Grafting Materials

A non-surgical approach achieving bone regeneration and implant stabilization without the use of grafting or biomaterials.

Summary

This case presents a severe peri-implantitis around implant 11 with total bone loss, successfully treated using **Er,Cr:YSGG 2780nm (Waterlase iPlus)** and **940 nm diode laser (Biolase),** without bone grafting.

Through precise laser decontamination and biostimulation**, bone regeneration** and **implant stabilization** were achieved within 12 months and maintained for over 2 years.

This clinical evidence highlights the transformative potential of laser-assisted regenerative therapy in implant dentistry.

General Medical Anamnesis:

A 37-year-old female patient, systemically healthy, non-smoker, with no history of systemic diseases, allergies, or medications, presented with **severe mobility and discomfort** in the anterior maxillary region.

Dental Anamnesis:

Implant placed 3 months earlier, previously asymptomatic. The patient reported a traumatic incident in which her daughter accidentally hit her maxillary central incisor implant (tooth 11) while playing. She presented to the clinic 2 months after the trauma with complaints of implant mobility.

Following trauma: **fistula formation**, occasional bleeding, and progressive mobility of the implant.

Diagnosis:

Peri-implantitis on implant 11 with grade III mobility in all directions and active vestibular fistula formation with minimal exudate, slighty edematous, no spontaneous pain, mild tenderness upon palpation, secondary to traumatic injury of implant 11.

Treatment Plan:

Laser-assisted decontamination of peri-implant tissues through the fistula, followed by stabilization with an elastic composite splint for 2 months and photobiomodulation. Long-term monitoring with CBCT to assess bone regeneration and implant stability.

Diagnosis (according to the EFP/AAP classification for peri-implant diseases):

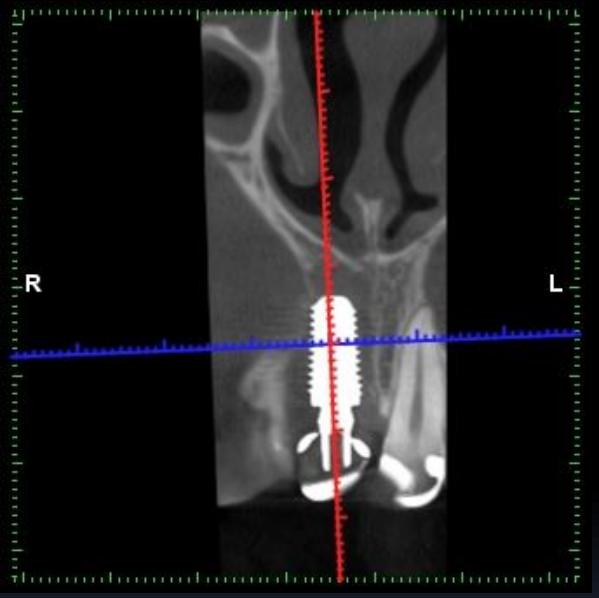
Severe peri-implantitis characterized by >50% circumferential bone loss, grade III mobility, and an active vestibular fistula.
Classified as *Stage IV* (severe support loss with functional compromise) and *Grade C* (rapid progression, trauma-related, secondary infection).

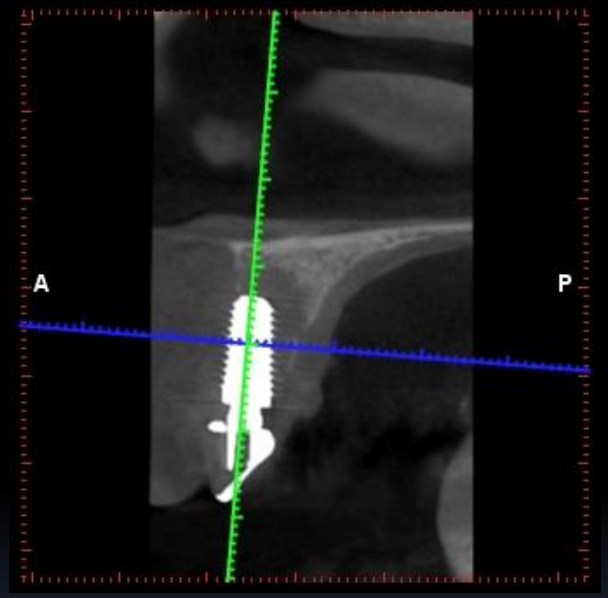
Clinical Findings:

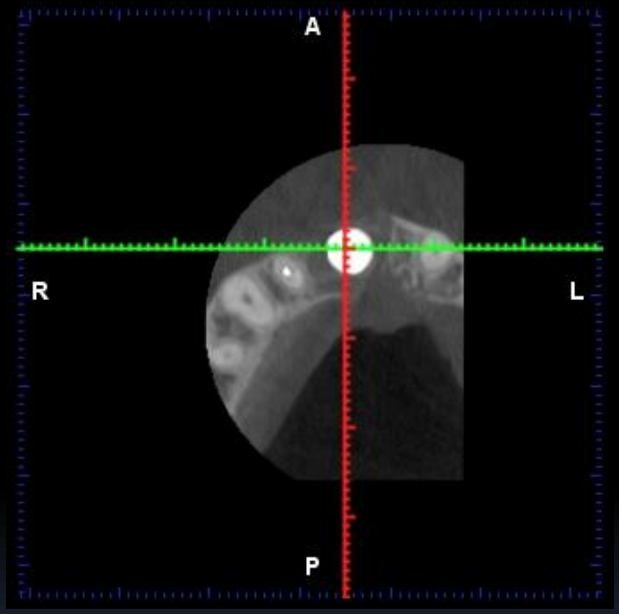
Clinical examination revealed grade III mobility of implant 11 in all directions and the presence of an active vestibular fistula in the peri-implant mucosa.

