

Oral Presentation

OP1

A rare case of choristoma CO2 Laser excised.

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Choristomas of the oral cavity are uncommon lesions that show a variety of clinical presentations, histological appearances and growth patterns. Choristomas are defined as an overgrowth (non neoplastic tumour mass) of normal tissue in an abnormal location. This clinical report describes the morphologic features of a rare case of choristoma arising in the palate, CO2 laser excised. Clinical appearances: the lesion (20 x 5 mm), located at the limit of the right gloss-palatal arch, showed soft consistence and strong adherence to the tissue, local anaesthesia was done before the laser CO2 was used at the following parameters : SP mode, output power: 2 W, focus mode, spot diameter: 2 mm. The time needed for surgery was about 5 minutes and a precise excision allowed histological findings that confirm the choristoma diagnosis (Fordyce's granules).

There was no need for suturing. A minimal post-operative oedema was observed and healing was obtained in healing in 10 days. Among heterotopic oral pathologies, in the English language literature (medline / pubmed, key words: choristoma, laser), in exception of one case of heterotopic gland cyst of the oral cavity plus some heterotopias of thyroid tissue, all lesions CO2 treated, this clinical report could be the first to be discussed.

OP2

Surgical laser (ER-YAG):Exeresis of jaw-cists.

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The objective of this project is to evaluate whether the use of the laser is complementary or a substitute for normal, standard surgery's procedures.

Using the laser's font Erbium - Yag (KaVo Laser III) with different Parameters we proceeded first with the ablation of soft tissues with

10 Hz 200 mJ (Power density=113.23 W/Cm2 Fluence=11.32 J/Cm2) and afterwards with creation of a bone window with 15Hz and 250mJ (Power density=212.31 W/cm2 Fluence=14.15 J/Cm2). Enucleating the cists by following parameters: frequency of 10 Hz and energy of 200 mJ (power density: 113.23 W/Cm2 - Fluence: 11.32 J/Cm2), unlike for the apicoectomy of distal root of the molar this parameters: frequency of 15 Hz and energy of 250 mJ. (power density: 212.31 W/Cm2 - Fluence: 14.15 J/Cm2) Welding of soft tissues using a setting of 10 Hz and 120mJ (power density: 67.94 w/Cm2 - Fluence: 6.79J/Cm2).

The whole operation done in presence of water and in continuous contact for the soft tissues with a focus of approximately 12mm; for hard tissues always with a spot-diameter of 1.5 mm.

This was done in order to realize an exeresis of a big mandibular cists, with a consequently sterilisation of the site.

The results were satisfying for operation's timing and for fast recovery accomplished with a minimal loss of cortical's bone.

Statistically significant the postoperative course.

It appears clear from this research how new techniques can be introduced in ambulatory's surgery, exploiting the laser's technology.

OP3

Long term follow-up of vascular lesion treatment results with Nd-YAG laser in oral cavity.

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ND-YAG laser has been used to treat various vascular lesions, which have high recurrence tendency. This report discusses the long term efficacy of treating lymphangioma and hemangioma of the oral cavity with the Nd-YAG laser. A search of the literature does not reveal any reports of the Nd-YAG laser being used to treat lymphangioma. Case 1 was a 6 years old girl who had a recurrent lymphangioma electrocautery application. Patient was treated with Nd-YAG laser and presented no recurrence after ten-years follow-up. Case 2 was a 12-years-old girl with a capillary hemangioma of the upper lip and gingiva. She was also treated with Nd-YAG laser and showed no recurrence at 5th-year follow-up. We can conclude that photocoagulation with Nd-YAG laser

can treat vascular lesions of oral cavity. Since penetration effect of Nd-YAG laser is higher than CO2 laser, deeper parts of vascular lesions can be easily coagulated and recurrence rate can be decreased.

OP4

Apical Surgical Lasertherapy.

Ortega, J.J.; Vilaplana, C.; Vilaplana, J.; Brotons, P.

Los tratamientos quirúrgicos utilizados en diversos procesos bucales son valorados de forma negativa por los pacientes no sólo por la naturaleza traumática del procedimiento sino también por las molestias que son de esperar en los días posteriores al mismo. La aparición de la tecnología láser ha supuesto un cambio radical en los tratamientos de multitud de especialidades médicas, siendo la cirugía bucal una de las grandes beneficiadas. El láser constituye una alternativa terapéutica válida en todos aquellos casos donde es necesario realizar un tratamiento quirúrgico periapical como complemento a la endodoncia. El objeto de esta comunicación es la presentación de diversos casos de cirugía periapical en dientes uni y multiradiculares utilizando el láser de Er:Yag como ejemplo de los beneficios que esta técnica puede aportar a los tratamientos quirúrgicos bucales.

OP5

Application of lasers for bone augmentation.

Tsuda, T.; Takahashi, T.

Objective: In the recent implant procedures, bone augmentation is widely recognized as an essential means for extension of susceptibility of dental implants. Among many methods of bone augmentation, distraction as a new method having multiple merits is currently paid a lot of attention due to development of regenerative medical treatment. However, there are such drawbacks that the noise at the time of osteotomy may cause a strong stress and approaches may be difficult in the case of distraction of small areas and in the molar area. At this time, we attempted to supplement such deficiency by utilizing lasers for drilling holes and bone cutting. Method: We used a Er,Cr:YSGG laser, with G6 tip at 1.0W, Air 10%, and Water 15% for incision of gingival tissue and at 3.0W, Air 40% for osteotomy. Result: Incision and osteotomy by the laser took more time than a bone saw but the post-

operative progress was observed excellent. Conclusion: We implemented bone distraction of the both sides of mandible using a laser. The laser device provides better approach into the oral cavity and the postoperative progress is outstanding.

OP6

Clinical evidences on peri-implantitis prevention and treatment by using different laser wavelengths.

Martelli, F.S.; Gonçalves, F.; Baldini, A.; Caccianiga, G;- Baldoni, M..

The international literature has shown many treatment possibilities for the periimplantitis. Nevertheless the success rate presented in all these studies are about 40%, what is not acceptable for setting any statement on the peri implantitis treatment.

The main difficulty for the treatment modalities is providing the implant surface decontamination.

In this study the author present a treatment and prevention protocols for the periimplantitis in its different forms by using the Nd:YAG laser (1064nm), CO2 laser (10600nm) and the diode laser (980nm) on low power settings (0,8 - 1,0watt), based on long term clinical follow up, in vitro studies and the literature findings.

OP7

The use of laser for the treatment of peri-implantitis.

Gonçalves, F.; Zanetti, R.V.; Elias C.N.; Granjeiro, J.M.; Martelli, F.S..

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The study aims to present the possibility of the peri-implantitis treatment by using several laser wave lengths and power settings according to literature review , scientific researches done by the authors in vitro and clinical findings. One of researches in vitro compares the effects of the irradiation of 4 laser wave lengths (CO2-10600 nm; Nd:YAG 1064 nm;Er:YAG-2940nm; Diode 980 nm) with different power settings, on three titanium discs types with different surface treatments under SEM examination. Osteoblastic cells were seed on the irradiated discs areas for studying their different behavior . Another one, focused the bac-

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tericidal efficacy of diode laser 980 nm in different power settings, on different implant surfaces contaminated with *P. gingivalis* and *E. faecalis*. Clinical cases follow up will be presented illustrating the therapy proposed.

OP8

Histologic evaluation of thermal damage produced on soft tissues by CO₂ Er, Cr:YSGG and diode lasers.

Arnabat, D.J.; Espanã Tost, A.; Ibarguren, I.C.; Aytés, L.B.; Escoda, C.G.

The aim of this in vitro experimental study was to perform a histological evaluation of the thermal effect produced on soft tissue irradiated with CO₂, Er,Cr:YSGG and diode lasers. Porcine oral mucosa samples were used, and they were irradiated with Er,Cr:YSGG laser at 1 W with and without water / air spray, at 2 W with and without water / air spray, and at 4 W, with CO₂ laser at 1 W, 2 W, 10 W, 20 W continuous mode and 20 W gate mode and diode laser at 2W, 5W, and 10W continuous mode. The thermal effect was evaluated measuring the width of damaged tissue adjacent to the incision, stained positively for hyalinized tissue. Results disclose that studied lasers develop a wide range of thermal damage, and that there are significant differences between groups, where the group with lower thermal effect was Er,Cr:YSGG laser when using with water / air spray, followed by CO₂ and diode lasers. Emission parameters of each laser system may influence the thermal damage produced in the soft tissue, but wave length of each laser will determine the absorption rate characteristics of every tissue and so its thermal effect.

OP9

SEM observation of composite restorations after Er:YAG vs Bur cavities preparation

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The aim of this study was to evaluate the microleakage between dental hard tissues and a composite resin after Er:YAG cavity preparation (class V) as compared with conventional methods (bur).

Fifteen human molars were selected. Four cavities were prepared on each sample (M, D, V, L) using the following parameters:

- Gp1 (vestibular): bur preparation + acid etching
- Gp2 (mesial): Er:YAG preparation (600 mJ, 6 Hz, 3. W, focus 12mm, fluence 33.97 J/cm²)
- Gp3 (lingual): bur preparation + acid etching + Er:YAG (etching technique : 100 mJ, 5 Hz, 0.5 W, focus 12mm., fluence 5.66 J/cm²)
- Gp4 (distal): Er:YAG preparation + acid etching (600 mJ, 6 Hz, 3.6 W, focus 12mm, fluence 33.97 J/cm²)

All cavities were filled with the composite resin Aelite TM LS Bisco following the manufacturer's instructions. Samples were then prepared for SEM examination.

The results have been analyzed with U-test of Mann-Whitney.

The best results have been observed using Er-yag cavity preparation plus total etching (statistical mean range $p < 0.05$).

OP10

An Interferometric study of Er-YAG Laser dentine ablation.

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The aim of this study was to evaluate the amount of dentine photo-ablated that depends on two main parameters (focal distance and energy delivered).

Crowns of nine freshly extracted human third molars were embedded in epoxide resin, sliced (Isomet, Buehler) and polished (Dap U technology) to obtain two dentine smooth surfaces. An Er-YAG non contact laser handpiece (Kavo Key II) was placed in a gauge and two output parameters were used (250 mJ, 400 mJ) at six different focal distances (6,9,12,15,18,21 mm). Six shots were delivered on each surface (1 Hz each) and the samples were prepared for interferometric observation and calculation (Wyko 1100, vertical resolution 1 Å°, lateral resolution 0.5 μm).

Results showed volumes of ablation (250 mJ) ranging from 6.87 x 10⁶ μm³ (6 mm) to 1.62 x 10⁷ μm³ (15 mm). With an output power of 400 mJ, volumes ranged from 8.2 x 10⁶ μm³ (21 mm) to 2.83 x 10⁷ μm³ (15 mm).

The best results on human dentine were observed when focal distance was 15 mm whatever the energy delivered.

OP11

Ultra-short laser pulses in Dentistry - a critical overview.

Wintner, E. ; Strassl, M..

In the last years ultra short laser pulses have proved their potential for application in medical tissue treatment in many ways. In hard tissue ablation their aptitude of material ablation with negligible collateral damage brings many advantages. Especially teeth as an anatomically and physiologically very special region with less blood circulation and lower healing rates than other tissues require most careful treatment. Hence, overheating of the pulp and induction of microcracks are some of the most problematic issues in dental preparation.

Up to now it was shown by many authors that the application of picosecond or femtosecond pulses allows to perform an ablation with very low damaging potential also fitting to the physiological requirements. Beside the short interaction time with the irradiated matter, scanning of the ultra short pulses turned out to be crucial for ablating cavities in the required quality. One reason for this can be seen in the instance that during scanning the time period between two pulses falling repetitively on the same spot is so long that no accumulation effects occur and each pulse can be taken as a first one.

So, on the one hand, scanning is important in dental hard tissue ablation to achieve a good preparation quality with low collateral damage. On the other hand it is necessary to treat larger areas than just the focal spot, as the dentist mostly must work in a free-hand mode thus needing a larger area to be treated at once to smooth the action tremor of his own hand. Additional it is necessary to give him a tool that ablates in dimensions that he is used to work with.

In our talk we present the actual results of our investigations on optimizing scanning patterns with the aim of creating a constant irradiation of the scanned area by using all the delivered spots (i.e. no masking of unfavourable intensity distributions) to achieve the most efficient use of the delivered laser power.

OP12

Er: YAG Laser and Adhesive Dentistry: A clinical approach

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The aim of this study was to evaluate the ability of Er:YAG laser (2940 nm) to ablate carious tissues and prepare the enamel/dentin surfaces before bonding composite resins. Our laboratory previous studies showed that the enamel surface morphology after Er:YAG laser irradiation was indiscriminate (type III of the Silverstone classification). When acid etching was applied, type I was preferentially observed (erosion of the core of the prisms). Moreover, Er:YAG laser treated dentin showed absence of debris and smear layer, opened dentinal tubules and a rough surface. When acid etching was applied, it allowed hybridization and very large and deep resin tags. In this study, five clinical cases are demonstrating the ability of Er:YAG laser (Fotona Fidelis Plus) to treat first, second, third, fourth and fifth class restorations. A particular VSP mode (100µs) was used with non-contact (mirror) as well as contact mode (sapphire tip). Discussion regards the advantages of this technical approach.

OP13

A morphologic analysis of Er-YAG prepared cavities in primary teeth: An in vitro study.

Baldini, A.; Caccianiga, G.; Baldoni, M.; Tredici, G.; Martelli, F.S.; Piras, V..

Aim: to investigate the microscopy morphology (SEM) of cavity surfaces in primary teeth, prepared with Er-Yag laser (deka)irradiation, compared with the conventional bur cavities. Materials and methods: A total of 20 extracted human primary teeth with no carious lesions are used in this study, in half of teeth using Er-YAG laser system, and in the other half a high speed turbine. All the cavities are bisected (only bur cavities are etched) and, dried with infrared light and observed by scanning electron microscopy Results: Cavity surfaces prepared with high speed turbine reveal a flat aspect and are almost covered with smear layer. After acid etching, the smear layer is completely removed and dentinal tubules are clearly visible. Surfaces treated with Er-Yag laser

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reveal a rough and irregular aspect; dentin surface is characterized by an absence of a smear layer, orifices of dentin tubules are exposed. Er-Yag obtains a surface roughness comparable with that of acid etching and might perform a greater adhesion force and a reduction of marginal micro-leakage.

OP14

Pit and Fissure sealants and Er:YAG laser.

Lupi-Pégurier,L.; Bertrand, M. F.; Muller-Bolla ,M.; Rocca, J.P..

LASIO Université de Nice Sophia Antipolis (France).

