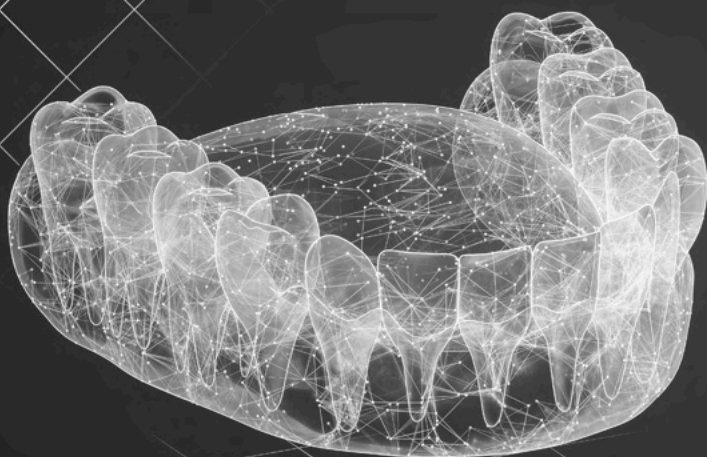


Novas tecnologias e
propriedades clínicas em
ODONTOLOGIA



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(Organizadora)

Novas tecnologias e
propriedades clínicas em
ODONTOLOGIA



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APRESENTAÇÃO

A expansão do conhecimento é alcançada pela busca de soluções para os problemas do cotidiano. Essa busca incessante traz inúmeros benefícios e hoje é movida pela tecnologia.

Em Odontologia, a incorporação de novas tecnologias no planejamento e manejo de cada caso tem aperfeiçoado a prática clínica, tornando os procedimentos mais rápidos, seguros e menos invasivos.

Neste novo E-book a Atena Editora traz uma sequência de artigos que apresentam as novidades na área. Espero que tenha um ótimo momento de leitura!


Emanuela Carla dos Santos

SUMÁRIO

CAPÍTULO 1..... 1

A IMPORTÂNCIA DE ESTRATÉGIAS NA PROMOÇÃO DA SAÚDE BUCAL NA GESTAÇÃO


Luana de Sousa Franco
Mara Ramel de Sousa Silva Matias
Caio César Silva França
Erick Thiago de Sousa
Carolina Pereira Tavares
Natanielly Oliveira de Abreu
Dalmária da Silva Raul Rocha
Camila Cardoso Ibiapina
Ana Caroline Chagas Silva Feitosa
Fernanda Noletto Santos
Maria Elisângela da Silva
Rita Flávia Mesquita

 <https://doi.org/10.22533/at.ed.5872222091>

CAPÍTULO 2..... 10

ANÁLISE TOMOGRÁFICA DO AUMENTO DE VOLUME ÓSSEO APÓS ENXERTO AUTÓGENO EM REBORDO ANTERIOR DE MAXILA

Kelvi Luiz de Freitas
Evaldo Artur Hasselmann
Leonardo Piazzetta Pelissari
Rafael Marques dos Santos
Alessandro Hyczy Lisboa

 <https://doi.org/10.22533/at.ed.5872222092>

CAPÍTULO 3..... 21

ANSIEDADE COMO FATOR PREPODERANTE PARA ADVENTO DE DTM

Luana de Sousa Franco
Camila Cardoso Ibiapina
Carolina Pereira Tavares
Brenda Gonçalves de Sá
Antoniell de Sousa Pereira da Silva
Fernanda Noletto Santos
Natan da Costa Damaceno
Rafaela Alves da Costa
Amanda Kalinca de Oliveira Silva
Ana Hellen Santos Costa
Fernanda Martins Sandes Bezerra
Liz Lemos Maranhão Souza Neta