Initial video-mobility

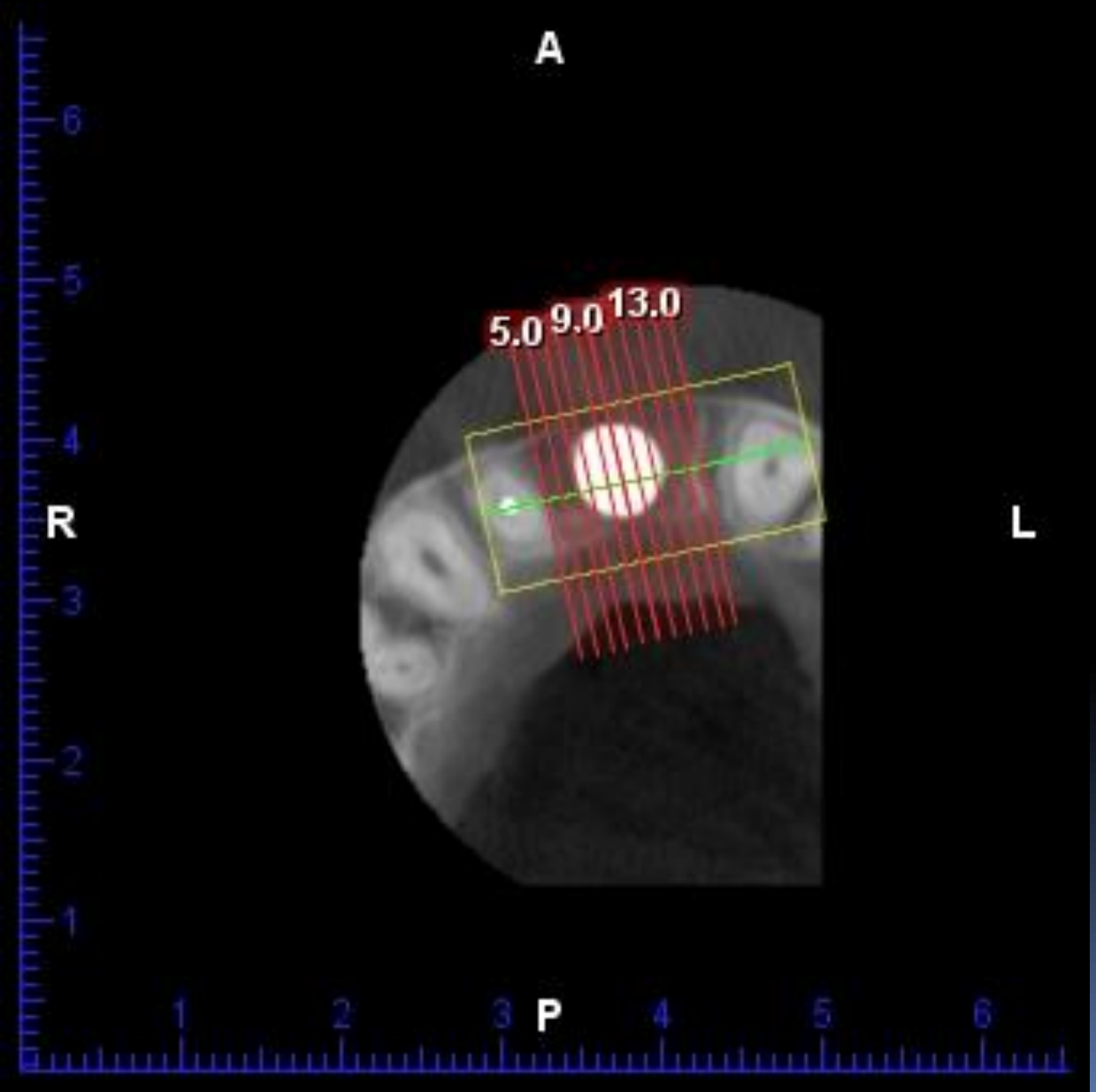
CBCT examination showed peri-implant radiolucency, circumferential bone loss around the implant, complete vestibular cortical bone resorbtion, radiolucency extending to the apex, absence of visible osseointegration.