Objectives: To study the preparation of pit and fissures with Er:YAG laser prior to sealing with a resin-based sealant. **Methods:** 90 sound extracted molars were cleaned. The fissures in the mesial halves were prepared with laser Er:YAG (Kavo Key III TM 250 mJ/pulse, 4 Hz) and etched. Then they were randomly assigned to three groups and the fissures in the distal halves were prepared differently according to the group: etching, bur and etching or laser alone. The sealant was applied on all teeth according to the manufacturer's recommendations. The teeth were thermocycled prior to staining with methylene blue. The samples were embedded into resin and sectioned. The extent of microleakage and the sealant penetration were measured with a digital-image analyzer. SEM observations were conducted on 6 teeth to study the lased enamel, to reveal the resin tags on the sealant material and to visualize the interface. **Results:** The sealants prepared with the Er:YAG laser alone displayed a significantly greater microleakage than the others. They also showed the highest means of microleakage: 0.63 ± 0.60 mm (acid) versus 0.15 ± 0.34 (laser+acid), 0.17 ± 0.48 (bur+acid), 0.12 ± 0.41 ($p < 0.05$). The penetration of the sealant in the fissures was comparable whatever the enamel surface preparation used before applying the sealant.

OP15

Ablation efficacy of Er:YAG laser on human dentin.

Lan, W.-H. ; Lin ,P.-Y..

The purpose of this study was to investigate the ablation efficacy of Er: YAG laser on human dentin. Twenty five dentin specimens were used. After being ground, dentin surface was divided into

four areas and were randomly divided into nine groups for subsequent different parameters of laser irradiation. Group one to nine were irradiated by Er: YAG laser from 100 mJx10pps to 500 mJ 10pps. The laser handpiece was mounted to make the tip perpendicular and 1 mm away from the dentinal surface. The specimens were subjected to laser treatment for 10 seconds, and then were examined by scanning electron microscope. On laser-treated dentin, flaky, scaly, and rough surfaces were seen. The surfaces were clean with several morphological reliefs, which indicated Er: YAG laser could selectively ablate the dentin structures. Crack lines and charring were shown on the samples of pulse energy over 350 mJ groups. The results revealed the harmful effect on the dentin surface under higher pulse energy. In conclusion, the most appropriate energy parameter of Er: YAG laser with water spray is 300mJx10pps for ablating dentin.

OP16

Application of DIAGNOdent as a guide of removing carious dentin with Er:YAG Laser.

Eguro, T.; Yonemoto,K.; Maeda, T.; Ogawa, M.; Nara, Y.; Katsuumi, I.

The purpose of this study was to examine the DIAGNOdent value as a guide for carious dentin removal using the Er:YAG laser. The carious tooth substances of human extracted molars were removed using an Er:YAG laser unit with a 80°curved tip (DELight, HOYA ConBio). The irradiation according to the DIAGNOdent value (D) was carried out, and four groups of cavity floor, Gr.1:30?D?20, Gr.2:20?D?10, Gr.3:10?D, were prepared. As a control, a group prepared by round bur with Caries Detector® was established. The cavity floors were examined using microradiograms, EPMA and SEM. The cavity floor of Gr.1 had the increased radiolucent parts that showed the decrease of Ca-P. In Gr.2, Gr.3 and control group, increase of radiolucency and decrease of Ca-P were not observed on the cavity floor. The decrease of Mg was observed on the more superficial part of the cavity floor for Gr.3 than for Gr.2. From the SEM observation, the peri-tubuler dentin of Gr.3 was more ablated than inner-tubuler dentin. It was concluded that the DIAGNOdent values between 20 to 10 could be a guide for carious dentin removal using Er:YAG laser.

OP17**Morphological aspects of laserfluorescence-effects in dental caries.**

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To detect initial caries lesions, laser fluorescence probes with an excitation wavelength of 655 nm were developed to support clinical diagnosis of occlusal decay. In the recent study the intensity of the fluorescence signals detected by the DIAGNOdent® device should be correlated to the different zones of decay to identify the origin location of the fluorescence.

Freshly extracted teeth (n=20) with initial lesions were separated longitudinally and fixed on an optical bench including a 3D-manipulator. The area of interest of the samples (caries lesion and the surrounding sound tissues) were systematically scanned in steps of 0.25 mm in enamel and dentin recording the DIAGNOdent® values (KaVo, Biberach, Germany). The measuring points were correlated to the different caries zones.

In enamel the highest values were recorded in the zone of cavitation followed by the "dark zone." In dentin the maximum values were measured in the center of the lesion. In the perpendicular zones the values decreased. No significant differences could be found comparing sound dentin and enamel.

The fluorescence effects could be correlated to the active zones of the caries lesions. These findings support the validity of this detecting system according to clinical relevance.

OP18**Heat generated by Er:YAG laser in the pulp chamber of teeth submitted to removal of dental tissue and composite resin.**

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The knowledge about and control of thermal energy produced by Er:YAG laser after irradiating hard dental tissues and compound resin is important because the pulp, like all vital biological tissue, has a certain capacity for supporting stimulus. The objective of

this study was to analyze the thermal variation generated by Er:YAG laser (?= 2.94µm) during the preparation of a Class I cavity in the dental structure and in the removal of microhybrid Z100® (3M) compound resin. An evaluation was made of 30 maxillary human pre-molar teeth from the bank of the Endodontic Laboratory Center of Ribeirão Preto Dental School, Brasil. The sample was divided into 6 groups of 5 teeth each: Group 1, preparation of Class I cavity with Er:YAG laser (350mJ, 3Hz, 343 impulses, 120J, 113 seconds); Group 2, preparation of Class I cavity with Er:YAG laser (350mJ, 4Hz, 343 impulses, 120J, 81 seconds); Group 3, preparation of Class I cavity with Er:YAG laser (350mJ, 6Hz, 343 impulses, 120J, 58 seconds); Group 4, removal of compound resin from Class I preparation with Er:YAG laser (350mJ, 3Hz, 258 impulses, 90J, 85 seconds); Group 5, removal of compound resin from Class I preparation with Er:YAG laser (350mJ, 4Hz, 258 impulses, 90J, 67 seconds); Group 6, removal of compound resin from Class I preparation with Er:YAG laser (350mJ, 6Hz, 258 impulses, 90J, 42 seconds). The laser used was KaVo Key 2 (Biberach, Germany), ? = 2,94µm, P = 3 Watts, pulse duration of 250µs, with air-water cooling. The increase in temperature during dental preparation and the removal of the compound resin was evaluated by means of a Tektronix DMM916 Thermocouple (Consitec, Brasil). The results showed that the application of laser for the removal of the hard dental tissues and for the removal of compound resins with the pulse frequencies 3, 4 and 6Hz did not generate heating greater than 3.1°C and remained within the histopathological limits permitted for pulp tissue (5.5°C) and there was a significant statistical difference between the heat generated by the application of laser in the removal of the hard dental tissues and in the removal of compound resins (p < 0.01). The average increase in temperature of the compound resin component was greater than the tooth.

OP19**Detection of subgingival calculus on the root surface using IR-laser fluorescence.**

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The aim of the study was to investigate IR-laser-fluorescence effects on the root surface to detect subgingival calculus of peri-

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dontally involved teeth.

The sensitivity and specificity of measurements indicating residual calculus should be calculated.

Twenty freshly extracted teeth, partially covered with calculus, were fixed in an artificial root socket. The root surfaces were scanned with a DIAGNOdent® unit (655 nm, < 1 mW) using a newly developed periodontal tip.

Measurement of the root surface were carried out at the mesial, buccal, distal and oral site of each root in 1 mm increments scanning 3 line/ site.

The laser fluorescence signals were correlated to the clinical findings recorded outside of the socket.

The sensitivity of a site specific evaluation (n = 240) was 78 %; the specificity 80 %; the positive predicting value 84 %; the negative predicting value 72 %.

Regarding the 1 mm increment measurements (n = 7320) the specificity increased to 96%.

These results significantly exceeded conventional sounding techniques.

The laser probe offers the possibility of subgingival calculus detection and may therefore be suited to determine the end points of root surface instrumentation during non surgical periodontal therapy.

OP20

Diode Laser Active Bleaching.

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The patients awareness of options available in changing the color of natural dentition has created an increase in public demand. The bleaching corrects or improves the color of teeth, and it is also the least expensive esthetic treatment option. Bleaching techniques involve a broad spectrum approach utilizing hydrogen peroxide (3- 38 %) with or without heat or laser, carbamide peroxide (10-30 %), or mixture of sodium perborate and hydrogen peroxide. The contribution describes the experience with laser-activated (infra red diode laser, wavelength 790 nm; power 40 mW, and eight light emission diodes, wavelength 467 nm P = 4 000 milicandelas each (Kondortech, Sao Carlos, Br) and diode laser, wavelength 970 nm, (university prototype) power 40

mW) bleaching agent (Ultradent Opalescence X Extra Boost) for discolored teeth. The objective of laser bleaching is to achieve the ultimate power bleaching process using the most efficient energy source, while avoiding any adverse effect. The selective diode laser radiation can decrease the time of bleaching without the surface modification.

OP21

Shear bond strength of composite resin bonded to Er:YAG laser-prepared dentin using self-etching adhesive systems.

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This study was conducted to determine the shear bond strengths to Er:YAG laser prepared dentin of three self-etching adhesive systems (Clearfil SE Bond™, Xeno III™, iBond™). The occlusal surfaces of 120 freshly extracted human third molars were ground flat to expose middle dentin. The teeth were randomly assigned to 2 groups. In group 1, the exposed dentin was prepared using a carbide bur at high-speed (H1.204.014, Komet). In group 2, the dentin was Er:YAG laser irradiated (Kavo Key 3™) at 350mJ/pulse and 10Hz (fluence: 63.7J/cm²). In each group, cylinders of Spectrum TPH™ composite were bonded to 20 surfaces prepared with bur and 20 surfaces prepared with Er:YAG laser for each self-etching adhesive systems. After 24h in water, specimens were sheared in an Erichsen Testing Machine. The debonded surfaces were observed under scanning electron microscopy. The data were analyzed using Mann-Whitney U-test and Fisher exact test.

Results:

Clearfil SE Bond™		Xeno III™		iBond™	
Bur	Er:YAG laser	Bur	Er:YAG laser	Bur	Er:YAG laser
13.87±5.25	9.63±3.28	9.76±3.49	8.92±2.96	9.37±3.49	6.44±2.28
p=0.006		p=0.519		p=0.002	

In regard of low bond strengths to dentin, the use of self-etching adhesive systems could not be recommended to bond composite resin to Er:YAG laser-prepared cavities.

OP22**Treatment of cervical dentin abrasion hypersensitivity by diode laser and glass ionomer cement.**

Liu, H.-C.; Lan, W.-H..

The aim of this study was to evaluate the effectiveness of Diode laser combined with glass ionomer cement in the treatment of cervical dentin abrasion hypersensitivity. Sixty medically healthy patients with 120 cervical dentin abrasion hypersensitive teeth were included in this study. All patients had at least one cervical dentin abrasion hypersensitive teeth in either upper or lower arch. Through a randomized double-blind placebo controlled trial, Group A was treated by Diode laser. Group B was treated by glass ionomer cement. Group C was treated by Diode laser combined with glass ionomer cement. Group D received no treatment as a control. The energy output of Diode laser was 1 W at 20 pulse/second for 2 min. The result indicated that Diode laser and glass ionomer cement can reduce the cervical dentin abrasion hypersensitivity by 63% and 72% respectively. The effectiveness of Diode laser combined with glass ionomer cement in the treatment of cervical dentin abrasion hypersensitivity is 93% with a statistically significant difference ($p < 0.01$). No adverse events were observed in any cases. Conclusion: Diode laser combined with glass ionomer cement is a useful method in the treatment of dentin hypersensitivity.

OP23**What are the main parameters that control the quality of laser welding for dental devices?**

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The success of laser welding procedures in dental materials depends on the operator control of many physical parameters. The aim of this study is to evaluate factors relating to the operator's skill and the choice of welding parameters (power, pulse duration, energy) recognized as determinants of weld quality. FeNiCr dental drawn wires were chosen because their properties are well known. Different diameters of wires were laser welded, then tested in tension and compared to the control material as

extruded, in order to evaluate the quality of the welding. SEM of the fractured zone and micrograph observations perpendicular and parallel to the wire axis were conducted in order to evaluate the depth penetration and the microstructural changes. Micro-hardness (Vickers type) was measured both in the welded and heat affected zones and then compared to the non-welded alloy.

A classification of welding parameters with adequate combination of energy and pulse duration with a power set of 1kW has been performed for that kind of material and this type of pulsed Nd:YAG laser. Operator skill is also an important variable.

The variation in laser weld quality in dental FeNiCr wires attributed to operator dexterity can be minimized by optimization of the physical parameters.

OP24**Results of antibacterial effects of Nd-YAG laser in laboratory. Modal and clinical application.**

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Objective: Laser is its bactericidal effect which reduces the risk of postoperative infections. By means of this effect, laser can be an alternative to the antibacterial and antiseptic agent regime postoperatively. Study Design: To determine and investigate the bactericidal effect of laser in an original model, a hemolytic streptococcus, *Bacteriodes fragilis*, *neisseriaceae*, *Streptococcus salivarius*, *Staphylococcus aureus* and *Candida albicans* were prepared in 104, 106, and 108, inoculum and placed in Muller Hinton Broth which have 5 different proportions of sheep blood. Samples exposed with various energy levels of Nd-YAG laser were spread on agar plates and at the end of an incubation time colonization counted comparatively. Our clinical study covered 40 patients, who were treated with conventional surgery and with Nd-YAG laser for soft tissue pathologies (20/20). Microbial samples obtained from surgical site were compared preoperatively and postoperatively. Results: Nd-Yag laser's bactericidal effect has been directly related to the amount of microorganisms and hemoglobin concentrations in the broth. There was not colonization on immediate postoperative samples in all patients treated with Nd-YAG laser. Conclusion: This study suggests that the Nd-

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YAG laser has a high bactericidal potential and this is an advantage for laser surgery when compared with conventional in some of the oral pathologies.

OP25

Long term clinical evaluation of laser gingivoplasty with Er:YAG laser for esthetic purpose.

Nagai, S.

Purpose of this study is to evaluate long term efficacy of Er:YAG laser used in gingivoplasty for esthetic purpose. Patients carefully selected by various diagnostic tests such as medical and dental history, intra and extraoral examination, lip line, smile line, study model, x-ray, periodontal chart, and bone sounding had healthy gum. Selected patients needed gingivoplasty only for the reason of esthetic improvement. Gum line were corrected and facial bone were abraded with Er:YAG laser [HOYA Combio] under local anesthesia to gain biolengthwidth. Patients had no concern during surgery. All parameters were charted. Short and long term evaluation were conducted and gingivoplasty using Er:YAG laser were proved to be very effective.

OP26

The efficacy of laser in Periodontology: Microbiological analysis.

Caccianiga, G.; Baldini, A.; Baldoni, M.; Tredici, G.; Martelli, F.S.; Piras, V.

Aim: to evaluate the effectiveness of laser application in periodontal therapy by a microbiological molecular method. Methods: to verify the bactericidal ability of Nd:Yag laser therapy. we use a molecular methodology to identify microbiological findings: PCR Real-Time method, which has a high specificity in a plaque sample (sensitivity=10 cells). We also recorded clinical periodontal index (GI, CAL, PPD). The microbiological and clinical findings are recorded before the therapy and after 6 weeks. We selected 10 patients and we compared the clinical and the microbiological efficiency of scaling and root planning by itself compared with periodontal debridement and laser irradiation with antiseptic substances (10 vol H₂O₂). Results: we identify the bacterial and the clinical modifications and the best results are showed by ultrasonic debridement and laser irradiation with antiseptic irri-

gation protocol. Conclusions: the laser therapy with subgingival ultrasonic debridement and antiseptic substance work together with an antiseptic and biostimulation action and this action have a considerable importance in periodontal therapy.