 <https://doi.org/10.22533/at.ed.5872222093>

CAPÍTULO 4.....28

BIOSSEGURANÇA: AVANÇOS E ADAPTAÇÕES PERANTE A COVID-19

Julia Robledo Jerez

Marcus Vinicius Ganda dos Santos


Adilson de Oliveira

 <https://doi.org/10.22533/at.ed.5872222094>

CAPÍTULO 5.....30

CARACTERÍSTICAS GEOMÉTRICAS DAS LIMAS ROTATÓRIAS E A INFLUÊNCIA NAS SUAS PROPRIEDADES MECÂNICAS

Jairo Barros Weiss

 <https://doi.org/10.22533/at.ed.5872222095>

CAPÍTULO 6.....56

CISTO DENTÍGERO RECIDIVADO COM COMPORTAMENTO RADIOLÓGICO DIFERENCIADO: RELATO DE CASO

Yann Lucas Barboza


Guilherme Rizental Koubik

Luciana Dorochenko Martins

Jessica Daniela Andreis

Gilson Cesar Nobre Franco

Dayane Jaqueline Gross

 <https://doi.org/10.22533/at.ed.5872222096>

CAPÍTULO 7.....62

EFICÁCIA DE TÉCNICAS CLAREADORAS EM DENTES NÃO VITAIS: REVISÃO DE LITERATURA

Brenda Gonçalves de Sá

Luana de Sousa Franco

Carolina Pereira Tavares

Patrícia Sthefânia Mulatinho Paiva

Laura Santa Rosa Gomes Netto

Paulo Rogério Corrêa Couto

Sérgio Salomão de Oliveira Moura


Maria Karen Vasconcelos Fontenele

Sophia Clementino Coutinho

Jânia Andreza Leite Braga

Antoniél de Sousa Pereira da Silva

Angela Luzia Moraes Silva de Moura

 <https://doi.org/10.22533/at.ed.5872222098>

CAPÍTULO 8.....71

EVOLUÇÃO ANATÔMICA HUMANA

Tiago Silva da Fonseca


Igor Duarte de Almeida

 <https://doi.org/10.22533/at.ed.5872222099>

CAPÍTULO 9..... 82

GNOSIS Y SU APLICACIÓN DEL CONSENTIMIENTO INFORMADO DE ATENCIÓN DE URGENCIA DURANTE LA PANDEMIA COVID-19 EN CONSULTORIOS ODONTOLÓGICOS DE PUNO

Yaneth Carol Larico Apaza
Russel Allidren Lozada Vilca
Madelaine Huánuco Calsín
Oscar Mauricio Flores López
Rosa Isabel Larico Apaza
José Oscar Huanca Frías
Rene Eduardo Huanca Frías

 <https://doi.org/10.22533/at.ed.58722220910>

CAPÍTULO 10..... 95

MANIFESTAÇÕES IMAGENOLÓGICAS TOMOGRÁFICAS DO SIALOLITO GIGANTE: RELATO DE CASO


Lucas Santana Santos
Felipe Barros Castro
Daniella Dias Ramos
Maislla Mayara Silva Ramos
Marynny Teixeira Silva
Raul de Souza Gomes
Luis Victor Silva Ribeiro
Samya Leal Peixoto Pinto
Maria da Conceição Andrade de Freitas
Rita de Cássia Dias Viana Andrade
Claudio Leite de Santana

 <https://doi.org/10.22533/at.ed.58722220911>

CAPÍTULO 11..... 103

MOLDAGEM CONVENCIONAL X MOLDAGEM DIGITAL NA CONFECÇÃO DE MODELOS DE ESTUDOS


Luciana Maria Gonçalves Furtado Ramos
Julia Furtado Ramos
Elimario Venturin Ramos