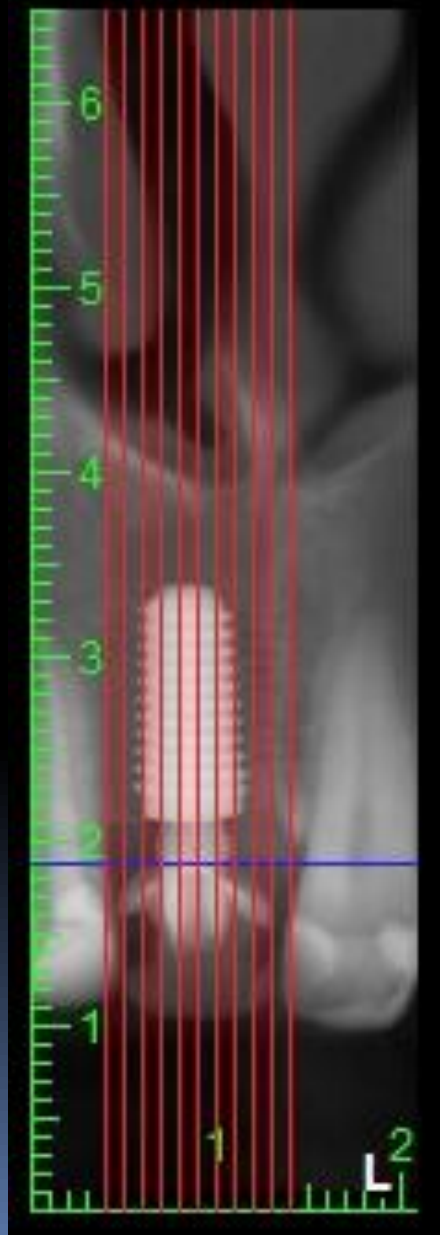




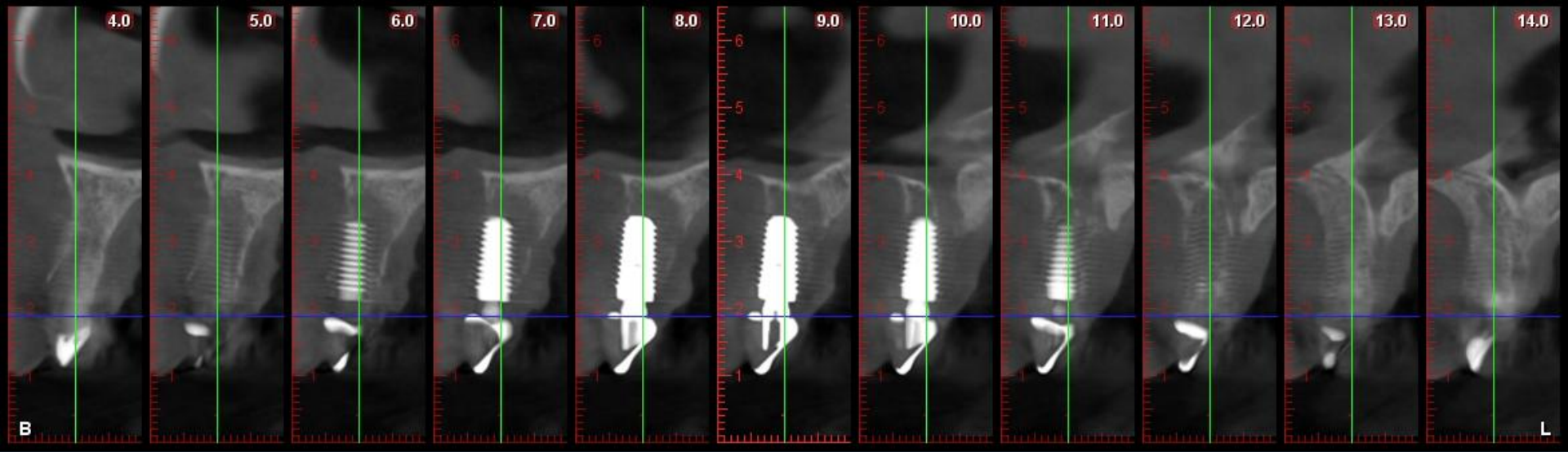


CBCT examination





CBCT examination



Treatment Plan:

The main objective was implant preservation and peri-implant tissue regeneration through a non-surgical, laser-based protocol focused on infection control, biostimulation, and immobilization.

1. **Laser decontamination via the fistula:**
   - Er,Cr:YSGG laser was used **Only Once** for the removal of granulation tissue and biofilm disruption, ensuring deep decontamination of the implant surface through the fistulous tract.
   - The approach avoided surgical flap elevation to minimize tissue trauma and preserve residual bone.

2. Photobiomodulation therapy (PBMT):

- A diode laser (940 nm) was applied externally on vestibular and palatal mucosa to stimulate osteoblastic activity and angiogenesis, promoting natural bone healing.
- PBMT sessions were performed immediately after treatment, at 1 week, and at 3 weeks.

3. Temporary stabilization:

• The implant was splinted to adjacent teeth using elastic composite bonding for 2 months, minimizing micro-movements and allowing secondary osseointegration.

4. Clinical and radiological follow-up:

• Evaluations at 1 week, 3 weeks, 6 weeks, 3 months, 10 months, 15 months, and 24 months.

• Comparative CBCT scans at 12 months.

Laser Parameters for chiurettage:

Laser Type: Er,Cr:YSGG (2780 nm)
Tip/Fiber: RFPT 5, 10 mm
Average Power: 1.5 W
Pulse Repetition Rate: 30 Hz
Pulse Duration: 60 µs (Mode H)
Pulse Energy:50mJ
Air/Water Ratio: Air 60% / Water 80%
Application Technique: through the fistula, used only once for the removal of granulation tissue and biofilm disruption

Laser Parameters –PBMT:

Laser Type: Diode Laser
Wavelength: 940 nm
Operating Mode: Continuous Wave (CW)
Average Power: 0.9 W
Application Tip: Whitening handpiece
Treatment Duration: 45 seconds per spot
Energy Density: 14.46 J/cm²
Application Method: Contact
PBMT sessions were performed immediately after treatment, at 1 week, and at 3 weeks

Treatment video:

1 week aspect: complete reduction of inflammation and closure of fistula.

3 weeks aspect: healthy peri-implant mucosa with no exudate or discomfort.

6 weeks aspect: no bleeding or tenderness on probing.

3 months video aspect: No mobility (complete stabilization). Normal, firm mucosal appearance.

10 months aspect: healthy peri-implant tissue, no recurrence of fistula.

10 months video aspect

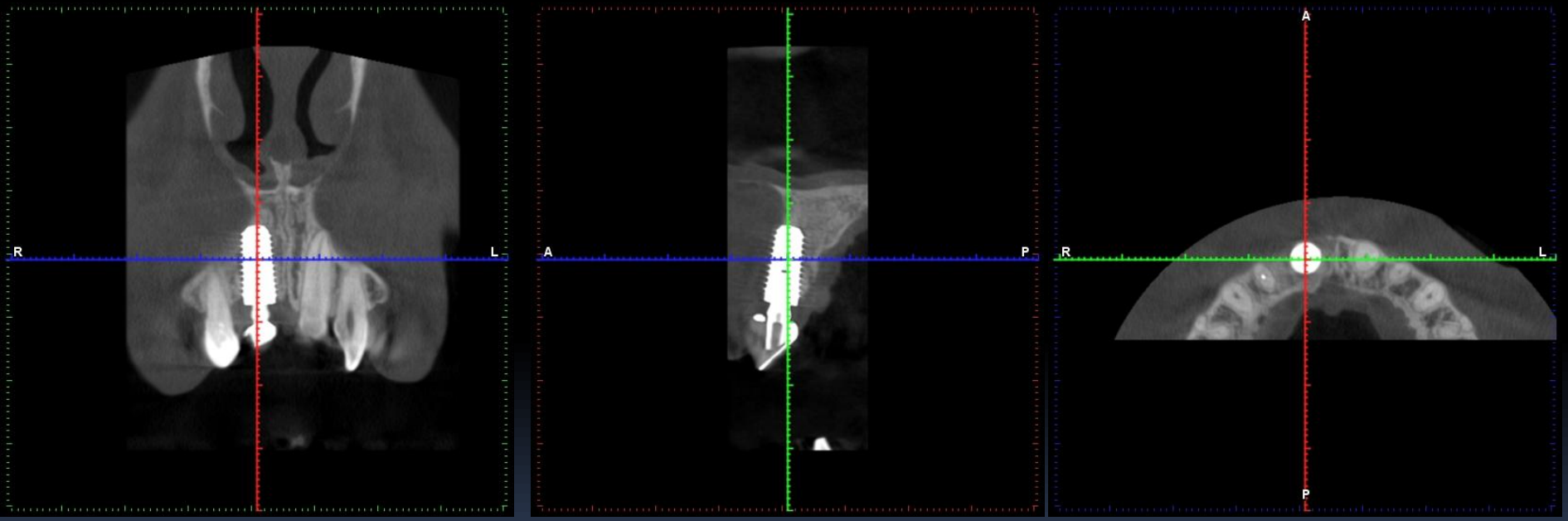
15 months aspect:

Post-treatment and 1-year CBCT images showing bone regeneration around the implant.