OP27

Use of Er:YAG laser and surgical microscope for gingival metal tattoo removal.

Aoki, A.; Ishii, S.; Mizutani, K.; Takasaki, A.A.; Watanabe, H.; Ishikawa, I.

Division of Periodontology, Department of Hard Tissue Engineering, Graduate School, Yokyo Medical and Dental University, Tokyo, Japan.

Ablation effect of the Er:YAG laser with minimal thermal damage is advantageous for esthetic surgery of periodontal soft tissues. Four patients presented with dark-colored gingiva containing foreign metal, which was unaesthetic. The Er:YAG laser combined with a surgical microscope (up to 30 x) was used to remove the gingival tissue with metal debris. Irradiation was performed at 24 - 48 mJ/pulse (8.5 - 17.0 J/cm²), 600 µm diameter, 10 - 30 Hz under water spray in contact mode, under topical or local anesthesia. Wound healing was evaluated after surgery by examining clinical parameters such as pain, redness, swelling, bleeding, thermal damage and epithelialization of the wound. The visual analog scale was used to evaluate the pain level experienced until one week after surgery. The metal debris was removed safely and very precisely. Water spray and surgical microscopic monitoring during the irradiation aided in complete removal of metal debris. Wound healing was ideal with no post-surgical pain and gingival recession. Results of the present case study indicate that removal of gingival metal pigmentation can be performed safely and effectively by Er:YAG laser irradiation, in combination with surgical microscope.

OP28

A 3-year follow-up clinical and radiological study of the Nd:YAG laser-assisted therapy in incipient and advanced chronic apical Periodontitis.

Todea, C.; Miron, M.; Petre, A.; Balabuc, C.; Filip, L. "Victor Babes" University of Medicine and Pharmacy,

Timisoara School of Dentistry.

Purpose: Assessing treatment results throughout a 3-year period after endodontic treatment of apical periodontitis using Nd:YAG laser versus the combination between Nd:YAG and GaAlAs diode lasers.

Material and Methods: 166 teeth were treated for apical periodontitis and divided in 3 groups, according to their diagnosis: chronic apical periodontitis (1); incipient apical periodontitis (2); chronic apical periodontitis with marginal periodontitis (3). Laser devices used: Nd:YAG American Dental Laser, (29.25J/cm²/procedure); GaAlAs diode IRRADIA (2J/cm²/procedure). Each group was divided in two equal lots; one treated only with Nd:YAG laser; the other with the combination between Nd:YAG and GaAlAs diode lasers. The control groups were represented by the teeth treated only conventionally. Treatment results were evaluated according to changes evidenced clinically and radiographically during the healing process, after 1, 3, 6, 12, and 24 months. Periapical status was evaluated using the periapical index (PAI).

Results: From the total number of teeth treated with laser in 3 procedures until root filling, 63.41% were represented by those treated with Nd:YAG combined with diode laser. Failure occurred in only 10.84% in the cases treated with Nd:YAG laser, in comparison with 76.66% in those treated conventionally (control groups). X-ray examination follow-up demonstrated that a large proportion of treated cases with chronic apical periodontitis showed signs of healing after 2-4 months, up to 1 year of treatment.

Conclusions: Incipient apical periodontitis treatment showed that Nd:YAG laser method was superior to the conventional one, while in chronic apical periodontitis the combination between Nd:YAG and GaAlAs was most efficient, determining a decrease in the number of treatment steps.

OP29

Evaluation of microleakage of composite resin restorations prepared by Er-YAG laser irradiation in primary teeth: An in vitro study.

Caccianiga, G.; Baldini, A.; Martelli, F.S.; Baldoni, M., Baldini, L.; Tredini; G.

Aim: to analyse in vitro the micro-leakage degree of composite resin restorations prepared with E-Yag and to compare this with the one obtained in bur cavity prepared. Materials and metho-

ds: 20 extracted primary teeth are used. On the buccal surface of each tooth, one round cavity is prepared with Er-Yag (SMART 2949, DEKA) about 3 mm occlusally to the cement-enamel junction; on the lingual (or palatal) surface a similar cavity is prepared with high speed turbine. All the composite resin restored cavities are subjected to micro-leakage test. The degree of micro-leakage using dye penetration is scored according to a 4-grade scale; the restored samples are examined by SEM to evaluate the gap formation between composite resin and dental hard tissues. **Results:** No micro-leakage is detected in 15 (75%) etched bur cavities and in 16 (80%) laser cavities. The examine sections show no gaps are revealed at the interface. The irregular surfaces without smear layer are suitable with a good adhesion and a strong bonding with restorative materials. **Conclusions:** Er-Yag laser surfaces decrease the micro-leakage of composite resin restoration in primary teeth.

OP30

Partial Pulpotomy with laser in primary and young permanent teeth.

Furze, H.A.; Gutierrez, R..

Profesor asociado de Odontopediatria de la Universidad del Salvador-Argentina.

OBJECTIVES: The present work was performed with the objective of checking the clinical feasibility and the benefits of using two of the different types of LASER energy, the ERBIUM-YAG laser , for treating the caries cavity and the opening of the pulp chamber, and the use of the NEODYMIUM-YAG laser to achieve the physics sterilization and the coagulation of the remaining pulp tissue in the root canal, in the primary dental pieces and young permanent teeth. In the same way the psychological acceptance of the treatment on the part of the paediatric patients was valued. - 30 teeth were treated, (15 primary and 15 young permanent) using as capping agent a paste of calcium hydroxide OHCa and sterile water in 18 teeth; a mix in equal parts of OHCa and iodoform in 11 teeth; and finally glass ionomer cement in one tooth. - The treated teeth were evaluated during one year clinically and radiological every three month, considering a success those treatments that didn't present: pain, pathological mobility, pathological x-ray image, and/or inflammatory aspect of the surrounding soft tissues. Successful treatment results in primary teeth 86.66%, and in permanent teeth 100%.

Oral Presentation

OP31

Microleakage of composite fillings in Er,Cr:YSGG laser prepared cavities comparing two self-etching primer systems in permanent and primary teeth.

Meneguzzo, D.T.; Apel, C.; Eduardo, C.P.; Turbino, M.L.; Oliveira, M.E.; Gutknecht, N.

Estagiária do LELO (Laboratório Especial de Laser em Odontologia) da FOU SP .

The aim of this in vitro study was to assess the performance of two self-etching primers in preventing microleakage of Class V cavities prepared by high-speed drill (HD) and Er,Cr:YSGG laser. Twenty human third molars (group 1) and twenty primary canines (group 2) were selected and divided into four subgroups (n=10) A: HD + Adhese (AD), B: Er,Cr:YSGG + AD, C: HD + Clearfil SE BOND (CSB), D: Er,Cr:YSGG + CSB. The laser settings were: 20Hz/5.5W, 63.94J/cm² enamel, 4W, 46.5J/cm² dentin, 2.5 W, 16.3J/cm² marginal beveling. Cavities were restored, thermally cycled and immersed in Rhodamine B (0.6%, 48h). The microleakage were evaluated under stereomicroscope (40X by 3 double-blind examiners, with scores 0-3). Data were analysed using Kruskal-Wallis/Dunn test (p<0.05). On group 1, no statistically significant difference was found between the self-etching primers and cavity preparation methods; on group 2 the only statistically significant difference (p<0.05, p= 0.0006) was found on bur prepared cavities once AD provided less microleakage than CSB. It can be concluded that the use of Er,Cr:YSGG for cavity preparations is comparable to high speed turbine when associated with both CSB or AD self-etching systems from the viewpoint of microleakage in permanent and primary teeth.

OP32

Interfacial micromorphology of adhesive systems in cavities prepared with Er,Cr:YSGG, Er:YAG laser and bur.

Aranha, A.C.C.; Eduardo, C.P.; Gutknecht, N.; Marques, M. M.; Ramalho, K.M.; Apel, C.

Doutoranda do Departamento de Dentística da Universidade de São Paulo - FOU SP.

This investigation was performed to evaluate the interfacial micromorphology of resin-dentin interface of adhesive systems bonded to dentin using lasers and bur. Twenty-seven human teeth

had their occlusal enamel removed. Class I cavities were prepared in dentin according to the groups (n=9): G1) cavity preparation with diamond bur; G2) Er:YAG laser (Kavo Key 3, Germany) at 250mJ (113.6J/cm²), 4Hz; G3) Er,Cr:YSGG laser (Millenium, Biolase Technology, USA) at 3.5W (61.7J/cm²), 20Hz. After cavity preparation, cavities were divided into 3 sub-groups (n=3): GA) application of self-etch primer AdheSE (Ivoclar Vivadent); GB) self-etch primer Clearfil SE Bond (Kuraray); GC) one-bottle Single Bond (3M/ESPE). A micro-hybrid composite resin Filtek Z250 was inserted in two increments and light cured. The specimens were sectioned across the bonded surface dividing the teeth into two halves. The cut surfaces were then prepared for SEM analysis. Higher magnification showed the hybrid layer and also resin tags. Gaps were observed in the cavities prepared with laser. With all adhesive systems tested, hybrid layer was cleared observed and resin tags were more pronounced in laser cavities. The results suggested that all adhesives systems tested in the three types of cavities were capable of generate consistent interfaces. Fapesp (Projeto CEPID 98/14270-8).

OP33

Dental bleaching efficacy with diode laser and LED irradiation - An in vitro study.

Barroso, M.C.S.; Wetter, N.U.; Pelino, J.E.P.

Mestre em Lasers em Odontologia pelo IPEN/FOUSP.

Objective: This in vitro study evaluated the whitening efficacy of LED and diode laser irradiation during the dental bleaching procedure, using the two agents Opalescence X-tra and HP Whiteness. Background: Bleaching techniques achieved significant advances with the use of coherent or incoherent radiation sources to activate the bleaching chemicals. Methods: A total of 60 bovine incisors were randomly divided into six groups, three for each bleaching agent, receiving 1) only agent, 2) agent and LED irradiation at wavelength of 470 nm, 3) agent and 1.6 watt diode Laser at 808 nm. The results of the irradiations were characterized with the CIELAB system by measuring the L*a*b* values for the teeth before and after bleaching. Results: The average increase of the lightness value (CIELAB L*) of the different groups was 3-7 and the average chroma value decreased by 5-9. Conclusions: This is to our knowledge the first time that the light sources Laser and LED are compared with respect to their whitening capability when applied to different agents. Best overall results are obtained with the Whiteness HP and Laser association.

OP34**Micro-shear bond strength of resin to Er:YAG laser treated dentin.**

Freitas, P.M.; Otsuki, M.; Eduardo, C.P.; Tagami, J.; Carvalho, R. C. R.

Doutoranda em Dentística na FO/USP.

Er:YAG laser is claimed to improve the bonding properties of dentin. It was tested if dentin adhesion is affected by Er:YAG laser. Ninety dentin disks were divided in groups (n=10): G1 - control; G2 - Er:YAG laser 150 mJ, 90o contact (38.8 J/cm2); G3 - Er:YAG laser 70 mJ, 90o contact (18.1 J/cm2); G4 - Er:YAG laser 150 mJ, 90o non-contact (1.44 J/cm2); G5 - Er:YAG laser 70 mJ, 90o non-contact (0.67 J/cm2); G6 - Er:YAG laser 150 mJ, 45o contact (37.5 J/cm2); G7 - Er:YAG laser 70 mJ, 45o contact (17.5 J/cm2); G8 - Er:YAG laser 150 mJ, 45o non-contact (1.55 J/cm2); G9 - Er:YAG laser 70 mJ, 45o non-contact (0.72 J/cm2). Then, bonding procedures were carried out and the micro-shear-bond test was performed. The adhesive surfaces were analyzed under Scanning Electron Microscopy. Two-way ANOVA revealed that the treatment of dentin surface with different parameters of the Er:YAG laser can influence micro-shear bond strength values. The Er:YAG laser constitutes an alternative tool for bonding procedures.

OP35**Changes in chemical composition and collagen structure of dentin tissue after erbium laser irradiation.**

Bachmann, L.; Diebolder, R.; Hibst, R.; Zzell, D.M..

Bacharel em Física pela Universidade Federal de Santa Catarina.

The erbium laser light has a great affinity to the water molecule, which is present in great quantity in biological hard tissues. The objective of this work is to identify chemical changes by infrared spectroscopy of irradiated dentin by an Er:YAG - 2.94µm laser. The irradiation was performed with fluences between 0.365 J/cm2 and 1.94 J/cm2. For the infrared analysis a Fourier transform infrared spectrometer was used. After the irradiation were observed: loss of water, alteration of the structure and composition of the collagen and increase of the OH- radical. These alterations can be identified by a decrease of the water and OH- band

between 3800-2800 cm-1, bands ascribed to collagen structure between 1400-1100 cm-1. The results show that the erbium laser changes the structure and composition of the organic matrix, OH-radical and the water composition in the irradiated dentin.

OP36**Conservative and minimal intervention in caries lesions with Er:YAG and Er,Cr:YSGG lasers in Pediatric Dentistry.**

Navarro, R.S.; Gontijo, I.; Raggio, D.; Imparato, J.P.; Guedes-Pinto, A.C.; Eduardo, C.P..

Pediatric and Restorative Dentistry/LELO- FOU SP.

The Er:YAG (2.94µm) and Er,Cr:YSGG (2.79µm) lasers wavelengths are highly absorbed in both water and hydroxyapatite, promoting effective ablation of caries and dental hard tissues in primary and permanent teeth. Previous studies showed efficient microbiological reduction of remains dentin, increase of acid resistance and potential reduction of secondary caries after removal of carious tissue and cavity preparation by laser. Restoratives clinical procedures were performed in children (3-9 years old) with active carious lesions from Pediatric Dentistry/LELO FOU SP, after inform consent and respected security rules, using Er:YAG (KaVo 3)(2Hz/150-250mJ/24ml/min air-water spray) and Er,Cr:YSGG (Millenium)-(20Hz/3-6W, air 40%, water 75%) lasers to minimal and selective caries tissues removal creating minimal cavities or conservative removal with decontamination and maintenance of dental substrate in extended lesions to atraumatic restorative treatment modified (ARTm) reducing possibility of accidental pulpal exposures. These procedures demonstrated noise reducing as vibration and pain, no contact, high acceptance and comfort by children during procedures. Conclude that Er:YAG and Er,Cr:YSGG lasers are useful and applicable to clinical procedure in Pediatric Dentistry, promoted ablation of carious tissues with minimal intervention, leading to conservative cavities and maintenance of hard tissues.

OP37**Imagin carious human dental tissue with three-dimensional optical coherence tomography.**

Freitas, A.Z.; Zzell, D.M.; Ribeiro, A.C.; Gomes, A.S.L.; Vieira, N.D..

Oral Presentation

Researcher of "Centro de Lasers e Aplicações-Ipen" .

