

New treatment protocol for periodontal pocket treatment

Combination of Er:YAG and Nd:YAG lasers

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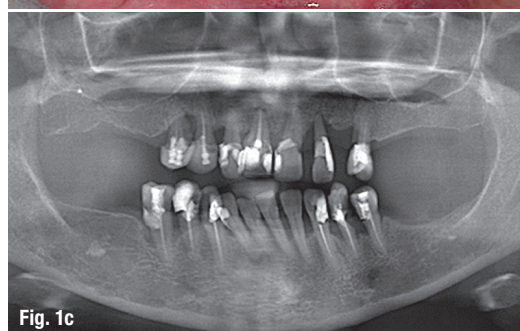
Periodontitis is the most common chronic inflammatory disease in adults of European populations. Eight out of ten over 35-year-olds suffer from some kind of gum complaint. It is associated with systemic diseases including type 2 diabetes, cardiovascular disease and stroke. Although they are so common, periodontal diseases are not very well acknowledged.^{1,2}

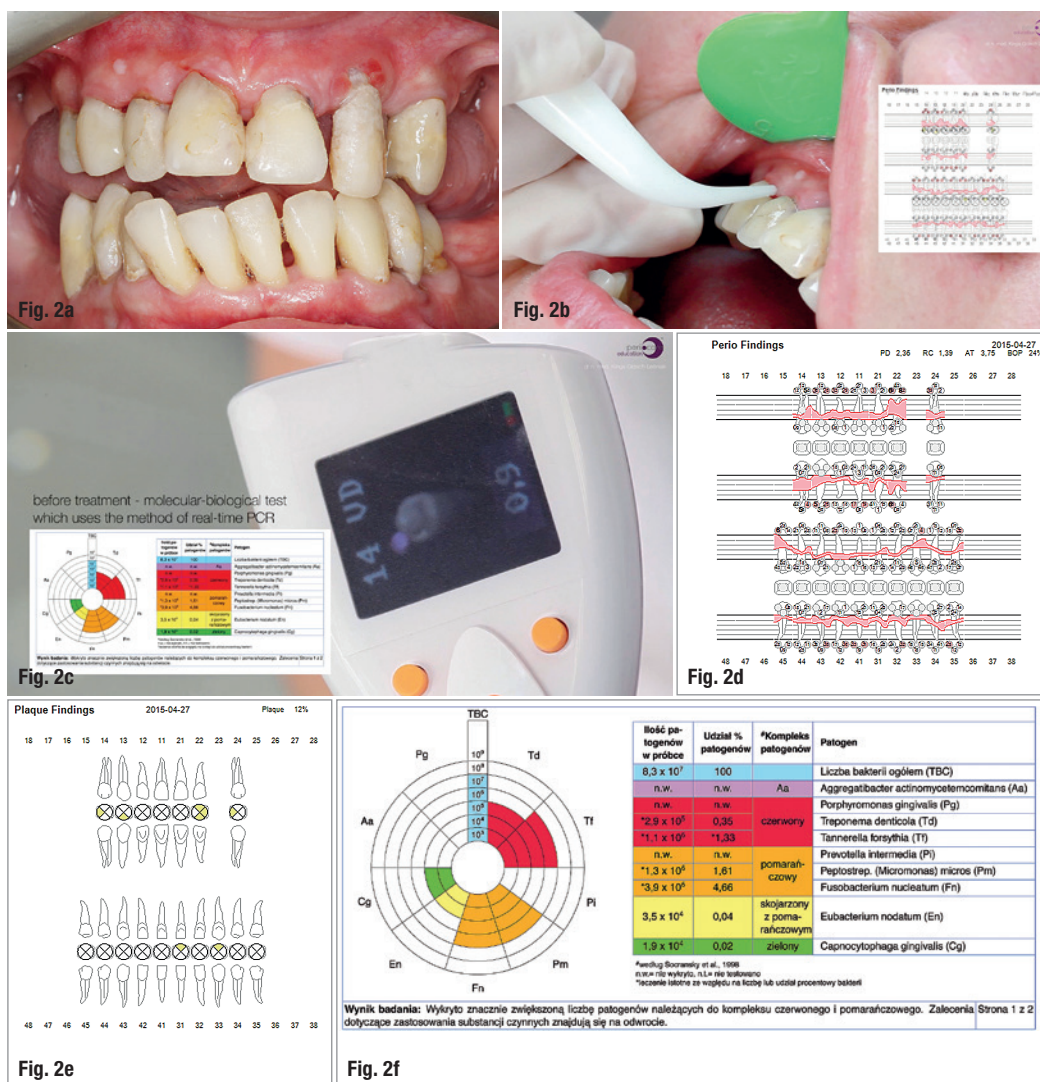
To date, mechanical therapy has been the general treatment for plaque-induced periodontal disease. A lot of studies have shown that mechanical treatment itself does not lead to a complete healing because it does not eliminate the periopathogenes.³