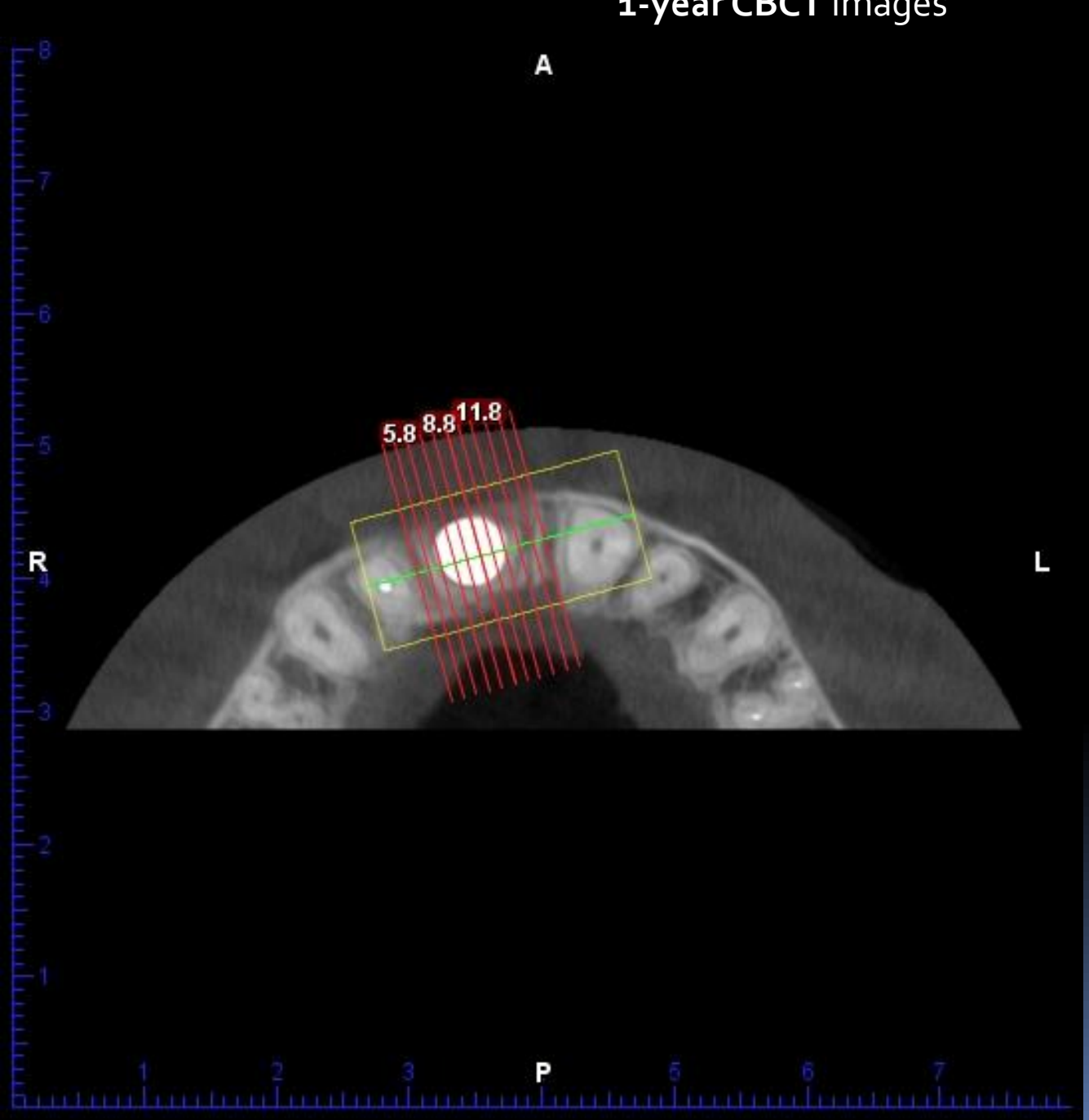
Circumferential bone regeneration around the implant.

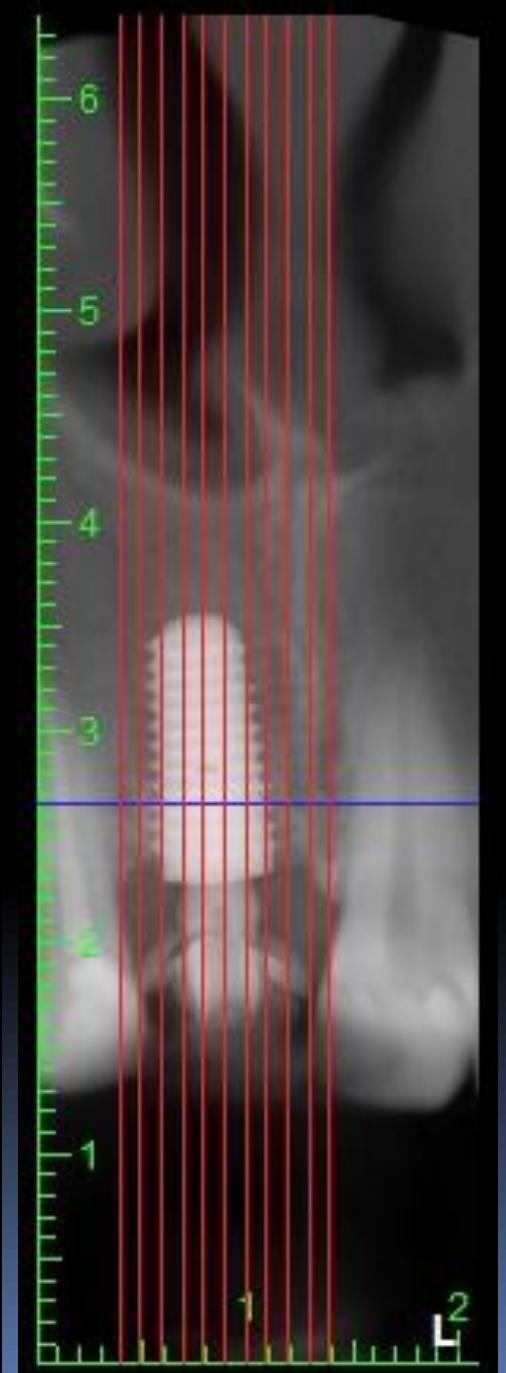
Restored also some of vestibular cortical bone.

Increased bone density and re-established osseointegration.