 <https://doi.org/10.22533/at.ed.58722220912>

CAPÍTULO 12..... 108

REANATOMIZAÇÃO DE INCISIVO LATERAL CONÓIDE COM RESINA COMPOSTA DIRETA- REVISÃO DE LITERATURA

Victória Costa Leal
Lucas Rosa Sampaio
Helena Viriato de Alencar Vilar

 <https://doi.org/10.22533/at.ed.58722220913>

CAPÍTULO 13..... 117

SINUSITE MAXILAR DECORRENTE DA INSTALAÇÃO DE IMPLANTES - RELATO DE

CASO

Lucas Pires da Silva
Rubens Jorge Silveira
Laryssa Thainá Mello Queiroz Cunha
Ângela Beatriz Cavalcante de Amorim Izac
Germano Angarani

 <https://doi.org/10.22533/at.ed.58722220914>

CAPÍTULO 14..... 123

STANDARDS GUIDELINES IN ORAL REHABILITATION

Hugo Carlos Campista
Jefferson David Melo de Matos
Daher Antonio Queiroz
Guilherme da Rocha Scalzer Lopes
Marco Antonio Bottino
Adolfo Coutinho Martins
Lucas Campagnaro Maciel
Marcelo Massaroni Peçanha

 <https://doi.org/10.22533/at.ed.58722220915>

CAPÍTULO 15..... 138

TÉCNICA 3S E 3S FULL FACE MODIFICADA BY ANA BASILE - SUSPENSÃO - SUSTENTAÇÃO - SUAVIZAÇÃO


Ana Carolina Nogueira Bientinez Basile
Helena Bittar Abrantes
Yara Aparecida Tovani
Erika de Aguiar Miranda Coelho
Vagner Coelho

 <https://doi.org/10.22533/at.ed.58722220916>

CAPÍTULO 16..... 146

TÉCNICAS DE RECOBRIMENTO RADICULAR DE CLASSE II: REVISÃO DE LITERATURA


Ramon Henrique Alves dos Santos
Nádia Cristina Fecchio Nasser Horiuchi

 <https://doi.org/10.22533/at.ed.58722220917>

CAPÍTULO 17..... 154

USE OF ND:YAG LASER SURGERY IN THE TREATMENT OF INFLAMMATORY FIBROUS HYPERPLASIA: A PRELIMINARY STUDY

Ana Carine Ferraz Rameiro
Thais Sayonara Romão Canuto
Luiz Alcino Gueiros
Jair Carneiro Leão
Giovanni Lourenzo Lodi

 <https://doi.org/10.22533/at.ed.58722220918>

SOBRE A ORGANIZADORA.....	165
ÍNDICE REMISSIVO.....	166

USE OF ND:YAG LASER SURGERY IN THE TREATMENT OF INFLAMMATORY FIBROUS HYPERPLASIA: A PRELIMINARY STUDY

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ABSTRACT: The aim of the study was to compare surgical features related to the exeresis of inflammatory fibrous hyperplasia performed by Nd: YAG laser surgery ($\lambda=1.064$ nm) and conventional technique. On the basis of a quasi-random allocation method, 20 consecutive patients with a diagnosis of IFH were divided into 2 groups: G1 - Nd: YAG laser surgery ($n = 10$) and G2 - conventional surgery ($n = 10$). Pre-surgical fear, surgical features and post-operative pain and infection were evaluated. No difference of lesional features was observed between the groups. The average size of the nodules was 1.25 cm, ranging from 0.5 cm to 4 cm. Surgical duration was significantly reduced in G1 (2.7 minutes) when compared to G2 (7.8 minutes) ($p = <0.05$). Patients in the G1 group had less bleeding ($p = <0.05$), and suturing was necessary to all patients of G2 ($p > 0.05$). Post-operative infection was not reported. These preliminary results may support the use of Nd:YAG laser surgery for inflammatory fibrous hyperplasia as a safe and predictable treatment.

KEYWORDS: Fibrous hyperplasia; Nd-YAG lasers; Oral surgery.