Laser therapy may constitute an efficient alternative to surgical treatment. Based on research, data and experience of many practitioners, we can enumerate potential advantages of laser therapy, such as bactericidal, detoxification and homeostatic effects and biostimulation. It is also easy to use, provides good access to anatomically difficult areas and makes a comfortable treatment for patients. Laser treatment provides for eradication of bacteria and better wound healing.^{4,5}

High-energy lasers are applied in periodontal procedures as adjunctive therapy or alternative conventional procedures have become standard treatment

Figs. 1a–d: **a)** initial state;
b) the situation of the gingival-tooth in the jaw;
c) orthopantomographic image;
d) the dental-gingival situation in the mandible.





Figs. 2a–f: **a)** Clinical improvement of the gum after hygienisation, reduction of swelling, bleeding and bacterial plaque; **b)** Clinical view of the periodontal treatment, electronic probe testing (pa-on, Orangedental); **c)** electronic probe, pa-on view and molecular-biological test; **d)** the result of pocket-depth probing (PD) and clinical attachment level (CAL), Bleeding on Probing (BOP), mean value of PD = 38; RC = 1.19; AT = 3.57; BOP = 33%; **e)** Plaque Index (PI), PI = 11%; **f)** baseline values of molecular-biological test (PET Plus test, MIP Pharma, Germany).

of periodontal pockets. Their effectiveness in eliminating periodontal pathogens and decreasing pocket depth is widely documented. Neodymium: Yttrium-Aluminum: Garnet (Nd:YAG) laser with a wavelength of 1,064 nm can decontaminate periodontal pocket without causing necrosis or carbonization of the underlying connective tissue.⁶ Periodontopathogens can persist within cells outside the pocket epithelium after mechanical conventional mechanical periodontal debridement, and Gianelli et al. reported that the Nd:YAG is capable of eradicating periodontopathogenic bacteria trapped within gingival epithelial cells.⁷

Erbium:YAG (Er:YAG) with a wavelength of 2,940 nm has been applied for effective elimination of granulation tissue, gingival melanin pigmentation and gingival discoloration. This laser is also used for contouring and cutting of bone with minimal damage and enhances healing.⁸ In addition, irradiation with the Er:YAG laser has a bactericidal effect with reduction of lipopolysaccharide, is efficient in calculus removal, with the effect limited to a very thin layer of the surface and is effective for implant maintenance.

A case report

A 47-year-old female patient was diagnosed with advanced generalised periodontal disease, numerous missing teeth, lack of prosthetic supplements in the posterior region, periapical lesions, and an incomplete endodontic treatment. The patient required a comprehensive dental treatment. To create a preliminary treatment plan, it is necessary to implement initial treatment (hygienisation) to check the patient's motivation to continue the highly specialised treatment and assess the prognosis of her teeth.

Detailed clinical examination should include, among others, data on the periodontal pocket depth (PD), bleeding on probing (BOP) and plaque index (PI). In the case of a significantly severe disease, high tooth mobility, numerous missing teeth, it is recommended to carry out a molecular-biological test to assess periopathogens quantitatively and qualitatively.

Before the treatment the patient underwent supragingival hygienic procedures done with ultra-

Figs. 3–7: Sterilisation of the periodontal pockets and decontamination.

Figs. 8–12: Removal of subgingival stone.

Figs. 13 & 14: Bleeding stop.