Optical Coherence Tomography (OCT) used in this study, is a new non invasive optical detection technique. The OCT system is based on a Michelson interferometer, that generates a cross-sectional image of the teeth with resolution up to 2 microns. The buccal surface from the third molar teeth was used to induce caries like lesions. This surface was coated with an acid resistant nail varnish except a small window. The pH demineralization-rem mineralization cycling model was used to produce the lesions. This cycle was repeated for 9 days and remained in the remineralizing solution for 2 days. The OCT system was implemented by using an ultrashort pulse laser (Ti:Al₂O₃@830nm) with 50fs of pulse width and average power of 80mW. The laser beam was focused into the teeth providing a lateral resolution of 10 microns. Image was produced with a lateral and axial scans steps of 10 microns. After analyzing the surface by OCT it was possible to produce a tomogram of dentine-enamel junction and it was compared with the histological image. This OCT system accurately depicts dental tissue and it was able to detect early caries in its structure, providing a powerful contactless high resolution 3D images of lesions. Grants: PROCAD/CAPES, 00/15135-9/FAPESP.

OP38

The influence of the Er-YAG laser application in the reduction of periodontalpathogenic bacterias.

Seto, M. ; Eduardo, C. P.; Micheli, G.; Conrads, G.; Apel, C. ; Gutknecht, N.

Estagiário do Laboratório Especial de Laser em Odontologia LELO - FOU SP.

The proposal of this study was to evaluate the influence of the Er:YAG laser application in the reduction of the periodontalpathogenic bacteria before and after periodontal treatment. The sample were consisted with 10 patients carried of chronic periodontitis, 20 uniradicular teeth, bone loss 50%, PCS 6mm and divided in two groups. The control group have received the conventional periodontal treatment and the test group have received the same treatment conventional in additional of the Er:YAG laser application (periodontal point 1,65 X 0,50mm; 60mJ/pulse; 10Hz, continuous irrigation) to the radicular surface. The samples were collected at baseline and after 4 weeks with sterile

paper cone and stored in eppendorf tubes. All samples were identified by DNA probes: A. actinomycetemcomitans; B. forsythus; P. gingivalis and P. intermedia. and the quantification were made by Real Time PCR and have demonstrated remaining of 2,03% of A. actinomycetemcomitans; 9,52% of B. forsythus; 16,70% of P. gingivalis and 15,70% of P. intermedia with relationship to the initial sample. Through of those results the study could demonstrate that there was a periodontalpathogens reduction in the periodontal treatment associated to the Er:YAG laser.

OP39

Angiogenesis and inflammatory cell infiltration in healing laser and scalpel wounds.

Luomanen, M.. Institute of Biomedicine/Anatomy, University of Helsinki, Finland.

The proliferation of capillaries and the infiltration of inflammatory cells were microscopically evaluated in healing laser and scalpel wounds in 40 Sprague Dawley rats under a healing period of 28 days. The incisions were made parallel on both sides of the midline of the tongue. The laser wounds were made with a 6W CO₂ laser by using the laser in a continuous mode and by moving the beam in focus manually 2 mms-1 with an exposure time of approximately 0.5 s per mm. The scalpel wounds were made with an ordinary surgical scalpel. Specimens for microscopic inspection were cut perpendicular to the wound sites immediately, 6h, 2, 11, and 28 days after surgery. Both wound sites were obtained into the same specimen. Each specimen was divided into two parts. The first part of each specimen was quick-frozen, fixed in methanol and further processed for immunohistochemical staining. These specimens were exposed to factor VIII related antigen antibodies (factor VIIIIR:Ag), a marker for endothelial cells, washed with PBS and overlaid with peroxidase-conjugated immunoglobulin antibodies. The specimens were then inspected under a light microscope using an objective lens of 40 x and the relative amount of capillary profiles was counted from an equal area of each specimen.

The immunostaining showed a smaller amount of capillaries in the immediate specimens and during the early healing at the laser wound sites. The proliferation of the capillaries during healing seemed to be somewhat slower in the laser than the scalpel wounds. The amount of vessel profiles reached its peak value of 11 days in scalpel and at 28 days in laser wounds. At that time

point the amount of vessels of the scalpel wounds had returned to the level of the normal mucosa.

The second part of each specimen was fixed routinely in formalin, embedded in paraffin, cut and stained with hematoxylin and eosin. The light microscopic inspection of the hematoxylin and eosin-stained specimens showed that the inflammatory cells infiltrated somewhat slower to the laser than the scalpel wound sites. However, as healing advanced the inflammatory cell infiltration seemed to be more prominent and could be seen to last for a longer period in the healing laser than the scalpel wounds.

OP40

Histological analysis of healing after flap surgery of experimental periodontitis with Er:YAG laser irradiation in dogs.

Mizutani, K.; Aoki, A.; Kinoshita, A.; Takasaki, A. A.; Oda, S.; Ishikawa, I.

This study evaluated the healing of periodontal tissue following flap surgery with Er:YAG laser irradiation for granulation tissue removal and root debridement. In 4 dogs degree III furcation defects were prepared on bilateral mandibular third and fourth premolars (P3 and P4) and experimental periodontitis was induced. On the experimental side, granulation tissue removal was performed with Er:YAG laser and root debridement was done with Er:YAG laser (P3) or curets (P4). On the control side, both procedures were carried out with only curets. After 12 weeks, the dogs were sacrificed and decalcified specimens were prepared for histological evaluation. With Er:YAG laser both procedures could be performed faster than manual instrumentation, and any major thermal damage was not shown on the root and bone surfaces. New bone formation tended to be more pronounced in the experimental group. Both groups showed similar amounts of new cementum formation and connective tissue attachment, although periodontal tissue appeared occasionally detached from the laser-treated root surface. These results indicate that the Er:YAG laser could be safely and effectively applied during flap surgery for removal of granulation tissue and root debridement. However, further investigation is required on the tissue attachment mechanism on the lased root surface.

OP41

Effect of low level laser irradiation on human oral squamous carcinoma cells.

Park, J.S.; Kim, S.Y.; Park, B. S.; Kim, G.C.; Ko, M.Y.; Park, J.S..

This study was to investigate the mechanism of tumor cell death involved in low level laser irradiation on human oral squamous carcinoma cell (OSC9) in vitro. GaAlAs and HeNe semiconductor diode laser, EIT 21 (ANAMEDICO Ltd., Korea) was utilized for laser application. Laser probes were placed at right angles with the plate above 10 mm and activated for 60 seconds each energy density. The energy densities were 21, 42, 84, 126, 168, and 210 J/?. In this study, MTT assay showed that cell survival rates were decreased by increasing energy density and frequency. Hemacolor and AO/EB stain also showed most cells were died by necrosis. It is hard to find condensed or fragmented nuclei in OSC9 cells after irradiated with low-level laser. TUNEL assay showed only a few positive reactions on condensed nuclei. By DNA electrophoresis, cells did not show DNA degradation characteristics of apoptosis with a ladder pattern of DNA fragments. In conclusion, the author observed that the cell death mechanism of OSC9 after low level laser irradiation without photosensitizer was mainly necrosis rather than apoptosis.

OP42

Er:YAG laser irradiation stimulates PGE2 production via COX-2 mRNA in human gingival fibroblasts.

Watanabe, H.; Pourzarandian, A.; Ruwanpura, S.M.P.M.; Aoki, A.; Noguchi, K.; Ishikawa, I.

Periodontology, Department of Hard Tissue Engineering, Graduate School, Tokyo Medical and Dental University, Tokyo, Japan.

AIMS: Our previous study showed that early bone healing was accelerated after irradiation with Er: YAG laser. We have then studied cell growth and PGE2 and COX-2 mRNA in cultured human gingival fibroblasts (HGF) by Er: YAG laser irradiation to better understanding the laser effect on healing. METHODS: HGF cells cultured in 35 mm dishes (n=30) were subjected to low-power Er: YAG laser irradiation with energy densities vary-

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ing from 2.0-5.0 J/cm² and control. PGE₂ levels were assayed by ELISA and RT-PCR was performed for COX-2 mRNA expression. Cell viability was confirmed by trypan blue exclusion and LDH assay. The effect of the laser on cultured cells was observed by light and transmission electron microscopy (TEM). The ANOVA test was used for all group comparison. **RESULTS AND DISCUSSION:** Er: YAG laser irradiation stimulated fibroblast proliferation and PGE₂ synthesis via COX-2. This should be considered as an important regulatory aspect for HGF proliferation and differentiation in healing after Er: YAG laser irradiation. In conclusion, these results may reflect the therapeutic characteristic of Er: YAG laser irradiation on early wound healing.

OP43

Management of neural disease using low power laser in the field or oral and maxillofacial surgery.

Yoshida, K..

First Department of Oral and Maxillofacial Surgery, School of Dentistry Aichi-Gakuin University, Nagoya, Japan.

Low power laser therapy is currently performed by semiconductor, Nd:YAG, and He-Ne laser. When mandibular surgery is conducted such as dental implant, removal of third molar impacted wisdom tooth and other surgery, sometimes the symptoms of paresthesia or neuralgia may be occurred result in disturbance of inferior alveolar nerve. Some cases of them would be cured without any therapy. However, the results were reported that the neural symptoms would significantly be cured when low level laser therapy was conducted as compared with non therapy group.

Since 1986, we intended to treat those patients by irradiating low level laser corresponding to the stellate ganglion and the region of mental nerve. The irradiating condition of output power may have significant therapeutic effects through the nerves when its power is about 300mW of semiconductor laser or Nd:YAG laser. The modalities would be presented and discussed about the indications of neural symptoms of maxillofacial region.

OP44

The use of hydroxyapatite associated with low level laser therapy on the repair of bone defects - Study in rats.

Limeira Júnior, F.A. ; Gerbi, M.E.M.M ; Ramalho, L. M. P.; Marzola, C.; Melo, D.; Pinheiro, A.L.B. Doutorando em Laser em Odontologia pela FO-UFBA - Centro de Laser da FO-UFBA.

The aim of this study was to evaluate the effects of LLLT (Ga-Al-As, 830nm, 40mW, CW, ~0,6mm) on the repair of bone defects on the femur of Wistar albinus rats submitted to implantation of hydroxyapatite synthetic Gen-phos® (Genius - Baumer S.A). Four randomized groups were studied: I (control); II (Gen-phos®); III (LLLT); IV (Gen-phos® + LLLT). The irradiated groups received seven irradiations at every 48 hours, being immediately the first after the surgery. The dosimetry was of 16J/cm² per session, divided in four points of 4J/cm² around the defect. The sacrifice periods were of 15, 21 and 30 days. The results showed evidence of a more advanced repair on the irradiated groups when compared to non-irradiated ones. The repair of irradiated group submitted to implant was characterized by both increased bone formation around the implant and at level of the bone defect, considering the osteoconductive capacity of the hydroxyapatite. It is concluded that the use associated of LLLT with hydroxyapatite promotes an increment of the bone repair in relation to your use in an isolated way.

OP45

Laser therapy (GaAlAs) effect in autogenous bone grafts in rats: morfological study.

Weber, J.B.B.; Pinheiro, A.L.B.; Ramalho, L. P.; Oliveira, M.G.

Doutor em CTBMF - PUCRS, Professor de Odontopediatria - PUCRS .

The aim of this study was to histologically evaluate the influence of radiation using an infrared laser diode in the process of bone healing on the femur of rats which have been submitted to autogenous bone grafts. Bone wounds were made on the femurs of 60 Wistar rats and the removed bone fragments were used as an autogenous graft. The animals were divided in four 15 groups: G1 (control group), G2 (irradiation on the surgical area), G3 (irradiation on the bone graft) and G4 (irradiation on the surgical area and on the bone graft). The irradiation dose used during the surgery was 10J/cm² . All the animals, except from the control group, were irradiated during 15 days at every 48 hours with a 10J/cm². The observation periods were on the 15th, 21st and 30th

days. The results demonstrated that in groups G2 and G4 the bone healing was qualitatively and quantitatively more exuberant if compared to the results achieved by G1 and G3. The results led to the conclusion that the use of laser therapy during the surgery causes positive biomodulation effects on the healing process on grafted bones.

OP46

Comparative evaluation of lasertherapy in cutaneous wounds of undernourished animals.

Meireles, G.C.S. ; Vieira, A.L.B; Almeida, D.; Carvalho, C.M.; Santos, J.N.; Pinheiro, A.L.B..

Doutoranda em Laser.

This work aimed to evaluate histologically the differences on the healing of cutaneous wounds on undernourished rats following Lasertherapy (635nm 20J/cm² or 40J/cm²). Thirty nourished or undernourished Wistar rats had a standardized wound created on the dorsum and were divided into four groups: Group 1 - Control (Standard diet; n = 5); Group 2 - Control (DBR; n =5); Group 3 - Standard diet X Lasertherapy (635nm; 20J/cm² or 40J/cm² (5 each); Group 4 - DBR X Lasertherapy (635nm; 20J/cm² or 40J/cm² (5 each). The first application of the treatment was carried out immediately and repeated at every 24 hours during seven days. The specimen were taken and routinely processed to wax, cut and stained with H&E and PICROSÍRIUS stains and analyzed under light microscopy. The analysis included: re-epithelization; inflammatory infiltrate and fibroblastic proliferation. PICROSÍRIUS stained slides were used perform descriptive analysis of the collagen fibers. The analysis of the results showed better results on Groups undernourished irradiated with the laser light (20J/cm² or 40J/cm²). It is concluded that there was effect positive biomodulatory of the laser, being more evident when it was irradiated undernourished animals in the dose of 20J/cm². Financial support: PIBIC/UFBA.

OP47

"LLLT in treating dentinary hypersensibility: a histologic study and clinical application "

Brugnera Junior, A. Garrini, A.E., Pinheiro, A.L.B., Campos, D.H.S., Donamaria, E., Magalhães, F., Zanin, F., Pécora, J.D., Takamoto, M., Ladalardo, T.C..

Director of APCD Laser Department.

Dental hypersensitivity has been studied for several years and it is reported as a striking painful condition that originates from the exposition of dentinal tubuli as a result of the reduction of the thickness of the enamel or cement. Usually the exposed area is subjected to several kinds of stimuli, resulting in a rapid sharp acute pain. The aim of this study was evaluated the efficiency of LLLT in the treatment of patients with dentinal hypersensitivity. 1102 teeth of 388 patients from the Laser Center of the Camilo Castelo Branco University were treated with LLLT between 1995-2000. 98 males and 290 females aged 30 to 45 years old were treated. For LLLT, a diode laser was used at 780nm, CW, 40mW, elliptical area of the beam 2mm², exposure time per point 25s. This corresponds to an equivalent dose of 50 J/cm² at each point (considering the area of the spot). If a 1cm² area is considered, the total dose per tooth is 4J/cm². With the diode laser 830nm ,CW, 50mW, elliptical area o the beam 2mm², exposure time per point of 20s. This corresponds to an equivalent dose of 50J/cm² at each point (considering the area of the spot). If a 1cm² area is considered, the total dose per tooth is 4J/cm². The results showed 403 (36.57%) out of 1102 teeth required a single session for complete remission of the symptom. 255 (23.14%) needed two sessions; 182 (16.51 %) three sessions; 107 (9.7%) four sessions; and 59 (5.35%) five sessions. 96 (8.71%) did not respond to LLLT and the patients were re-assessed and treatment changed. The more affected tooth was the lower premolar (301 - 27.4%), followed by lower molars (163 - 14.8%), upper premolar (149 - 13.5%), lower incisive (148 - 13.4%), upper canine (119 - 10.7%), upper incisive (108 - 9.9%), lower canine (62 - 5.6%), and upper molars (52 - 4.7%). The result of the present investigation demonstrates indeed that LLLT, when based on the use of correct irradiation parameters, is effective in treating dentinal hypersensitivity as it quickly reduces pain and maintains a prolonged painless status. The authors concluded that the use of LLLT was effective on 91.27% of the cases. Previous studies were carried out by the authors to evaluate histologically the reaction of the dentinal pulp in rats after application of LLLT .The LLLT was shown to be efficient in the stimulation of odontoblast cells, producing reparative dentin and closing dentin tubuli.