RESUMEN: El objetivo del estudio fue comparar las características quirúrgicas relacionadas con la exéresis de la hiperplasia fibrosa inflamatoria

realizada mediante cirugía láser Nd:YAG ($\lambda=1.064$ nm) y la técnica convencional. Sobre la base de un método de asignación casi aleatorio, 20 pacientes consecutivos con diagnóstico de IFH se dividieron en 2 grupos: G1 - Nd: cirugía láser YAG ($n = 10$) y G2 - cirugía convencional ($n = 10$). Se evaluó el miedo quirúrgico, las características quirúrgicas y el dolor e infección postoperatorio. No se observaron diferencias en las características lesionales entre los grupos. El tamaño promedio de los nódulos fue de 1,25 cm, variando de 0,5 cm a 4 cm. La duración de la cirugía se redujo significativamente en G1 (2,7 minutos) en comparación con G2 (7,8 minutos) ($p = <0,05$). Los pacientes del grupo G1 tuvieron menos sangrado ($p = <0,05$), y fue necesario suturar a todos los pacientes del G2 ($p > 0,05$). No se informó infección posoperatoria. Estos resultados preliminares pueden respaldar el uso de la cirugía con láser Nd:YAG para la hiperplasia fibrosa inflamatoria como un tratamiento seguro y predecible.

PALABRAS CLAVE: Hiperplasia fibrosa; Láseres Nd-YAG; Cirugía Oral.

INTRODUCTION

Inflammatory fibrous hyperplasia (IFH) consists of an exophytic lesion of fibrous connective tissue, which develops in association with the edges of a poorly fitting, partial or total denture. [1]. IFHs are usually asymptomatic and present sessile or occasionally pediculated base with a firm consistency, although some lesions may be ulcerated and erythematous, appearing similar to a pyogenic granuloma. Eventually, it can be observed pleated edges that fit perfectly into the denture. However, these factors may vary depending on the severity of the irritation or the time course of the IFH lesion [1].

IFH occur more frequently among middle-aged adults and elderly, as it is an injury related mainly to the use of dentures. Maxilla and the mandible can be equally affected, often involving the anterior portion. There is a predilection for the female sex, comprising two-thirds to three-quarters of the biopsied cases [1, 2]. Histologically, inflammatory fibrous hyperplasia reveals hyperplasia of fibrous connective tissue usually covered by a hyperkeratotic epithelium. Histopathological examination is important to confirm the clinical diagnosis, since IFH can eventually mimic other reactive oral lesions [1, 3].

The treatment of IFH consists of surgical removal of the lesion, followed by replacement or relining of the denture, to prevent recurrences, although some small lesions may regress spontaneously following denture modification. Surgical treatment include scalpel, electric scalpel microabrasion and cryotherapy [4]. Recent studies indicate that the use of high-power lasers may offer a superiority in clinical outcomes compared to conventional surgical techniques, as it appears to reduce trans- and post-operative morbidity [5,6,7].

The Nd:YAG laser ($\lambda=1,064$ nm), presents a proposal of multiple use for general dental practice, allowing its use in several areas such as endodontics, dental sthetics, periodontology, oral surgery and oral medicine. Its wavelength acts by contact mode and allows good absorption by the tissues, allowing instantaneous volatilization of the superficial tissue with the minimum carbonization [8,9]. The laser penetrates deeply into

the tissue, down to a depth of 4 – 5 mm. As it passes through tissues, the laser beam emits heat and thus coagulates tissue down to the depth of about 7–10 mm, a process called photocoagulation, being selectively absorbed by hemoglobin and poorly absorbed by water [8]. In this way, it allows accurate incision with little or no bleeding and the absence or the minimal occurrence of edema.

Although some studies showed better outcomes of oral surgeries performed with Nd:YAG laser ($\lambda=1.064$ nm) [10,11,12], there is no comparative study using this laser in the treatment of IFH. Therefore, it is important to provide an adequate evidence on the outcomes of Nd:YAG surgery in the management of IFH, as well as its advantages and limitations when compared to conventional surgery. In this context, the present study aimed to compare pre, trans and post-operative parameters of resections of IFH performed by conventional surgery or Nd:YAG laser.