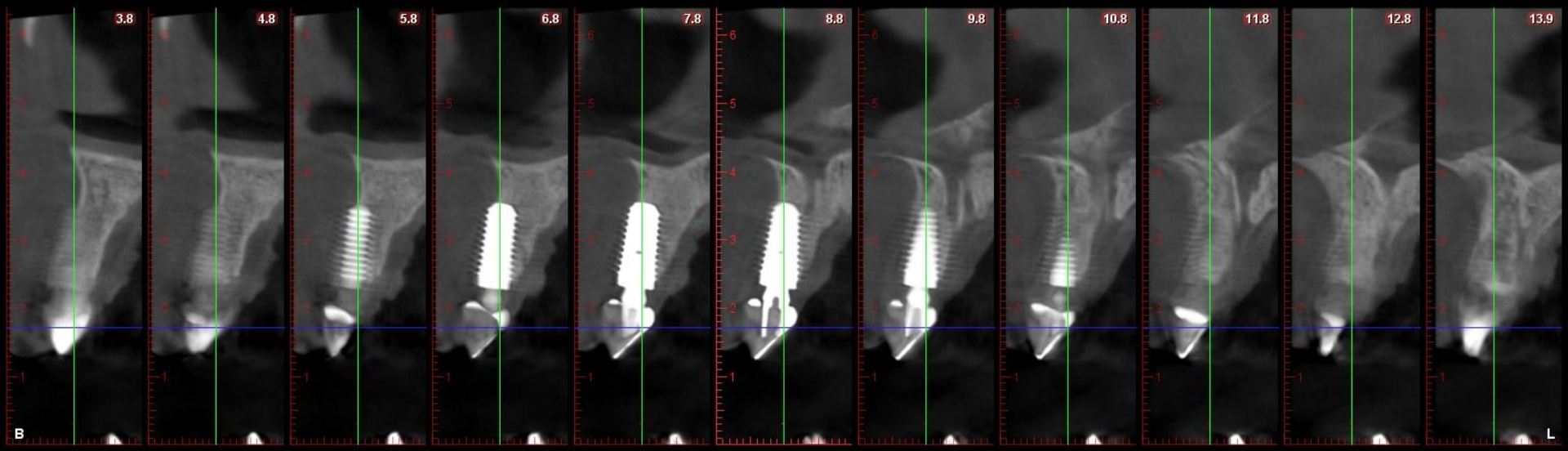


1-year CBCT images

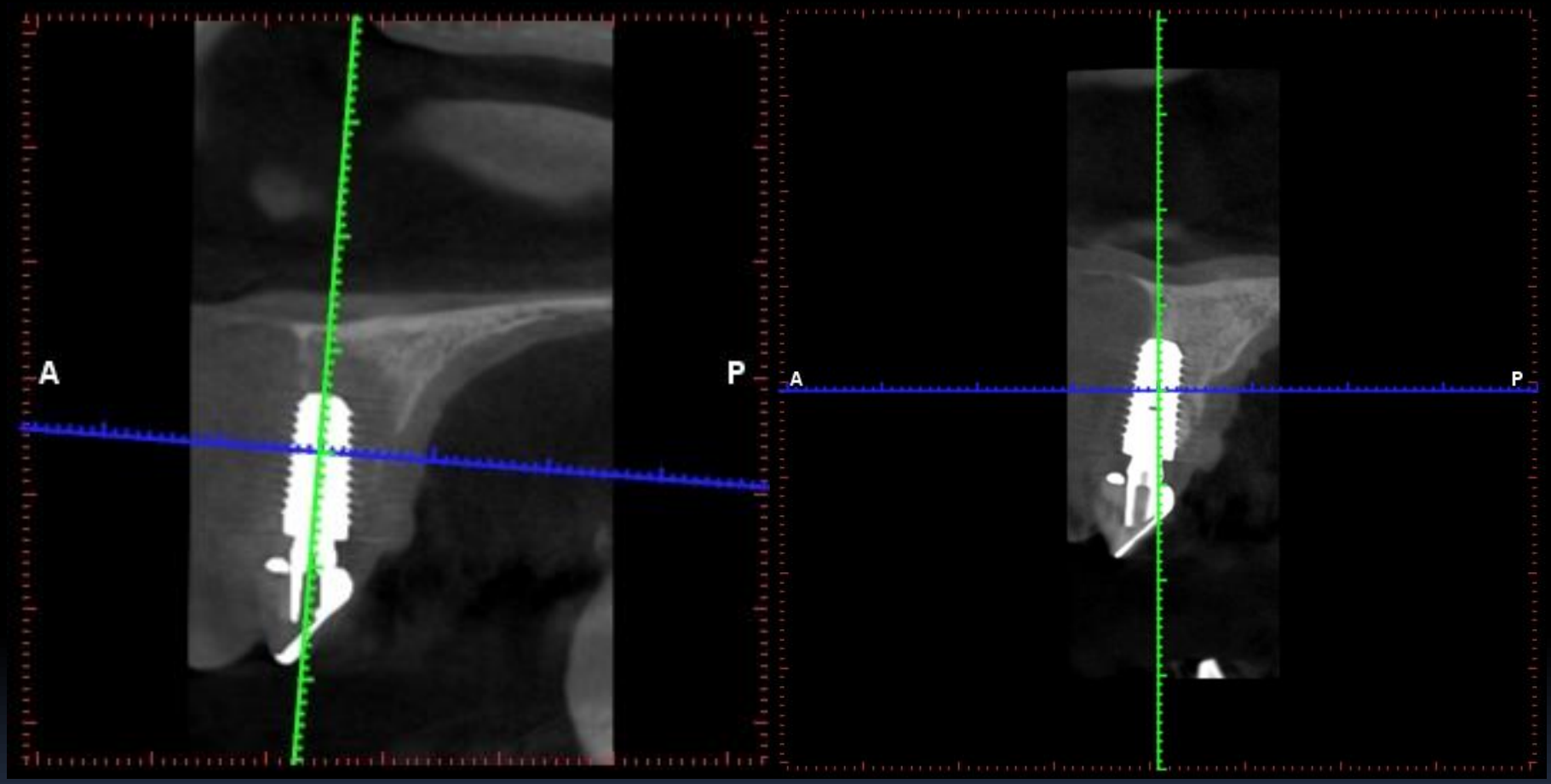




1-year CBCT images

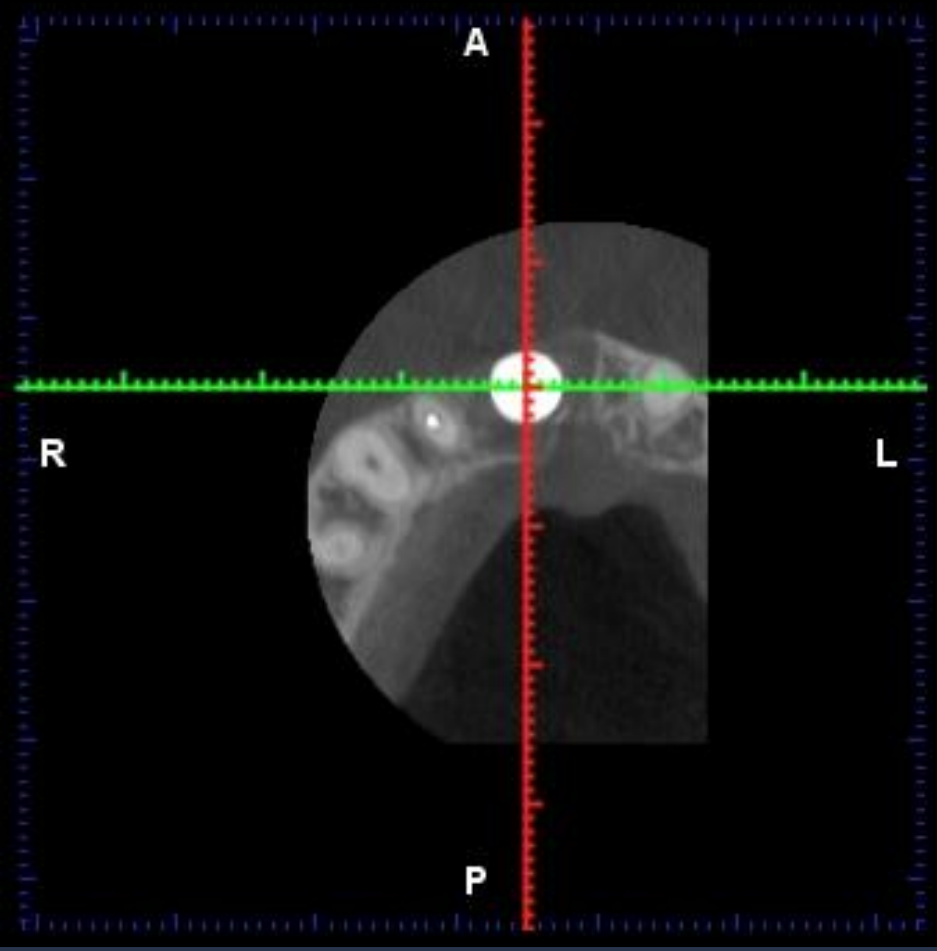


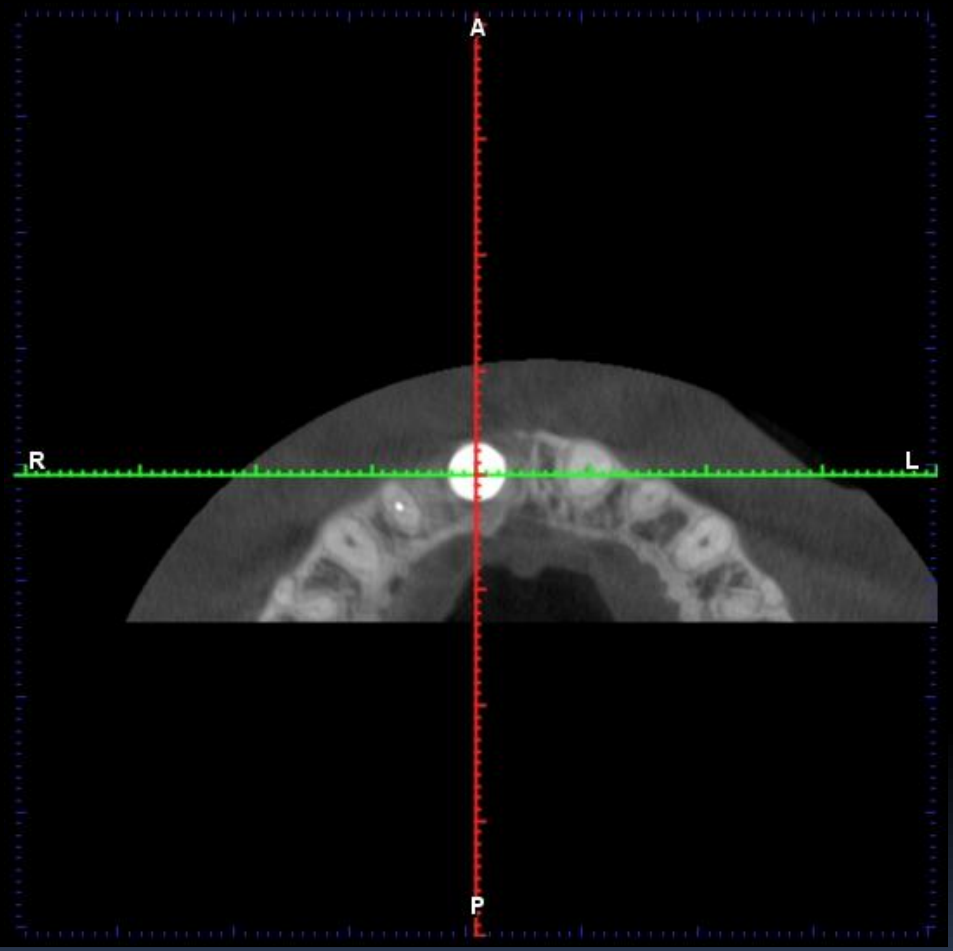