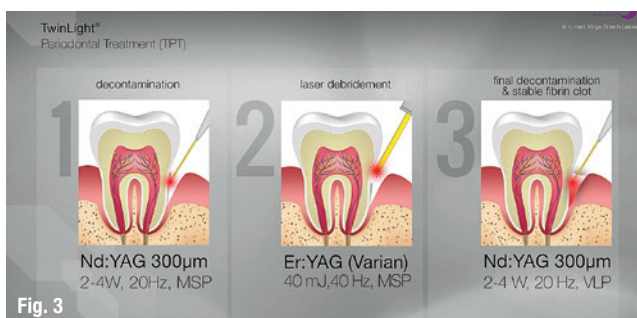


Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9



Fig. 10



Fig. 11



Fig. 12



Fig. 13



Fig. 14

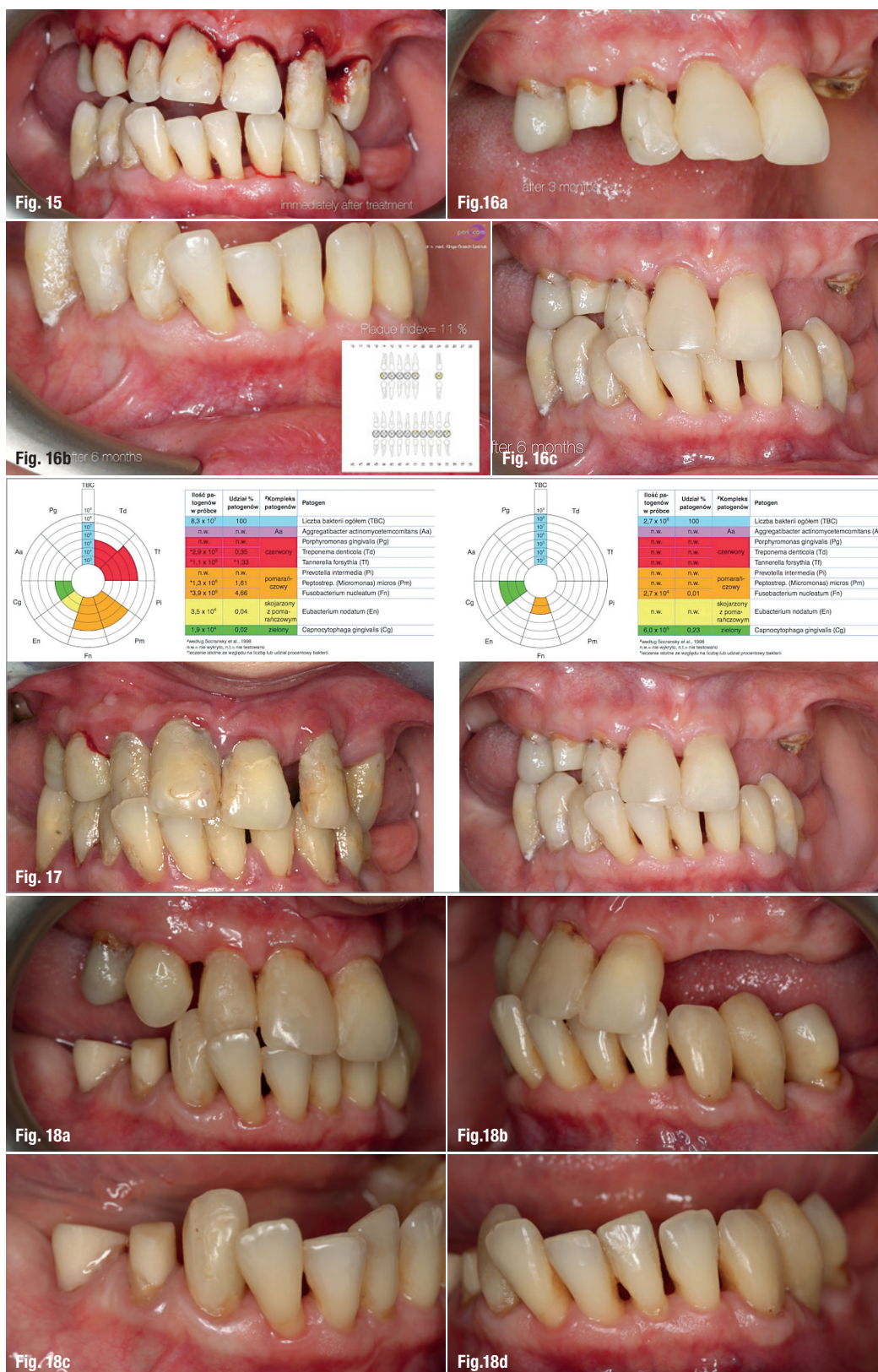


Fig. 15: Situation immediately after surgery, subgingival plaque removal and sterilisation of the periodontal pocket.

Figs. 16a–c: Clinical view during inspection after three and six months.

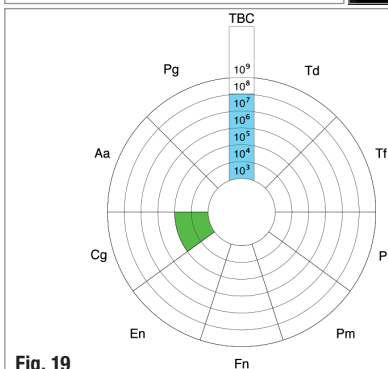
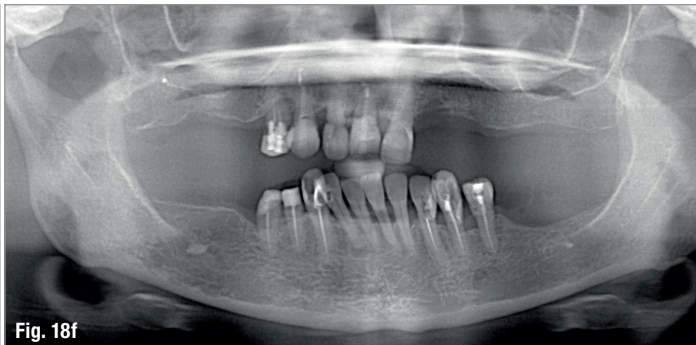
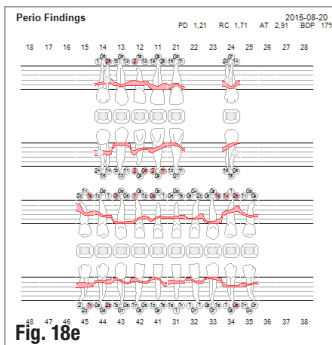
Fig. 17: Comparison of the clinical condition at microbiological/ molecular baseline and after six months.