PATIENTS AND METHODS

This study was approved by the Human Ethics Committee of the Universidade Federal de Pernambuco, under the protocol CAAE nº 52243315.8.0000.5208.

Study Design

A quasi-randomised open clinical trial was conducted to compare pre-, intra- and postoperative clinical outcomes of excision of IFH performed through conventional surgery or Nd:YAG laser ($\lambda=1.064$ nm). The trial was conducted at the oral medicine clinic - UFPE between May and September/2016. Twenty consecutive subjects with a clinical diagnosis of IFH were enrolled in the study. The first ten were allocated to the laser surgery group (G1), and the second ten to the conventional surgery group (G2). Such quasi-randomised approach was due to practical reasons, in particular availability of laser.

Participants

Inclusion criteria: individuals with clinical diagnosis of IFH without systemic contraindication to surgery and over 18 years of age.

Exclusion criteria: individuals on antimicrobial, analgesic or anti-inflammatory treatment; history of any type of oral surgery for less than 30 days; symptomatic oral lesions of any nature; mental disabilities; and presenting histopathological diagnosis of conditions other than IFH .

Interventions

Surgical interventions were performed by the same trained operator and strictly adhered to the surgical principles of antisepsis, local anesthesia, incision, hemostasis, exeresis and synthesis (when indicated). The surgical steps related to the surgeries by the conventional technique were: a) application of topical anesthetic (benzocaine 20%) in the region of the lesion to be treated; B) local infiltration with 2% lidocaine associated with

epinephrine 1:100,000; C) clamping the lesion with a Halstead forceps; D) incision of the lesion with scalpel blade #15; E) total exeresis of the lesion addressed; F) simple suture with 4-0 silk thread, when necessary.

Nd:YAG laser surgery included: a) application of topical anesthetic (benzocaine 20%) in the region of the lesion to be treated; B) local infiltration with 2% lidocaine associated with epinephrine 1: 100,000; C) clamping the lesion with a Halstead forceps; D) exeresis of the lesion with Nd:YAG laser ($\lambda = 1064\text{nm}$) (Fotona Fidelis Plus III \AA , Slovenia), in the following parameters: 40 mJ of energy, frequency of 40 Hz, power of 4 W, in activation intervals of 10 seconds (power density = $1244,02\text{ W/cm}^2$ and energy density = $12440,28\text{ J/cm}^2$) and "short pulse" width with 320 μm laser fiber in contact with the oral mucosa; E) hemostasis with gauze, when indicated; F) suturing with 4-0 silk thread, when necessary. The abovementioned dosimetric parameters of the laser were based on previous studies published in the literature [12, 13, 14].

For the control of postoperative pain, oral acetaminophen 750mg was prescribed every six hours, when necessary.

Outcome

Preoperative evaluation of the patients included: socio-demographic profile, characteristics of the lesion (size, localization, and type of insertion), and degree of fear for the treatment. Size of the lesion was measured with the aid of an endodontic ruler. Pre-operative fear was evaluated through a numerical visual scale (NVS) [15] graduated from left to right in unit values from 0 (absence of fear) to 10 (intense fear).

Intrasurgical evaluation included: number of anesthetic cartridges, bleeding, suturing and surgical time. Bleeding was classified empirically as absent (no bleeding), scarce (punctual flow), or abundant (flowing bleeding) [13]. Surgical time was measured from the beginning of the incision to the end of the procedure.

Postsurgical evaluation included: pain, analgesic consumption and presence of infection. Data were collected 1 hour (immediate), 7 and 15 days after surgery. Pain was measured by a NVS, similarly to fear evaluation. The scale was classified into 4 degrees according to the result: no complaint (value equal to 0), mild (value from 1 to 2), moderate (from 3 to 7) and severe (from 8 to 10).