CBCT before & after 1 year



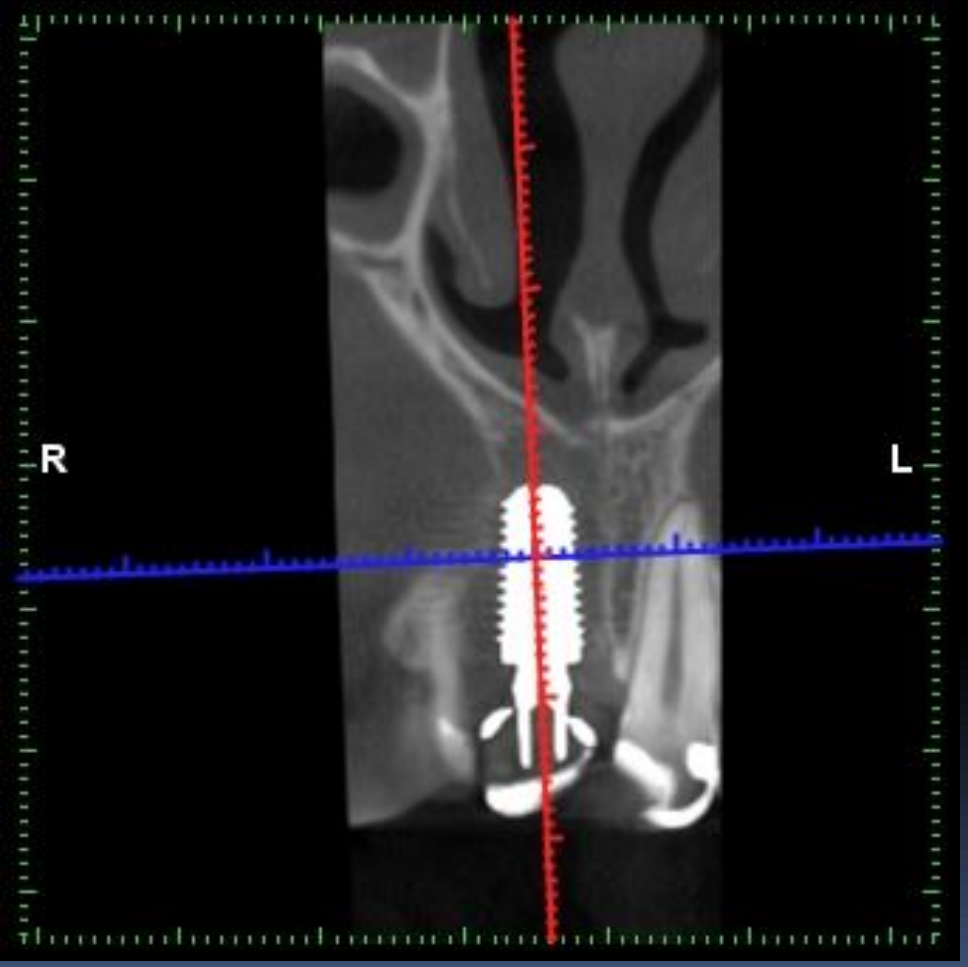
This case highlights the regenerative potential of laser therapy even in severely compromised implants.