Oral Presentation

OP48

Assessment of bone repair associated to the use of bovine bone morphogenetic protein (BMPs) and biological membrane irradiated with laser of 830nm.

Gerbi, M.E.M.; Limeira Júnior, F. ; Ponzi, E.A.; Ramalho, L.; Marzola, C.; Pinheiro, A.L.B..

Doutoranda em Laser em Odontologia pela UFBA.

The aim of the present investigation was to assess histologically the effect of LLLT (AsGaAl, 830nm, 40mW, CW, f~0,6mm) on the repair of surgical defects created in the femur of the Wistar rat. The defects were filled to bovine bone morphogenetic protein (BMPs) associated to GTR. Surgical bone defects were created in n=48 divided into four groups: Group 1 (control n=12); Group 2(Laser n=12); Group 3 (BMPs + GTR n=12); Group 4((BMPs + GTR + Laser n=12). The animals on the irradiated groups received 16J/cm² per session divided into four points around the defect (4J/cm²) being the first irradiation immediately after surgery and repeated seven times at every 48h. The animals were humanely killed after 15, 21 and 30 days. The results of the present investigation showed histological evidence of improved amount of collagen fibers at early stages of the bone healing (15 days) and increased amount of well organized bone trabeculae at the end of the experimental period (30 days) on irradiated animals compared to non irradiated ones. It is concluded that a positive biomodulative effect on the healing process of defects associated to the use of BMPs and biological membrane on the femur the rat.

OP49

Assessment of bone repair following the use of organic and mineral bovine bone graft laser irradiation 830 nm.

Gerbi, M.E.M.; Limeira Júnior, F. ; Ponzi, E.A.; Ramalho, L.; Marzola, C.; Pinheiro, A.L.B..

Doutoranda em Laser em Odontologia pela UFBA

The aim of this work was to evaluate the effectiveness of the Laser (LLLT) (AsGaAl, 1830nm, 40mW, CW, f~0,6mm) in the repair of bone defects submitted to organic and mineral bovine bone graft in femur of Wistar rats (n= 42). The sample was divided in 05 Groups: Group 1 (control, n= 06); Group 2 (Organic

Bone graft, n= 09); Group 3 (Organic Bone Graft + Laser, n= 09); Group 4 (Anorganic Bone Graft, n= 09); Group 5 (Anorganic Bone Graft + Laser, n= 09). The irradiated groups, received seven irradiations at every 48 hours, being immediately the first after the surgical procedure. The dosimetry was of 16J/cm² per session, divided in four points of 4J/cm². The sacrifice periods were of 15, 21 and 30 days. The obtained results demonstrated that in the irradiated groups, it was observed the concentration of collagen fibers in the period of 15 and 21 days and for a larger bone new formation and a well organized bone trabeculae at the end of period (30 days), when compared with the control group. It is concluded that LLLT associated to organic or anorganic bovine bone graft resulted in bioestimulation effect on the repair of the bone defects.

OP50

A histologic assessment of the low level therapy associated with photosensitizing drug on wound healing in diabetic rats.

Silva Neto, U.T. ; Catapani, W.R.; Theodoro, L.H.; Milanezi, L.A.; Garcia, V.G.

Mestre em Clinicas Odontológicas, Área de Concentração Buco-Maxilo-Facial- Universidade de Marília -UNIMAR.

The aim of this study was to histologically assess the effect of low level laser therapy (LLLT) associated with photosensitizing drug on the repair of skin wounds performed on rats dorsum with streptozocin-induced diabetes. Sixty rats divided into 3 groups were used: Group I (control), Group II (LLLT) and Group III (Photosensitizing drug +LLLT). In Groups II and III, the laser (685 nm - GaAlAs laser) was applied continuously with 50 mW, in 9 points during 10s, with a total of 90 s (3.375 J/cm²) in contact mode . In Group III, the laser was applied immediately after the wounds were treated with toluidine-O blue (100 µg/ml). The results showed that untreated wounds presented a delay on the tissue healing while the ones treated with the LLLT or toluidine-O blue and LLLT, the wound tissue healing process was differentiated. The LLLT with toluidine-O blue application promoted more decrease of the inflammatory infiltrated, bigger epithelial differentiation, bigger collagen deposition and decrease of the delay of the wound tissue process. It is concluded that the association toluidine-O blue dye and LLLT revealed more efficacious in the skin wounds healing performed on dorsum of diabetic rats than the laser only.

OP51**Effect of low power laser over cells infected by herpes simplex virus.**

Tardivo, J.P. ; Granato, C.; Sakuma, M.E. ; Soares, J.H.; Huemer, C.; Figueiredo, C.A.

Serviço de Virologia do Instituto Adolfo Lutz - SP.

The purpose of this study was check the behavior of Vero cells infected by HSV, under low power laser action.

Doses of 4 joules and 12 joules were were applied from a 904 nm GaAs laser with 30mW out put power. Vero cells (4X10⁴ / Wells) were infected with HSV (100 TCID₅₀) and observed everyday. The irradiations were daily, for 3 successive days.

We observed a lower cytophatic effect in the irradiated cells concerning the controls, been this action more evident with 4 J.

These cells were incubated for 7 days. After this period the cells were frozen and the released viruses were inoculated in new cultures of Vero.

We observed na absence of cytophatic effect in that cells infected by viruses derived of cultures that received 12 J initially.

Low power laser over Herpes Simplex can be useful in clinical practice.

OP52**Effects of low-intensity laser therapy on the Orthodontic movement velocity of human teeth: A clinical study.**

Kohara, E.K. ; Cruz, D.R.; Wetter, N.U.; Ribeiro, M.S. Mestrando do Centro de Lasers e Aplicações do IPEN/USP.

Low-intensity laser therapy (LILT) has been studied in many fields of Dentistry, but, to our knowledge, it is the first time that its effects on orthodontic movement velocity in humans are investigated. In our study, eleven patients were recruited for a two-month study. One half of the upper arcade was considered control group and received mechanical activation of the canine teeth every thirty days. The opposite half received the same mechanical activation and was also irradiated with a diode laser (?=780nm) on ten points around the root, during 10s with 20 mW, 5 J/cm², on four days of each month. Data of the biometrical progress of both groups were statistically compared. All patients showed significant higher retraction velocity of the canines on the laser treated side when compared to the control. Conclusion: Our findings suggest that LILT does accelerate

human teeth movement and could therefore considerably shorten the whole treatment duration.

OP53**Bacterial reduction by photodynamic therapy in peri-implantitis. An in vivo study.**

Yamada Júnior, A.M.; Hayek, R.R.A.; Gioso, M.A.; Ferreira, J.; Batista Sobrinho, C.A. ; Ribeiro, M.S.

Doutorando em Ciências, IPEN/USP.

Progressive peri-implantar bone losses, which are accompanied by inflammatory process in the soft tissues is referred to as peri-implantitis. The aim of this study was to compare the effects of lethal photosensitization with the conventional technique on bacterial reduction in ligature induced peri-implantitis in dogs. Seventeen third premolars of eight Labrador dogs were extracted and, immediately after, the implants were submerged. After osseointegration, peri-implantitis was induced. After 4 months, ligature were removed and the same period was waited for natural induction of bacterial plaque. The dogs were randomly divided into two groups. In the conventional group, they were treated with the conventional techniques of mucoperiosteal flaps for scaling the implant surface and irrigation with chlorexidine. In the laser group, only mucoperiosteal scaling was carried out before photodynamic therapy. On the peri-implantar pocket an azulene paste was introduced and a GaAlAs low-power laser (l= 660 nm, P= 30 mW, E= 5,4 J and Dt= 3 min.) was applied. Microbiological samples were obtained before and immediately after treatment. The results of this study showed that *Prevotella* sp., *Fusobacterium* e *S. Beta-haemolyticus* were significantly reduced for the conventional and laser groups (100%,99.8%; 100%,100%; 85.7%,97.6%, respectively).

OP54**Photodynamic action of toluidine blue in streptococcus mutans by fluorescence spectroscopy.**

Núñez, S.C.; Gomes, L.; Garcez, A.S.; Müller, K.P.; Jorge, A.O.C.; Ribeiro, M.S..

Doutoranda em Ciências, IPEN/USP.

The antimicrobial activity of toluidine blue associated with red light has been demonstrated for a wide range of microorganisms including those commonly found in infected root canals, carious

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lesions and periodontal pockets. Recent reports have drawn attention to the problems of antimicrobial resistance and resistance of oral bacteria to antibiotics and local antiseptics is of increasing concern, thus photodynamic therapy could be an alternative antimicrobial approach to treat localized infections in oral cavity. In this study the fluorescence spectra of TB were obtained before and after laser exposure in the presence or absence of *Streptococcus mutans*. The dye concentration was 0.01%, the irradiation was performed with a diode laser, $\lambda = 660$ nm, $P = 40$ mW, exposure time of 3 minutes in a volume of 0.5 ml, with a pre-irradiation time (PIT) of one or five minutes. The results showed shifts in fluorescence spectra observed for different pre-irradiation times in the presence of *S. mutans*. In the absence of bacteria, a shift in the spectra was observed in the dye before and after irradiation. These findings may indicate a photobleaching of the dye denoting structural alterations after irradiation and confirm the importance of the PIT for the success of this therapy.

OP55

Comparative study between photodynamic therapy and chemical solution on bacterial reduction in root canals.

Núñez, S. C.; Gomes, L.; Garcez, A.S.; Lage-Marques, J.L.,

Doutoranda em Ciências, IPEN/USP.

One of the major medical problems facing mankind in the next century will be the resistance of many pathogenic microbes to existing antibiotics. Oral bacteria can easily reach other body sites and also spread to other individuals. Therefore, antibiotic-resistant oral bacteria have the opportunity for rapid dissemination through the community and to transfer their resistance genes to other bacterial species. Photodynamic therapy involves the use of light-activated drugs which may offer an alternative approach to the use of traditional antimicrobial agents. The purpose of this study was to evaluate bacterial reduction in infected root canal. Thirty teeth with their root canals prepared were contaminated with *Enterococcus faecalis*. Control group was untreated. Chemical group was treated with sodium hypochlorite for 30 minutes and in the laser group, a photosensitizer paste was placed and maintained in the root canals for 5 minutes and irradiated with a diode laser, output power 10 mW and $\lambda = 685$ nm for 3 minutes. The bacterial reduction was significantly higher for laser group when compared

to chemical and control groups. These results indicate photodynamic therapy as an effective method to kill *E. faecalis*.

OP56

Effects of the lasertherapy on cutaneous wounds infected by *Staphylococcus aureus*.

Macedo Sobrinho, J.B.; Almeida, P.F.; Santos, J.N.; Macedo, C.R.S.; Santos, N.R.S.; Pinheiro, A.L.B.

Doutorando em Laser em Odontologia pelo Programa Integrado de Doutorado da Universidade Federal da Bahia - UFBA.

The literature shows several studies showing positive effect of the use of lasertherapy on wound healing, but no study was found on infected wounds. The aim of the present study was to assess the effects of the lasertherapy on cutaneous wounds infected by *Staphylococcus aureus*. Twelve rats had a standard wound created on the dorsum. Four hours after wounding the wound was contaminated with a solution containing *Staphylococcus aureus*. Forty-eight hours after contamination and assessment of infection, the animals were divided: Control-removal of the crust and no further treatment; Laser-removal of the crust and a single application of lasertherapy (660 nm, 50 mW, 30 J/cm², CW, 15 min). Immediately after a swab was used to collect material from the wound surface. The swab was placed in a tube containing PBS, diluted and placed in Baird-Parker medium. Colony counts were then performed. Eight days after contamination, the same procedure was carried out and the animals were humanely sacrificed. The specimens were stained with HE and Picrosirius stains. The result of the colony count showed no significant differences between the groups. Histological analysis showed increases collagen deposition and epithelial migration and mild inflammatory reaction was seen on laser-treated subjects. The Lasertherapy improved healing on infected wounds.

OP57

In vivo study of photodynamic therapy effect on deciduous dentin: microbiologic and SEM analysis.

Sant'Anna, G.R.; Simionato, M.R.L.; Duarte, D.A..
Mestre em Odontopediatria /USP .

In vivo decayed dentine of deciduous teeth ($n=29$) were treated with 0.005% toluidine blue O and sensitized with a low-power

InGaAlP diode laser and were then collected before, immediately later and 90 days post photodynamic therapy; the control group samples (n=19) were treated exclusively with 0.005% TBO dye. With time both groups presented significant mortality rates ($p < 0.01$). However, if differences between times were evaluated, the experimental group presented differences among the 3 times, before, immediately after and 90 days post ($p < 0.01$), whilst, the control group did not demonstrate evidence of significant differences among the times before and immediately after. The median differences between the before and immediately after moment were significant among the groups ($p < 0.01$). The differences between IA and 90 days post were not significant, neither were the differences B and 90 days post. Using SEM, after 90 days dentin tissue reorganization suggestive of tubular sclerosis was observed in the experimental group, while the control group demonstrated evidence of dentin collagen disorganization. Photodynamic therapy can, therefore, be considered as a possible alternative approach for dental decay lesions in deciduous teeth.

OP58

The use of low level laser therapy in the Odontopediatric clinic

Sant'Anna, G.R.

Mestre em Odontopediatria /USP .

Laser represents a new therapeutic modality in Dentistry; it doesn't just consist of a new equipment uses or even a new technology for the dentist in the clinic. It represents a modern therapeutic philosophy, minimally invasive originating from the knowledge of the light biophysical interaction, that possesses special characteristics, with the biological tissue, aiming to improve the quality of the conventional treatments. Pediatric Dentistry aims the child's total care; in this context laser therapy can be used in the several approaches in order to health promotion.

This paper intends to present the pediatric dentistry clinic low level laser uses for caries lesion diagnosis and control; for development anomalies; for soft tissues lesions treatment; for the microbial control in dental caries lesions and as a reparative dentine biostimulator.

OP59

Surgical Applications of Erbium Laser.

Trevino, E.

The purpose of this presentation is to share some surgical applications of Erbium laser, placing dental implants and in Endodontic surgery. We know today that bone response to Erbium is much better than burs and that the highest absorption is mainly in water and hidroxyapatite, so it works safely on bone. The laser energy couples into the hidroxy radical in the apatite crystal and into the water that is bound to the bone structures; the mineral substrate of water vaporization causes a massive volumen expansion and this expansion causes the surrounding material to explode away, and temperature decreases during treatment. The minimization of this thermal effect makes the erbium lasers ideal for bone removal, caries removal and tooth preparation when used with water spray.