Statistical analysis

A descriptive analysis of the study population was carried out by means of frequency distribution for the categorical variables and by average with its respective standard deviation when the variable was quantitative. In the comparison between the groups, Mann-Whitney test was used to compare numerical variables and Fischer exact test was used to evaluate categorical data. In the comparison of the different moments of the postoperative period, the median and the non-parametric Wilcoxon test were used as the central tendency measure for paired samples. In the analysis of the statistical tests was adopted a significance

of 5% ($p < 0.05$). The software used for the analysis was software R 3.3.1

RESULTS

Twenty patients were included in the study, 10 patients underwent treatment of lesions of inflammatory fibrous hyperplasia with Nd:YAG laser (**G1**) and 10 submitted to the conventional technique (**G2**). The majority of patients were female (60%, $n=12$), with average age of 52 years, with a minimum of 18 years and a maximum of 65 years. Patients presented nodular formations in different regions of the mouth, being the most frequent in the jugal mucosa (8/20, 40%), where 3 of the patients belonged to group 1 and 5 to group 2. The lesions with firm consistency were present in 7/10 of patients in group G1 and 9/10 of patients in group G2, all other lesions presented a flaccid consistency. A smooth surface was observed in 9/10 patients of each group (**Table 1**). The average size of the nodules was 1.25 cm, ranging from 0.5 cm to 4 cm (**Figure 1**). Regarding the type of insertion, 6/10 presented a pedicled insertion in the G1 group, and 4/10 in G2. Concerning preoperative fear, the majority of patients in group G1 (4/10, 40%) and group G2 (5/10, 50%) did not indicate fear of the method, and there was no statistically significant difference between groups G1 and G2 (**Table 1**).

The intrasurgical outcomes showed difference between the two treatments. The mean duration of laser surgery was significantly reduced when compared to conventional surgery was longer than ($G1=2,7\text{min} \times G2=7,8\text{min}$, $p=0.037$). G1 presented with scarce bleeding (70%) and absence of bleeding (30%), while G2 showed abundant bleeding (80%) and scarce bleeding (20%) ($p=0.001$). The amount of anesthetic used was similar between the groups, with the majority of G1 patients (50%, $n=5$) needing a tube of infiltrative anesthesia and most of the G2 group (60%, $n=6$) needed only half of one anesthetic tube. All patients treated with conventional surgery required suturing, whereas none of the patients treated with laser required it ($p < 0.001$) (**Table 2**).

In the postsurgical period, eight patients of each group reported analgesics use (**Table 2**). Nevertheless, G1 patients used this medication for a shorter period of time ($p=0.05$). Regarding immediate postoperative pain, 6/10 G1 patients and 2/10 G2 patients did not report pain. Seven days after the procedures, 6/10 of the G1 group and 9/10 of the G2 group reported no pain. After 15 days, all patients in the G1 group and 9/10 in the G2 group reported no postoperative pain (Chart 1). There was no report of postoperative infection.