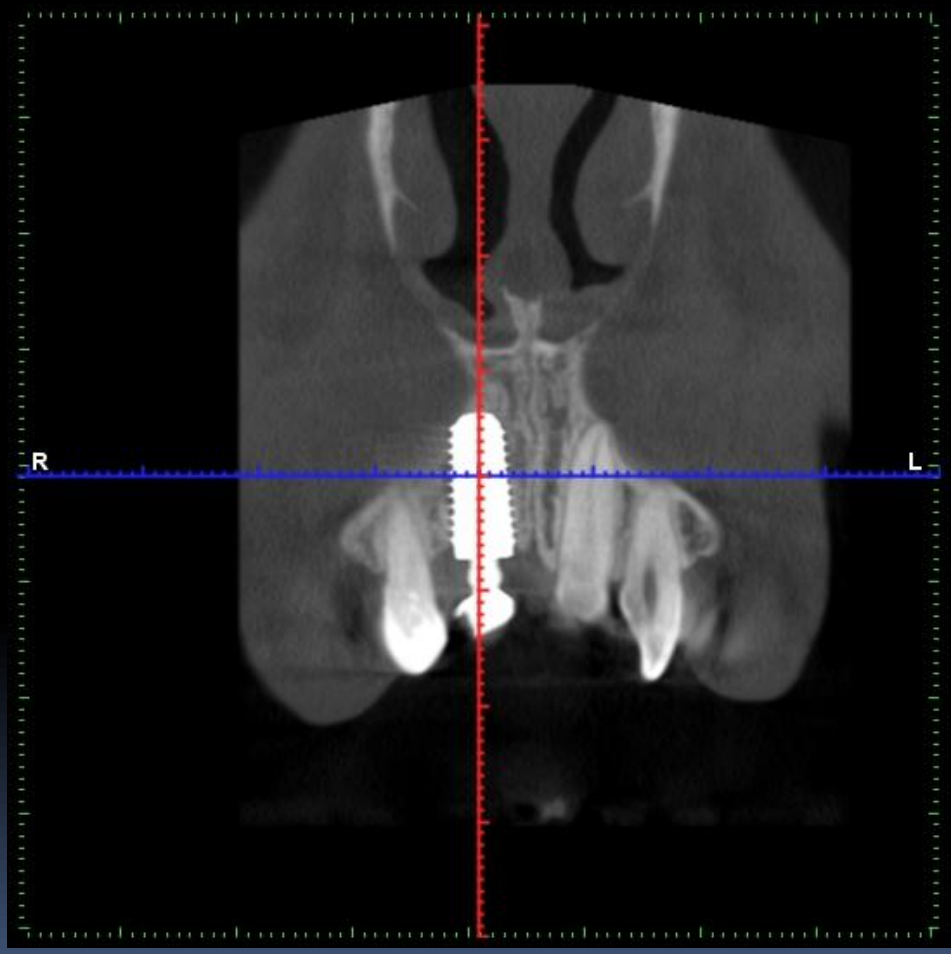
CBCT before & after 1 year



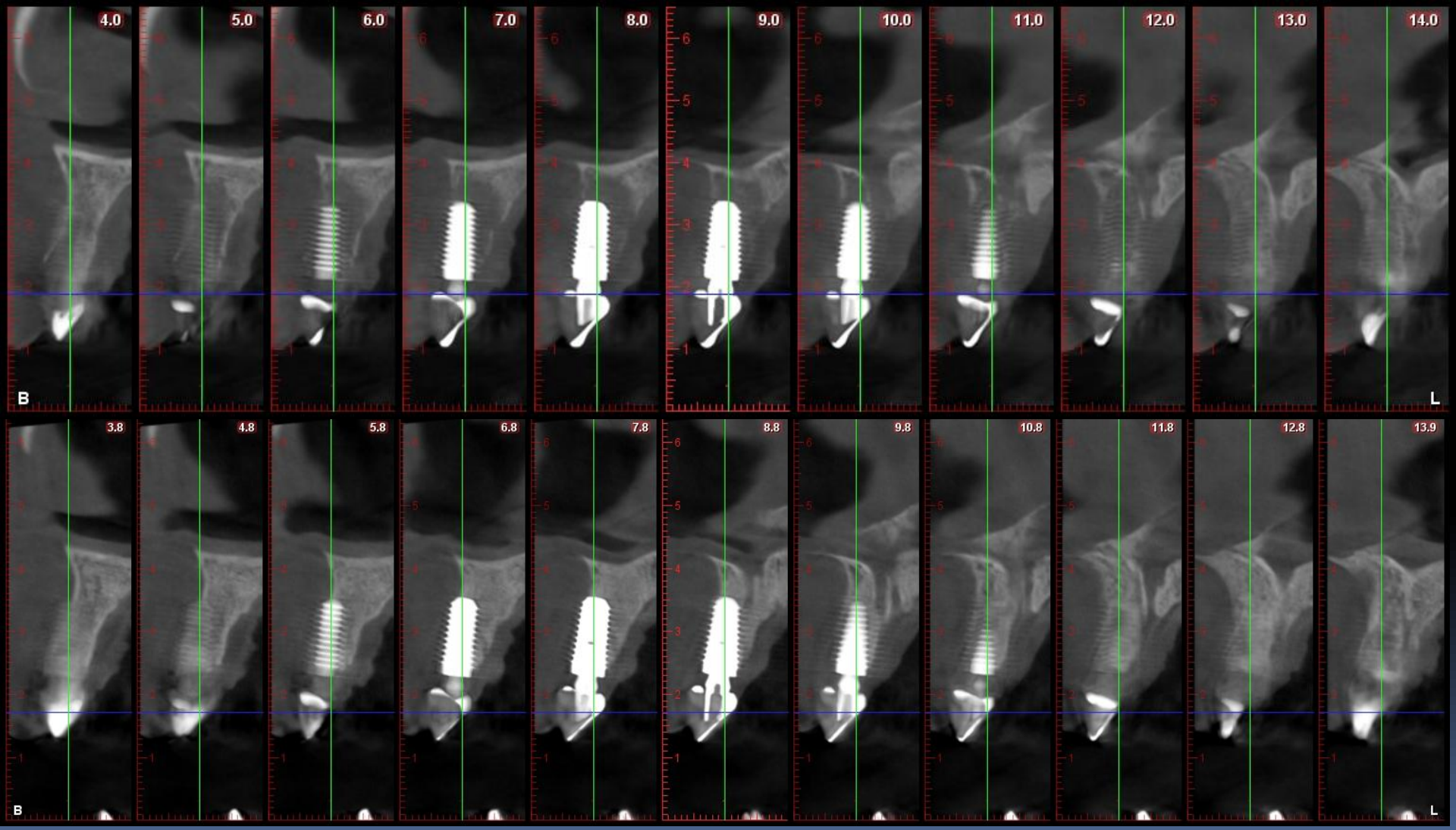


CBCT before & after 1 year





CBCT before & after 1 year



Clinical aspect after 2 years: Implant remained fully stable and functional. Healthy peri-implant tissue and harmonious esthetics.

Discussion:

This case demonstrates the **regenerative potential of dual-laser therapy** in managing advanced peri-implantitis non-surgically.

The Er,Cr:YSGG laser provided:
- Thorough decontamination of the implant surface without overheating;
- Precise removal of granulation tissue with minimal invasiveness;
- Creation of a sterile environment favorable for spontaneous bone regeneration.

The 940 nm diode laser (PBMT) complemented this by:
- Enhancing osteoblast and fibroblast activity;
- Promoting angiogenesis and collagen synthesis;
- Accelerating the healing process and improving bone metabolism.

Notably, **no grafting materials or membranes** were used. The complete bone regeneration observed radiographically supports the concept that, under optimal biological conditions, **laser-induced biostimulation alone** can trigger natural osteogenesis.

These findings are consistent with current literature emphasizing the **efficacy of lasers** in reducing bacterial load, removing contaminated surfaces, and promoting tissue regeneration in peri-implantitis cases.

Conclusions:

- This case underscores the remarkable regenerative potential of laser therapy, demonstrating successful outcomes even in severely compromised implants. Notably, no additional grafting or biomaterials were used—the regeneration was achieved entirely through the body's natural healing mechanisms facilitated by the laser.

- Dual-laser therapy (Er,Cr:YSGG + diode 940 nm) offers a **safe, minimally invasive, and biologically effective** alternative for treating severe peri-implantitis.

- **Bone regeneration** can occur naturally when decontamination and laser-induced biostimulation are combined, even without grafting materials.

- Long-term stability (24 months) confirmed **successful re-osseointegration** and absence of recurrence.