Five clinical cases will be presented.

OP60

Effects of low-intensity red laser radiation on the dentine-pulp interface after class I cavity preparation disfunction.

Godoy, B.M.; Arana-Chavez, V.E.; Bortoli Groth, E.B.; Ribeiro, M.S.

Mestre Profissional em Lasers em Odontologia Especialista em Prótese.

The aim of this study was to investigate the effects of low-intensity red laser radiation on the ultrastructure of dentine-pulp interface after conventionally prepared class I cavity preparation. Eight premolars indicated for extraction for orthodontic reasons from 2 patients were used. Class I cavities were prepared and the teeth were divided into two groups. The first group received a treatment with a GaAlAs laser, $\lambda = 660 \text{ nm}$, $P = 30 \text{ mW}$ and $D = 2 \text{ J/cm}^2$. The laser tip was applied directly and perpendicularly into the cavity in only one sense. The teeth from the second group had their class I cavities prepared but they did not receive the laser therapy. All cavities were filled with composite resin. Twenty-eight days after the preparation, the teeth were extracted and processed for transmission electron microscopy analysis. Two sound teeth (healthy group) without any preparation were also examined. The first group presented odontoblastic processes

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in intimate contact with the extracellular matrix, while the collagen fibers appeared more aggregated and organized than those of the second group. These results were also observed in the healthy teeth. The results suggest that laser irradiation accelerates the recovery of the structures at the dentine-pulp interface involved during cavity preparation layer.

OP61

Low level laser therapy in treatment of TMJ and masticator muscles disease: biometrical and pain evaluation.

Eduardo, L.R.P.; Ribeiro, M.S.; Duarte, M.; Zezell, D.M. Mestre em Ciências pelo IPEN.

A sample of 11 patients showing temporomandibular joint disease, in one or both sides, was selected. Clinical examinations were performed on patients to define which side was the most compromised by the disease. Only the worst side was chosen to be treated by the laser therapy. The Laser Unit used was a diode laser (AlGaAs) in which the wavelength was 810 nm (infra-red spectrum). Irradiations were done in three points of TMJ, with 22,5 J/cm²; two points in the masseter muscle, with 15 J/cm²; and three points in the temporal muscle, with 7,5 J/cm². All points were irradiated for 30 seconds. The other side, of lesser complaint received a sham therapy. Treatment was done during two weeks, three irradiation with 48 hours interval in the first week, and two irradiations with the same interval in the second week. Patients reported improvement in relation to the level of pain, mainly after the fourth irradiation, and the level of pain decreased until the last day of treatment. In relation to the degree of mouth opening, the majority of patients showed a significant increase, mainly after the fifth day of irradiation.

OP62

Effect of low level laser therapy on the viability and proliferation of human primary bone cells.

Moraes, V.; Almeida-Lopes, L. ; Tuebel, J.; Saldamli, B.; Juergens, P.; Sader, R..

Technologies for improving bone formation and regeneration are a constant research in tissue engineering. Biostimulatory effects of low level laser therapy (LLLT) on hard tissue have been previ-

ously described, but the parameters (total energy doses, irradiation mode, power density) for Laser irradiation on bone remain uncertain. Moreover, no data was found concerning LLLT on human primary bone cells (HPBC). Our objective was to investigate the effect of different laser irradiation parameters on the viability and proliferation of HPBC. A HPBC culture was established. Cells were plated in DMEM, 5% FCS, simulating nutritional deficit. They were irradiated 3 times with 72 hours interval. An 830 nm-GaAlAs-Laser, 100 mW power output was used in continuous or pulsed mode, each with total energy doses of 2, 4, 6, 8 and 10 Joules. Cellular proliferation was analyzed with BrdU colorimetric immunoassay; viable cells were counted with a hemocytometer. Phenotype changes were investigated with ALP staining. We found out, in the present nutritional deficit conditions, that LLLT improved the viability and proliferation of HPBC in vitro without changing their phenotype. Different doses and irradiation modes resulted in different cellular responses. Further investigations about LLLT effects on ALP, collagen and protein expression are being performed.

OP63

Histologic aspect of maxillary bone repairing after autogenous graft influenced by the use of AsGaAl laser and BMP.

Nascimento, P. L.; Genovese, W. J. ; Bastos Neto, F.V.R., Soares, N.S.

Mestrando em Bioengenharia.

Objectives: To analyze the potential of regeneration of autogenous graft interface, treated or not with BMP and AsGaAl laser. Material and Methods: We selected patients with necessities of bone grafts for installation of implantations in the region of previous maxilla. The autogenous donor area was the mentum symphysis and the patients had been divided in 4 randomly groups: G1-only graft (control), G2-graft and BMP, G3-graft and laser, G4-graft and BMP + laser. In the groups G3 and G4 we used the AsGaAl laser, 50mW, 3J/cm² and wave length of 670nm. After 150 days, the region of the interface graft-bed was removed with aid of a trephine drill of 3mm of diameter. These bone fragments had been descalcificated and processed for histomorfometric analysis. Results: We observed the formation of a compact bone tissue with great marrow sockets. However, bigger number of osteocytes in the treated groups was observed. The marrow tissue

presented fibrous aspect, more relevant in the groups G2 and G4. Discussion: We looked for to validate a model that preserved the advantages of these procedures, with easiness of the technique and low cost. Conclusion: The conjugated use of BMP and laser stimulate the cellular proliferation and potencialize their effects.

OP64

Effectiveness of lasertherapy applied to traumatic labial injury of patients with spastic cerebral palsy (CP) .

Santos, M.T.B.R. ; Campos, V.F.; Genovese, W.J.

Profa. Dra. pela UNIFESP/EPM .

The aim of this study was to demonstrate the effectiveness of lasertherapy when applied to traumatic labial injury of patients with spastic CP. We report two patients who presented internal mucosa and lower lip traumatism caused by oral reflex automatism with spastic tonic bite and lower lip interposition. The first patient presented extensive lower lip ulceration, loss of tissue, crustous and hemorrhagic areas, with increasing pain and spasticity. The second case presented local congestion signs, extremely enlarged tissue growth and increased labial volume. Lasertherapy was applied to all injured areas, with a low-potency diode InGaAlP laser 685nm with energetic deposition of 190 J/cm² in scanning, with a 24-h interval between the first and second administration, and a 7-day interval between the two subsequent ones. The first re-evaluation, 24h later, showed a striking inflammatory process reduction, vascular congestion decrease, and reduction of the ulcerated area with spasticity and pain reduction. At the 14-day re-evaluation, significant clinical differences in the advanced healing process were noticed. Low-intensity laser showed to be effective in traumatic soft tissue treatment in CP individuals by accelerating the healing process, reducing secondary contamination, promoting analgesia, and it can be an important tool in the treatment of such patients.

OP65

The photo reflectance as an analysis technique in Dentistry.

Cesar, I.C.R. ; Munin. E.; Liporoni, P.; Munin, E.

Doutoranda em Engenharia Biomédica pelo Instituto de Pesquisa e Desenvolvimento (IP&D-UniVap).

The analysis of the color in tooth by visual evaluation is a complex task. A system was implemented for reflectance spectroscopy measurements in diffuse media, such as biological tissues. The photoreflectance system consists of a halogen lamp whose light is launched into a test sample placed inside an integrating sphere by means of an optical fiber. The light dispersed inside the sphere is sampled by another optical fiber and sent to a spectrograph. Among several potential applications in dentistry, the technique has been used in our research group to study the alteration of tooth color, as staining in enamel or even in compound resin. In addition, the technique stands as a powerful tool to evaluate the efficacy of different dental bleaching protocols.

OP66

Degree of conversion in dental resins polymerized by Argon laser, halogen lamp and LED: a Raman Study.

Soares, L.E.S. ; Pinheiro, A.L.B. ; Brugnera Júnior, A.; Zanin, F.; Martin, A.A.

Doutorando em Engenharia Biomédica (IP&D - UNIVAP). Raman Spectroscopy was used in the present investigation to evaluate the degree of conversion of composite resin, photoactivated by the Halogen lamp, the Argon Laser beam and by the Light Emitting Diode. Eighteen circular blocks of resin (7mm X 2,5mm) were cured by the Halogen light source (n = 9, = 400-500nm, Power density = 478 mW/cm²), by the Argon laser beam (n = 9, = 488nm, Power density = 625 mW/cm²) and nine blocks (6mm X 3mm) by the LED (n = 9, = 475 15nm, Power density = 190mW/cm²) using the same irradiation time (20, 40 and 60 seconds). The resin surfaces were analyzed immediately after curing by Raman and FT-Raman Spectroscopy. The Raman results show changes of the relative intensities between the peaks at 1610 and the 1640cm⁻¹, as a function of irradiation time. After 60s of irradiation time, the maximum degree of conversion reached for the samples cured either by the Argon laser, the Halogen lamp and LED were 66,4%, 62,2% and 52%, respectively. The Argon laser was more effective and shown a better biocompatibility, with less residual monomer in the bottom.

Oral Presentation

OP67

Monitoring of in vitro caries lesion production by photographic visual method and DIAGNOdent.

Zanin, S.; Zanin, I.C.J.; Rodrigues, L.K.A.; Brugnera Júnior, A.; Santos, M.N.; Zanin, F.

Universidade Biomedical Laser Center at IPD&UNIVAP-São Jose dos Campos -SP.

The conventional methods for caries diagnosis have some difficulties in detecting the presence of lesion, mainly in its initial development phase. The DIAGNOdent laser (KaVo) appeared in dental clinic practice in 1998 as a device for diagnosis of caries lesions on smooth and occlusal surfaces. Many studies have reported the good sensitivity and specificity of such device in the diagnosis of lesion in its initial stages. The purpose of this work was the in vitro monitoring of enamel demineralization of deciduous teeth promoted by acid treatment with a saturated hydroxyapatite demineralizing solution for 24, 48 and 96 hours. The monitoring based on photographic visual examination and DIAGNOdent readings has been performed by three calibrated examiners and the correlation between the two methods has been determined. The validation of the mineral loss has been obtained from the determination of the difference in phosphorus concentration of the caries promoter solutions before and after the treatments. According to the obtained results, the photographic visual examination and the DIAGNOdent laser device were capable of monitoring the caries lesion production by acid treatment and a positive correlation between the methods has been found.

OP68

Effect of Er:YAG and diode lasers in the adhesion of blood components and in the morphology of irradiated root surfaces.

Theodoro, L.H.; Garcia, V.G.; Zezell, D.M.; Haypek, P.; Bachmann, L.; Sampaio, J.E.C.

Doutora em Periodontia- Araraquara-UNESP.

The aim of this study was to evaluate in vitro the adhesion of blood components on root surfaces irradiated with Er:YAG (2.94 μ m) and GaAlAs Diode (808 nm) lasers and these effects on irradiated root surfaces. It was obtained 100 samples of human teeth. They were scaled and divided into five groups of 20 samples each: G1 (Control); G2 -Er:YAG laser (7.6 J/cm²); G3 -

Er:YAG laser (12.9 J/cm²); G4 -Diode laser (90 J/cm²) and G5 - Diode laser (108 J/cm²). After these treatments were conducted, 10 samples of each group received a blood tissue, and the remanent 10 samples did not receive such treatment. After laboratory treatments the samples were analysed by scanning electron microscopy. The results have shown that there were no significant differences between the Control Group and the groups treated with Er:YAG laser (p=0,9633 and 0,6229); G4 and G5 were less effective than the Control Group and the Er:YAG laser groups (p<0,01). No proposed treatment increased the adhesion of blood components in a significant way when compared to the Control Group; although the Er:YAG laser did not interfere in the adhesion of blood components it caused more changes on the root surface, while the Diode laser inhibited the adhesion.

OP69

Clearness effect of Er:YAG and Nd:YAG laser radiation on root canal walls.

Ramalho, K.M.; Eduardo, C.P.; Marques, M.M.; Mene-guzzo, D.T.; Apel, C.; Gutknecht, N.
Estágiaria do LELO.

The purpose of this study was to evaluate the effect of laser radiation (Er:YAG and Nd:YAG) after conventional endodontic treatment on the clearness of root canal walls. 13 extracted single root human teeth were divided into 3 groups: 1- Er:YAG laser radiation (Key-Laser 3, Kavo Germany - 120mJ, 1.8W, 15Hz) (n=5); 2- Nd:YAG laser radiation (Pulse Master 1000IQ, American Dental Technologies - TX USA - 100mJ, 1.5W, 15Hz) (n=5); 3- Control group, not irradiated (n=3). The teeth were irradiated 3 times with rotational movements in apical-coronal direction, 1 second per 2 mm of root canal. The teeth were longitudinally bisected and prepared for scanning electron microscope (SEM) study. Independently of the experimental group, both clean and dirty areas could be observed at the same sample. The samples treated with Er:YAG laser mostly presented clean areas, whereas the control canal walls mostly exhibited areas covered by smear layer. These results showed that fully cleaned root canal walls are difficult to obtain. Thus, changes in laser radiation parameters and technique should be tested to achieve better results.

OP70**Model of thermal and optical effects in dental pulp during the neodymium and diode lasers irradiation.**

Farhart, P.B.A.; Tanji, E.Y.; Farhat, R.P.; Zezell, D.M.; Miyakawa, W.; Nogueira, G.E.C.

Mestre em Laser em Odontologia pelo IPEN e FOU SP/SP. Applications of high intensity lasers in the enamel and dentine can produce adverse thermal effects into the pulp. Since the evaluation thermal effects into the intact pulp is not a solved problem, extracted teeth models have been used frequently. Current models, however, simulate only tooth thermal properties, not taking the remaining radiation in the pulp chamber into account. The aim of this study was to verify if the remaining radiation from neodymium and diode lasers that reach the pulp chamber, at the models using extracted bovine teeth, can causes local thermal effects. For this purpose, two models were developed using extracted bovine teeth with their pulp chambers filled with: water (model 1) and with an optical absorbent (model 2). Models were radiated with 1 W. The obtained results show that, for both lasers, the temperature rise in model 2 pulp chamber is: i) up to 11% higher than in the model 1 when the enamel is radiated and ii) up to 37% higher than in the model 1 when dentine is radiated (1 mm from the pulp). Thus, remaining radiation into the pulp is relevant for the above mentioned lasers and doses.

OP71**Carbon dioxide laser or cold scalpel on the removal of gingival melanin pigmentation - Comparative Study.**

Kogler, V.L. ; Maio, M.; Lage-Marques, J.L.; Zezell, D.M.. Melanin pigmentation is the result of melanin granules produced by melanocytes present in the basal layer of the oral epithelium. Gingival physiological melanin pigmentation is symmetric and persistent, may cause esthetic problems especially in individuals with a gummy smile. Various techniques have been described for the removal of melanin pigmentation from the gingival epithelium and partial thin connective tissue, as chemical agents, cryosurgery, surgery and gingival grafts. Recently, lasers systems have been used to coagulate and vaporize cells, promoting controlled gingival ablation. This study compares clinical efficiency

to removal gingival melanin pigmentation in 20 patients with dioxide carbon laser, and 20 patients with cold scalpel during 30 days after surgery. A dioxide carbon laser (output = 5W; super-pulse = 0,5s; spot size = 2,5mm defocused; focal distance = 5,5cm, Intensity = 102 W/cm²) was irradiated on gingival mucosal surface. Both techniques presented epithelialization in 15 days. Both systems are considered effective for removal melanin pigments. Patient's evaluation with postoperative pain found the carbon dioxide laser technique superior to the cold scalpel one. After 30 days, the repigmentation occurred in 45% of the dioxide carbon laser patients, and 80% of the cold scalpel patients.