Figs. 18a–f: Clinical situation after 16 months.

sound scaler (EMS, Piezon). After hygienisation, the clinical condition of the patient improved. Additional examination was carried out to determine the stage of the periodontal disease. Then, an Nd:YAG laser was applied for periodontal pocket sterilisation and decontamination (Figs. 3–7) and Er:YAG laser to re-

move subgingival calculus (Figs. 8–12). For final decontamination and stabilization of the fibrin clot, the Nd:YAG laser was applied again (Figs. 13 & 14). Figure 15 shows the situation immediately after surgery by Er:YAG and decontamination of the periodontal pocket by Nd:YAG (LightWalker, Fotona).

Fig. 19: Molecular-biological test results after 16 months (PET plus, MIP Pharma Germany)



Ilość a-togenów w próbce	Udział % patogenów	#Kompleks patogenów	Patogen
7,8 x 10 ⁷	100		Liczba bakterii ogółem (TBC)
n.w.	n.w.	Aa	Aggregatibacter actinomycetemcomitans (Aa)
n.w.	n.w.		Porphyromonas gingivalis (Pg)
n.w.	n.w.	czerwony	Treponema denticola (Td)
n.w.	n.w.		Tannerella forsythia (Tf)
n.w.	n.w.		Prevotella intermedia (Pi)
8,5 x 10 ²	0,00	pomarańczowy	Peptostrep. (Micromonas) micros (Pm)
6,7 x 10 ²	0,00		Fusobacterium nucleatum (Fn)
n.w.	n.w.	skojarzony z pomarańczowym	Eubacterium nodatum (En)
2,7 x 10 ⁴	0,03	zielony	Capnocytophaga gingivalis (Cg)

*według Socransky et al., 1998
n.w. = nie wykryto, n.t. = nie testowano
*liczenie istotne ze względu na liczbę lub udział procentowy bakterii

Summary

Er:YAG and Nd:YAG lasers have become the tool of choice in the treatment of periodontal diseases. They effectively reduce bleeding (BOP) and a pocket depth (PD) and are less time-consuming in comparison to conventional methods. Another advantage is the increased access of laser light to anatomically difficult areas compared to conventional hand tools, such as deep narrow pockets or furcations.

Lasers broaden the range of treatments offered in the dental office, increasing precision, enabling minimally-invasive treatments and better wound healing. The introduction of laser methods to the dental practice compels us to further learning, im-

proving professional qualifications and specialisation in the field. This in turn extends the range of non-surgical treatments of periodontal diseases.

Editorial note: A list of references is available from the publisher

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Kurz & bündig

Vorgestellt wird ein Fallbericht zur Anwendung des Er:YAG-Lasers in der Behandlung von Zahnfleischtaschen. Eine 47-jährige Patientin stellte sich in der Praxis der Autorin mit fortgeschrittener Parodontitis, einigen verlorenen Zähnen, mangelnder prothetischer Versorgung im Seitenzahnbereich, periapikalen Läsionen sowie einer unvollständigen endodontischen Behandlung vor. Sie wünschte sich eine umfassende Behandlung. Für die Erstellung eines ersten Behandlungsplans wurde mit einer gründlichen Prophylaxe begonnen, um eine exakte Prognose zu erhalten sowie Einblick über die Motivation der Patientin zu gelangen, sich konsequent auch komplexeren Behandlungen zu unterziehen. Weiterhin wurden Daten zur Taschentiefe, dem BOP-Index (Bleeding on Probing) und dem Umfang von Zahnbelag und Zahnstein (PI) erhoben. Auch die molekular-biologischen Eigenschaften des Biofilms wurden getestet, um die Parodontalkeime qualitativ und quantitativ ermessen zu können. Nach der laserbasierten Reinigung speziell der Taschentiefe zeigte sich eine deutliche Verbesserung der klinischen Situation der Patientin. Sowohl Nd:YAG-Laser als auch Er:YAG-Laser kamen zum Einsatz. Die Autorin zeigt sich überzeugt, dass der Einsatz von Dentallasern in schweren Fällen, wie dem hier vorgestellten, das mögliche Behandlungsspektrum sowie den Patientenkomfort erweitert.