- The presented case illustrates how modern laser technology can **convert a hopeless implant** into a stable, functional, and esthetically integrated result.

- Laser-assisted regenerative therapy should be further investigated as a potential adjunctive approach in peri-implantitis management.

References:

The following publications provide scientific support for the biological mechanisms and clinical results observed in this case report:

1. Alpaslan NZ, et al. *Evaluation of the effect of Er,Cr:YSGG laser application on peri-implant crevicular fluid RANKL and OPG levels in the non-surgical treatment of peri-implantitis.* **Clin Oral Investig.** 2024.
2. Huang N, et al. *Effectiveness of non-surgical laser therapy for the management of peri-implantitis: a systematic review and meta-analysis.* **Int J Implant Dent.** 2024.
3. Hashim A, et al. *Comparison of the efficacy of Er,Cr:YSGG laser on oral biofilm removal from implant surfaces with various application times: an ex vivo study.* **BMC Oral Health.** 2024.
4. Chegeni E, et al. *Effects of Er,Cr:YSGG laser irradiation on titanium implant surfaces: morphological and physicochemical changes.* **Lasers Med Sci.** 2020.
5. Cosgarea R, et al. *Surface decontamination approaches for peri-implantitis management: a systematic review.* **J Clin Periodontol.** 2023.
6. Camolesi GCV, et al. *Photobiomodulation in dental implant stability and post-surgical healing: a randomized clinical trial.* **Clin Oral Implants Res.** 2023.
7. Torkzaban P, et al. *Effects of low-level laser therapy on the stability of dental implants: a randomized clinical trial.* **Photomed Laser Surg.** 2018.
8. Qu C, et al. *The effect of photobiomodulation therapy on dental implant osseointegration and healing: a systematic review.* **Photobiomodul Photomed Laser Surg.** 2022.
9. Saini RS, et al. *Evaluation of photobiomodulation therapy on osseointegration of dental implants: a clinical and radiographic study.* **J Lasers Med Sci.** 2024.
10. Romanos GE, et al. *Implant surface decontamination methods and their effect on surface integrity and wettability: a review.* **Clin Oral Investig.** 2024.

Thank you!