OP72**Bacterial reduction in class II furcation after root debridment with or without Nd:YAG laser irradiation.**

Andrade, A.K.P. ; Feist, I.S.; Cai, S.; Pannuti, C.; Zezell, D.M.; De Micheli, G.

The use of Nd:Yag laser for bacterial reduction as an adjuvant to nonsurgical periodontal treatment has been approached in several studies. Furcation complex anatomy is responsible for comprised treatment results in this areas due to the lack of proper access for instrumentation showing the persistence of a pathogenic microbial flora. The purpose of this clinical trial, randomized, double-blinded was to evaluated the bacterial reduction achieved with the Nd:YAG associated to conventional treatment on furcation sites of patients with chronic periodontitis. In a split mouth design study, 34 class II furcations that were selected from 17 patients with chronic periodontitis. They received previous full mouth periodontal treatment, except for the experimental sites. The 17 furcations of the Control group underwent twice manual and ultrasonic root debridment in weekly intervals. The Test group received the same treatment as the Control group followed by the Nd:YAG laser application (100mJ/pulse; 1.5W; 15Hz; 60sec). The microbiological parameters total numbers of anaerobic Colony Forming Units(CFU); Black pigmented CFU and the level of *Actinobacillus actinomycetemcomitans*(Aa), *Porphyromonas gingivalis* (Pg) and *Prevotella intermedia*(Pi) were determined at baseline, immediatly and one month after the treatment. The results showed a significant reduction of total CFU for both groups immediatly after the treatment, but it was better for the Test group. After one month the total CFU average increased but

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was still below pretreatment levels for both groups. The black pigmented CFU and the level of Aa, Pg e Pi decreased significantly after the treatment but 30 days after there was an increase almost equal to baseline levels for both groups. The Nd:Yag laser associated with convencional treatment promoted bacterial reduction on class II furcation immediately after its application.

OP73

Ultrashort pulses over bovine dental enamel.

Todescan, C.D.R.; Vieira, Jr., N.D.; Samad, R.E.; Freitas, A. Z.; Eduardo, C. P.
FOUSP - LELO.

The interaction of lasers with the hard structures of the teeth, has found the excess of heat as a problem for its utilization. This study analyzes, in vitro, the interaction of the ultrashort pulse laser of Ti:safire (830 nm) with the bovine dental enamel.

The system consisted in one main oscillator integrated with an amplifier (CPA). The pulses extracted before the temporal compression inside the amplifier had 30ps, 1000Hz and ~1mJ. The pulses extracted after the compression had 60fs, 1000Hz and ~0,7mJ. The M2 was 1,3, the focal lens 2,5 cm, the focal distance 29,7 and a computadorized translation stage x,y,z moved the sample.

We evaluated the amount of tissue removed per pulse, the resulting cavities and the surrounding tissues not irradiated, under OM and SEM.

The fluency was the major factor for differentiating the two regimens studied, therefore, the intensity was not so important as we expected in this process. We found: one ablation region in "cat tongue", one ablation length, one fluency ~0,7J/cm² for 30ps and ~0,5J/cm² for 60fs (50% of high speed burr), smooth edge for 30ps and high precision of the shrp edge cut of submicrometric order for 60fs.

OP74

Bonding of self-etching and total-etch systems to Er:YAG laser-irradiated dentin. Tensile bond strength and scanning electron microscopy - Bonding to lased dentin - Tensile strength and SEM.

Ramos, R.P., Chinelatti, M.A., Chimello, D.T., Borsatto,

M.C., Pécora, J.D., Palma-Dibb, R.G.

Centro de Laser - FORP-USP.

This study investigated the effect of Er:YAG laser on bonding to dentin and the interaction pattern of different adhesive systems with the lased substrate. Tensile bond strength of a self-etching [Clearfil SE Bond(CSEB)] and two total-etch [Single Bond(SB) and Gluma One Bond(GOB)] systems to lased and non-lased dentin was evaluated and the adhesive interface morphology was examined by SEM. Dentin was either treated following the manufacturers' instructions (A) or submitted to Er:YAG lasing (80mJ;2Hz) + adhesive protocol (B). Resin cones were bonded to demarcated dentin site and tested in tensile strength. For SEM, dentin discs were obtained, bisected and the halves were treated as described above (A or B). The adhesive interfaces were examined. TBS means in MPa were: CSEB: (A)20.65(±1.81), (B)14.06(±1.88); SB: (A)18.36(±1.48), (B)16.19(±1.90); GOB: (A)16.58(±1.94), (B)14.07(±2.13). ANOVA and Tukey tests revealed that lasing of dentin resulted in significant decrease in bond strength ($p < 0.05$). In the non-lased subgroups, CSEB had higher bond strength than the total-etch adhesives ($p < 0.05$). Conversely, in laser-ablated specimens, CSEB provided the lowest bond strength, while SB yielded the highest means ($p < 0.05$). Consistent hybrid layers were observed for conventionally treated specimens, whereas either absent or scarce hybridization zones were viewed for lased subgroups. Er:YAG laser irradiation severely undermined the formation of consistent resin-dentin hybridization zones and yielded remarkable lower bond strengths. CSEB self-etching primer appeared to be the most affected by the laser ablation on dentin substrate, resulting in the weakest adhesion.

OP75

Cavosurface angles of Er:YAG laser cavity preparations in deciduous teeth.

Giusti, J.S.M.; Santos-Pinto, L.; Lizarelli, R.F.Z.; Bagnato, V.S.

Doutoranda em Odontopediatria pela Faculdade de Odontologia de Araraquara UNESP/ IFSC - USP.

The purpose of this study was to evaluate the rounding of the cavosurface margins and cavity floor. Measurements of cavosurface angles and the angle of cavity concavity were made at the margins and the bottom of the lased deciduous teeth enamel using

scanning electron micrographs and modified cephalometric program. The laser used was the Er:YAG laser system (Twin-light Laser Dental, Model S, Medical Lasers, Slovenia) that emitted at a wave length of 2.94 μm with a spot size of 0.70 mm. Radiation was perpendicularly applied during 10 s at a focal distance of 13 mm, with a pulse repetition rate of 10 Hz. The energy was set at 200 or 300 mJ. Statistical analysis indicated significant difference in both, occlusal and cervical cavosurface angles, when energy was increased. The occlusal versus cervical angles analysis in cavities prepared with the same energy levels presented no significant difference. However, higher energy level irradiation resulted in concavity angle reduction and the cavity preparation became deeper.

OP76

Enamel superficial roughness submitted to laser-activated bleaching followed by neutral fluor in teeth of individuals with cerebral palsy: in vitro study.

Marsilio, A.L.; Santos, M.T.B.R.; Siqueira, W.S.; Genoveze, W.J.

Doutora em Odontologia Restauradora pela UNESP - F.O.São José dos Campos .

The objective of this study was to evaluate superficial roughness of enamel submitted to the laser-activated bleaching followed by application of neutral fluor in teeth of individuals with cerebral palsy. Twenty deciduous teeth obtained by exfoliation were used. In the buccal face of teeth a rectangle (2mm x3mm) was done. All twenty samples were analyzed in a profilometer obtaining baseline mean roughness (baseline Ra), afterwards, they were submitted to bleaching with laser-activated 35% hydrogen peroxide with use of LED (470nm) and a diode infrared laser (830nm). Three applications of the bleaching agent activated for 90 seconds each were accomplished. After bleaching samples were analyzed again for final mean roughness (final Ra). Soon after the samples received topical application of neutral fluor for 4 minutes and new roughness measurement was accomplished (Fluor Ra). The results analyzed by the Friedman test showed significant difference between the baseline Ra ($2,28 \pm 0,39$) and the final Ra ($3,26 \pm 0,77$) $p < 0.01$. However significant difference was not observed between Baseline Ra and the Fluor Ra ($2,29 \pm 0,61$). Superficial roughness of enamel in teeth of individ-

uals with cerebral palsy increased significantly after the laser-activated bleaching. Nevertheless, it came back to similar baseline values after the application of neutral fluor.

OP77

Electromyographic evaluation of masseter and temporalis muscles before and after low intensity laser therapy on sigmoid notch.

Paiva, G.; Moreira, L.A, Paiva, A.F.; Nunes, L.J.; Nasr, M.K.

Director of the Centro de Diagnóstico e Tratamento da ATM - UNICSUL.

Electromyographic (EMG) evaluation of the masseter and anterior temporalis muscles were made previous and after application of Laser of low intensity of 10 students of the Dental University (Universidade Cruzeiro do Sul - UNIC-SUL). The EMG exam was made with the BioPAK (BioRESEARCH, Assoc., Inc., USA) system, being used surface electrodes. The protocol of punctual application of the laser (LaserMED, Carci Ltda, infra red Laser of InGaAs of 905 nm, 60 Watts of pick, medium potency of 19,2 miliWatts, class 3b) of low intensity was as follow: 8 J/cm² on the posterior part of the capsule, 8 J/cm² on the medium third of the capsule and 8 J/cm² on the anterior third of the capsule, after what was made new EMG evaluation, showing as resulted EMG alterations in the masseter and anterior temporalis muscles.

OP78

The clorexidine influence on the microleakage of Er:YAG laser prepared cavities.

Robles, F.R.P. ; Geraldo-Martins, V.R.; Matos, A.B.

Restorative Dentistry.

This study aims to evaluate the role of the clorexidine on marginal microleakage of class V cavities prepared with carbide bur (CB) and Er:YAG laser. Forty-eight bovine incisors were divided in four groups; cavities were performed on their buccal-cervical surfaces, having their edges surrounded by enamel: GI and II-#56 CB conventional preparations; GIII and IV-Er:YAG laser preparations (350mJ/4Hz/112.34J/cm² on enamel and 250mJ/4Hz/80.24J/cm² on dentin) air/water refrigerated (5ml/min). In groups II and IV, before adhesive application, cavities were 2% clorexidine rinsed

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(unlike the other groups). All cavities received Clearfill SE Bond application and Z100 composite resin restoration. After 24h, teeth were polished, submitted to 500 thermo-cycles (50-55°C), sealed (Araldite and cosmetic varnish - except for the restoration and 2mm around it). Samples were immersed in 2% methyl-blue dye (4h) then sectioned in buccolingual direction to be later evaluated by scores (0-3) according to the degree of microleakage. The results showed no significant differences among the studied groups nor between the evaluated restoration margins (Kruskal-Wallis, $p < 0,05$). In conclusion, it was found that the use of the clorexidine didn't negatively interfere on the adhesion process whether in CB or Er:YAG laser prepared cavities, when resorted to using the studied self-etching adhesive system.

OP79

Effects of Nd:YAP laser on dentin permeability after endodontic preparation: a scanning electron microscopic study.

Santos, C.H.S.D.; Koga, E.; Molina, L.P.; Genovese, W.J.; Zampieri, M.J.P, Zângaro, R.A..

Mestrando em Bioengenharia UNIVAP .

This study evaluated in vitro the capacity of reduction of dentin permeability using the Nd:YAP laser (1340nm) after endodontic preparation. For this purpose, 30 human teeth were prepared by serial technique with 0,5% sodium hypochlorite and final irrigation with EDTA-T and then divided in three groups: GI- control group; GII- laser parameter I (5Hz; 0,9W; 180mJ) and GIII- laser parameter II (5Hz, 1,8W, 360mJ). After endodontic preparation of all groups and irradiation of GII and GIII, specimens had been split longitudinally and one hemiface of the canal was submitted to SEM (Scanning Electron Microscope) analysis. Less amounts of open tubules had been observed in the irradiated groups when compared with control group. Use the Nd:YAP laser was effective in the reduction of dentin permeability.

OP80

In vitro and in vivo evaluation of deciduous teeth whitening technique - The diode laser and light cure.

Gontijo, I.T.; Ciamponi, A.L.; Zezell, D.M. ; Navarro,R.; Rodrigues, W.; Ciamponi, A.L..

Mestre em Odontopediatria -FOUSP .

A great number of children suffer from traumatic injuries on the deciduous dentition. The darkening resulting from these injuries create an aesthetic problem in these children in the middle of their psychosocial development. The whitening technique might be a satisfactory aesthetic resolution, as well as non-invasive. The objectives of the present study were to evaluate "in vitro" and "in vivo" the teeth color variation and superficial temperature, obtained by the thermocatalytic technique used in devitalized human deciduous teeth, as well as evaluate "in vivo" the teeth color variation obtained by the whitening. The whitening agent was the hydrogen peroxide 35%, having as a variant the source of catalyzing energy- diode laser and the light curer. 21 deciduous teeth were utilized. The light curer group-11 teeth and the laser group, 10. The color evaluation was carried out by the spectrophotometer and VITA 3D scale. After statistic analysis, it can be concluded that the whitening was verified by both methods. The temperature variation was significantly higher in the light cure group than in the laser group.

OP81

The antibacterial effect of Nd:YAG Lasers in Endodontic therapy - Study in vivo.

Camargo, S.C.C.; Silva, R.M.; Olsen, I.; Aun, C.E.; Debelian, G. Doutora em endodontia pela FOU SP .

The aim of this study was to evaluate the antibacterial effects of Nd:YAG lasers in endodontic therapy. Twenty-four teeth with the diagnosis of asymptomatic apical periodontitis were selected . In group I, conventional endodontic instrumentation was performed. In group II, after instrumentation, intracanal Nd: YAG (ADT-SOL) laser irradiation was done (1.5W and 15Hz, (1mm/sec), 10 irradiations with intervals of 30 seconds. Microbiological sampling was taken from the root canals before and after instrumentation the 1st appointment. The root canals were then left empty for 7 days when a third sampling was taken. (The samples were anaerobically cultivated. Microorganisms were evaluated in accordance to number of strains recovered and the CFU (colony form units) based on a graduation of low, moderate and high growth. Microorganisms were isolated from 23 (95,8%) canals during the first collection. Obligate anaerobic bacteria were recovered in 90,9% of the cases and facultative-aerobe in 43,47%. Nd: YAG laser irradiation (Gr. II) reduced the number of intracanal microorganisms following instrumentation and one

week after, when compared to Gr. I (without Nd:YAG) ($p < 0,05$). The results indicated that Nd:YAG irradiation associated to conventional endodontic preparation has better disinfection properties than conventional instrumentation of the canals alone.

OP82

In vitro thermographic measurement in pulpal chamber during diode laser bleaching.

Guimarães, J.G.A.; Miyakawa, W.; Stolf, S.F.; Silva, E.M.; Zezell, D.M.; Eduardo, C.P.

Membro do Núcleo Integrado de Aplicação do Laser em Odontologia da Universidade Federal Fluminense (NIALO-UFF).

Thermographic was employed to determine the temperature rise in lower incisors pulpal chambers during diode laser bleaching. Two methods were used: a thermocouple for 72 teeth and a infrared (IR) thermographic camera for 36. Two bleaching agents, both 35% hydrogen peroxide- Whiteness HP (HP) and Hi Lite (HL) - were applied to the specimens buccal surfaces and irradiated with a diode laser (808 5nm), CW for 30s. Intensities tested were 21.W/cm², 29.8W/cm², 35.8W/cm², 38.2W/cm², 52.9W/cm² e 63.7W/cm². Means of the greatest temperature rises with the HL were statistically lower than the HP ($p < 0.01$). When HP was irradiated with 50.9W/cm² and 61.1W/cm², the temperature registered was over 5.5°C, considered as the limit to avoid pulp damage. The IR thermacam analysis showed that, when the HP was used, the temperature rise in pulp chamber was similar to the target area on the buccal surface. Evaluation of tooth color was done using a VITA shade guide at baseline and at the end of the bleaching treatment. Both products proved to be efficient, however HP produced statistically higher shade changes than HL ($p < 0.01$). It can be concluded that the diode laser bleaching associated with the HP was safe when intensities below 50mW/cm² were employed. Higher parameters can cause damage to pulp vitality of the lower incisors, fact that did not occurred with the HL gel. Both gels were efficacious to the bleaching technique proposed, but the HP showed better results.

OP83

Surgical Treatment of dilantin gingival fibromatosis with the CO2 laser.

Varellis, M.L.Z.; Brugnera Júnior, A.; Zanin,F.;

Pinheiro, A.L.B..

Biomedical Laser Center IPD/UNIVAP - São José dos Campos/SP.

Periodontal diseases have varied etiology, includingv the use of some drugs. The use of dilantin and simiçar drugs results on severe gingival growth. Previous study has pointed out that the use of the drug alone is not enough to trigger the growth beeing necessary the presence of local irritants such as the dental plaque. Histologic studies have pointed out that on gingival hyperplasia there is a increase on the number of fibroblasts, macrophages and varied levels of inflammation and edema.The treatment os dilantin induced hyperplasia with surgical alsters is effective and presents advantages such as reduced time of the procedure, hemostasis,less pain and good wound repair. This work presnts a case of dilantin hyperplasia treated with a CO2 laser.

OP84

Cavity Preparation with ER:YAG Laser - Pain Evaluation.

Paiva, P.F.; Paiva, G., Nasr, M.K., Nunes, L.J., Moreira, L.A., Zezell, D.M.

Director of the Centro de Diagnóstico e Tratamento da ATM. This work was approved by the ethics committees in research in human beings of IPEN and of FOU SP, under the opinions # 000753 and # 34/01, respectively.

They were selected for this work clinic patient of the which were selected 15 teeth with decay lesion, being ten teeth with lesion type class I, of these five for the group-control with high conventional rotation, and five for the group laser class I, and five teeth with lesion type class V for the group laser. In the preparations with laser of Er:YAG (Kavo Key Laser 2), any patient do not was anesthetized, even in the deepest cavities, and the maximum degree of pain (that varied from 0 to 10) it was of 4. In the group-control, with mounted tip in high conventional rotation, two patients were anesthetized, and the maximum degree of pain was of 7.

The use of the laser in the dental clinic (restorative dentistry), using the technology laser in the dental preparations, it showed to be a good alternative to the use of the mounted tip in high conventional rotation.

OP85**Mechanical and histological evaluation of Ga-AsAL laser (=830nm, 40 mw CW) effects on distraction osteogenesis mandibular in sheeps.**

Gaião, L. ; Cerqueira, A.; Pinheiro, A.L.B.; Lamberts, M.; Oliveira, M.G.; Heitz, C.

Mestrando em Cirurgia e Traumatologia Bucocomaxilofacial, Pontifícia Universidade Católica do Rio Grande do Sul.

The application of non-ablative lasers on distraction osteogenesis technique, which presents different characteristics from the ones observed on bone repair, it wasn't so deeply researched until now. This study aimed to verify the effects of GaAsAl laser (=830 nm, 40 mw, CW) in mechanical resistance and histological findings of bone sites underwent distraction osteogenesis technique. Eighteen sheeps, divided in two experimental groups: E1 (irradiated on distraction time) and E2 (irradiated on consolidation time); and a control group: C (not irradiated). All groups were undergone to the same protocol of distraction osteogenesis mandibular technique. The experimental groups were irradiated five times, every other day, with 4,0 J/cm² dose, resulting in 16 J per section and 80 J total dose. As results, it was observed a significant increase in mechanical resistance to traction of lengthened mandibles that received laser irradiation (p=0,028). The experimental group which was irradiated on distraction time presented a more resistance to traction than control group. In histological findings, it was verified an important presence of woven bone osseous trabeculae in all of lengthened sections, it was also observed an absence of dense fibrous conjunctive tissue with osteoid matrix deposition, however it was presenting areas with an endochondral ossification pattern and cartilaginous tissue formation.

OP86**Investigation of the possibility of bacterial transmission when using the CO₂ Laser: Study in vitro.**

Almeida, D. ; Meireles, G; Azevedo, A.C.; Vieira, A. ; Soares, A.; Pinheiro, A.L.B.

Doutoranda em Laser - UFPB/UFBA.

This Work has the purpose to verify the possibility of bacterial transmission through the smoke emitted during surgeries using laser of high power, in this case, the CO₂ laser. For this, fifteen

rats of the Wistar specie were used, adults and males. These animals were divided in three groups, where in each group two animals were the control (without infection) and three infected with Staphylococcus aureus. Four hours after the surgeries (excisional wounds) these animals were inoculated with Staphylococcus aureus suspension (ATCC 6538). After 48 hours, the infection was evident and subsequently, the CO₂ laser irradiation with 4,5; 7 and 10 W performed, and the smoke plume resulting from the wounds laser treatment were collected by suction and sent for laboratory analysis. The suction was carried out by a device of air collection, SAS Super, used by nutrition professional in "Restaurant's". This trapped smoke is deposited in planes with selective culture for Staphylococcus aureus and later analysed to confirm the presence of this microorganism. The result was negative for the Staphylococcus aureus.

OP87**Frenectomy and gingivoplasty with Er:YAG laser-09 years as laser users.**

Menezes, M.R.M.; Menezes, A.F.; Florio, M.L.; Flório, M.C..

Lasers of high power density are those able to promote ablation in soft or hard tissue without cause damages and heating, the example of the Er: YAG laser. In Dentistry, the Er:YAG laser can be used, amongst as many applications, for periodontal surgery as gingivoplasty, crown lengthening, lingual and labial frenectomy, distal wedge, implants. Frenectomy is the removal of the superior or inferior labial frenum or tongue-tie, with the purpose to get a better esthetic or prostheses adaptation, and to close diastemas. The anquiloglossia partial (tongue-tie) presents short lingual frenum or insertion close to the tongue, and when it develops diction disturbs, deglutition or phonation problems to the patient, must be removed. The authors consider to present clinical cases with labial and lingual frenectomy, gingivoplasty realized with the Er: YAG laser of high power density and to show the innumerable advantages of the use of such mechanism in the daily clinic on the conventional surgery such as, little bleed, good visualization, sterilization of the surgery field, reduction postoperative pain, repairing without contraction of scars, postoperative without edemas and with fast process of healing.

OP88

Root surface decontamination by using Er YAG Hard Laser.

Kina, J.R.; Lopes, A .M.; Jardim Júnior, E.G; Kina, E.F.U.; Castilho, A. P.; Kina, J.R.

Mestrado e Doutorado em Reabilitação Oral: USP - Bauru . The ANUG is acute lesion that occurs in patient under hard stress. We have treated a patient that developed ANUG by using root scaling associated with metronidazol. After resolution of acute phase we have used mucogingival surgery to try to recover root surface of 31 and 41. Er YAG (Kavo Key Laser) Hard laser is used to decontaminate the root surface and soft laser (J. Morita Co) is used to improve the result. In this case the root surface decontamination by using Er YAG hard laser at 120 mJ and 10 Hz was effective and helped to recover root surface of 31 and 41.

OP89

Histological evaluation of oxidized regenerated cellulose resorption under low level laser therapy.

Pozza, D.H. ; Soares, L.P.; Fronza, B.R.; Santos, M.E.S.-M.; Pinheiro, A.L.B.; Oliveira, M.G.

Doutorando em Laser pela UFBA - BAHIA.

Thirty-six white male Wistar rats averaged aged 6 weeks and weighing 250g were used on the present investigation, they were kept under controlled laboratory conditions. Each animal, under general anesthesia had a standard 0.5cm² block of oxidized regenerated cellulose (Surgicel®) inserted on its tongue. After surgery the animals were randomly distributed in two groups with 18 animals in each: Irradiated and non-irradiated (control). The groups were divided into three subgroups according to the killing time: G1 (one day), G2 (three days), G3 (seven days). Lasertherapy consisted of four sessions carried out at every 48h. Laser light was transmucosally applied in one field (4J/cm², 685nm, 35mW, F=0.06mm). The control group receives no laser therapy. Thereafter, the tongues underwent microscopic examination after staining with haematoxylin and eosin. The better results to the laser group were seen by statistical differences on acute inflammation (neutrophils at 1st day, p=0.004) and wound healing (fibroblasts at 3rd day, p=0.041). No statistical differences were seen on chronic inflammation (lymphocytes at 7th day, p=0.209). The results propose that LLLT, 685nm, can improve the healing process, even when the inflammatory

process has being stimulated by Surgicel®.

OP90

A protocol for the use of lasertherapy on the treatent of dentine hypersensitivity.

Cruz, F.M., Brugnera Júnior, A., Santos, A.E.G., Bologna, E.D., Ladalardo, T.C., Zanin, F.

Disciplina de Laser em Odontologia e Centro de Laser da UNICASTELO.

Dentine hypersensitivity is one of the most frequent complain on the Dental Clinic. Because of this, there is a constant search for new methods for treating this condition. The aim of the present study was to demonstrate the protocol used on the Centro de Laser da UNICASTELO. This protocol was based upon clinical and histological assessment of the proposed methodology. The technique consist of a correct diagnosis of the condition and the use of 670nm (4mW), 790nm (40mW) or 830nm (50mW) laser light and the use of 1J/cm² on four points, being three on the buccal surface and one on the lingual. This method has been proven very effective on treating this condition. The authors carried out a five years clinical retrospective study, which found the effectiveness on pain reduction in 91,7% of teeth treated. This alternative treatment is useful for both patients and professionals.

OP91

The lasertherapy in some clinical applications.

Santos, A.E.C.G; Bologna, E.D.; Ladalardo, T.C.C.G.P.; Brugnera Júnior, A..

Mestre em Dentística Restauradora - UNICASTELO.

The lasers have been used in a large scale when we talk about dentistry, with different wavelengths and power densities, possibiliting its use by various manners. Its cellular response is characterized by the tissue's biomodulation, compatible with the analgesic, anti-inflammatory and wound healing process.

It has been employed the LLLT (Low reactive-Level Laser Treatment) in dentistry to rebalance the cellular functions, bringing a better comfort to the patient. Because of this biomodulation capacity, we are proposing some suggestions of treatment in a clinical indications, like: gingival hyperplasia, T.M.D, pericoronaritie, wound healing, etc.

We observed that, although the application's form can be different

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one to another lesion, we concluded that, generally, the time of the wound healing and the symptoms remission always were inferior. Based on it, we require some especial attention at the moment that we use the laser to the tissue absorbs the maximum energy causing a satisfactory therapeutic effect.

Because of the LLLT therapeutic action, the authors can suggest some clinical applications, energy densities, forms and frequency in the various clinical indications with the purpose of offer a better treatment and comfort to the patient.

OP92

Effects of Low Intensity Laser Radiation in the Prevention of Oral Mucositis in Patients Undergoing Bone Marrow Transplant.

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Oral mucositis is one of the complications arising from pre bone marrow transplant conditioning, which can substantially change the patient's quality of life. The purpose of this randomized double blind study was to compare the effects of low intensity laser radiation in the prevention of oral mucositis in patients undergoing bone marrow transplants. Seventy patients at the Seattle Cancer Care Alliance in the U.S.A. were approved by the local ethics committee and gave their informed consent to take part in the study. The 70 patients were divided into three groups (group 1 - laser 650nm; group 2 - laser 780nm and group 3 placebo). The therapy or placebo treatment began on the first day of the conditioning and continued through to two days following the bone marrow transplant. Mucositis was measured according to the oral mucositis rate and the pain assessment rate (VAS). We were thus able to conclude that the diode 650nm laser indeed decreased the severity of oral mucositis as well as the degree the pain when used as a preventative therapy in patients undergoing bone marrow transplants. In this study, low intensity laser therapy was regarded as safe and did not present any side effects.

OP93

Conditioning of Fossulae and Fissures with ER:YAG Laser in Odontopaediatrics.

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It will be presented clinical pediatric case of fossulae and fissures preparation with Laser of ER:YAG (Kavo Key Laser 2) 2,94 micrometers, class 4, maximum 800 mJ/Pulse.

Duration of the pulse: 250 - 500 microseconds

Frequency of the pulse: 1 - 15 Hz

Pilot laser (635 nm), class 2, maximum of 1mW

The use of Laser of ER:YAG in the cavity preparation has countless advantages in the children's treatment, mentioning as example: pain absence, structural change of the enamel-dentin, turning them resistant to the acids and comfort for the patient.

It will be discussed regarding the times of application of the conditioning as well as of the protocol of use of the Laser of ER:YAG in pediatric patient.

OP94

Dental Cervical Lesions Prepared with Er:YAG Laser Caused by Abfraction, Abrasion and/or Erosion.

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Three (3) clinical cases of patient with cervical dental lesions were selected. The lesions are respectively classified as abfraction, abrasion and/or erosion. The preparation of the lesions was made with ER:YAG laser (Kavo Key Laser 2). Pulp protection with light cure glass ionomer liner (Vitrebond, 3M ESPE) and restoration with composed resin Filtek Z 250 (3M ESPE). The patient with lesion cervical type abfração was the only to need of anesthesia. The diagnosis and classification of the cervical lesions, exception of the type abfração in youths, is difficult.

It is indispensable occlusal analysis of patient with cervical lesions. The use of the laser of ER:YAG was shown extremely effective in the conservation of dental tissue.

OP95

Application of the Laser of Low Intensity in the Muscle Masseter and Temporal: Evaluation electromyography.

Nasr, M. K; Paiva, A. F.; Paiva, P. F.

The objective of this work is to evidence the answers electromyography of the muscles masseter and previous storm after different forms of application of the Laser.

In a total of 15 individuals, divided in 3 groups, the Laser was applied (LaserMed InGaAs of 905 nm, 60 Watts pick of Carci LTDA) in the muscle Left Masseter: On time 3 Joules (group 1), for sweeping 9 Joules (group 2) and on time and concomitant sweeping (group 3).

Quantified the results, it was possible to verify that so much the muscle that received irradiation of the Laser, as well as the same individual's other muscles, had an increase of the activity electromyography, independent to the application form.