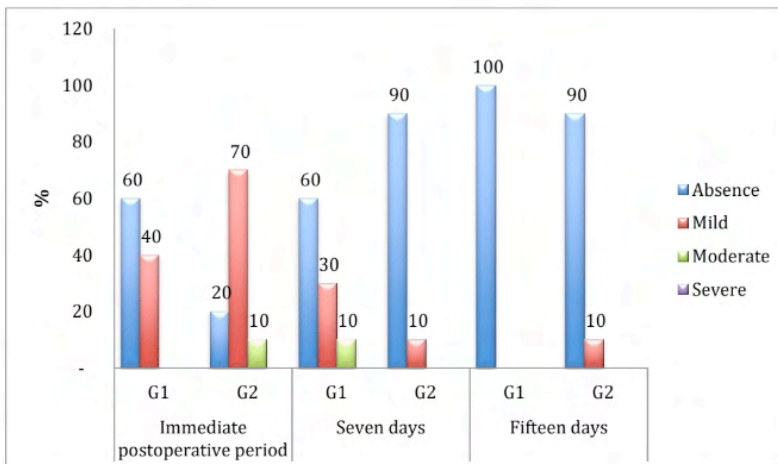
Characteristics	Type of surgery		Total	p-value
	Laser (G1)	Conventional (G2)		
Number of patients	10	10	20	-
Age (Average and average with standard deviation)	57 ± 11,9	52,5 (39.5 -63.2)	52,7 ± 15,0	<0.001*
Gender				
Male	3 (30 %)	5 (50 %)	8 (40 %)	
Female	7 (70 %)	5 (50 %)	12 (60 %)	
Location				
Lingual floor	1 (10 %)	0 (-)	1 (5 %)	
Dorsum of the tongue	1 (10 %)	0 (-)	1 (5 %)	
Upper vestibule bottom	1 (10 %)	0 (-)	1 (5 %)	
Jugal Mucosa	3 (30 %)	5 (50 %)	8 (40 %)	
Hard palate	2 (20 %)	1 (10 %)	3 (15 %)	
Inferior Alveolar Ridge	2 (20 %)	1 (10 %)	3 (15 %)	
Superior Alveolar Ridge	0 (-)	3 (30 %)	3 (15 %)	
Size (average)	1,75 (1 – 3)	1 (0,62 – 3,37)	1.25 (0,87 – 3,12)	0.765
Inserction				0.371
Pedunculated	6 (60 %)	4 (40 %)	10 (50 %)	
Sessil	4 (40 %)	6 (60 %)	10 (50 %)	
Consistency				0.263
Firm	7 (70 %)	9 (90 %)	16 (80 %)	
Flaccid	3 (30 %)	1 (10 %)	4 (20 %)	
Surface				1.00
Smooth	9 (90 %)	9 (90 %)	18 (90 %)	
Rough	1 (10 %)	1 (10 %)	2 (10 %)	
NVS – Fear				0.485
Absense (0)	4 (40 %)	5 (50 %)	9 (45 %)	
Mild (1 a 3)	3 (30 %)	3 (30 %)	6 (30 %)	
Moderate (4 a 6)	1 (10 %)	2 (20 %)	3 (15 %)	
Severe (7 a10)	2 (20 %)	0 (-)	2 (10 %)	

Table 1. Clinicopathological aspects and preoperative evaluation of the sample.

Characteristics	Type of surgery		p-value
	Laser (G1)	Conventional (G2)	
Surgical Time (minutes) (average)	2, 7 (2,3 – 3,1)	7,8 (5, 7 – 13,9)	0.037*
Surgical Bleeding			<0.001*
Absent	3 (30 %)	0 (-)	
Scarse	7 (70 %)	2 (20 %)	
Abundant	0 (-)	8 (80 %)	
Number of used tubes in infiltrative anesthesia			0.442
½ tube	4 (40 %)	6 (60 %)	
1 tube	5 (50 %)	2 (20 %)	
1 ½ tube	1 (10 %)	1 (10 %)	
2 tubes	0 (-)	1 (10 %)	
Need for suture			<0.001*
Yes	0 (-)	10 (100 %)	
No	10 (100 %)	0 (-)	
Analgesic Consumption			1.00
Yes	8 (80 %)	8 (80 %)	
No	2 (20 %)	2 (20 %)	
Analgesia time			0.051
One day	4 (40 %)	0 (-)	
From two to five days	3 (30 %)	4 (50 %)	
From six to eight days	1 (10 %)	4 (50 %)	
Infection			1.00
Yes	0 (-)	0 (-)	
No	10 (100 %)	10 (100 %)	

* Statistically significant difference

Table 2. Surgical features according to surgical methods.



Graphic 1. Pain evaluation in patients submitted to treatment of inflammatory fibrous hyperplasia, in the immediate postoperative period, 7 days and 15 days after surgery. G1 Group 1 (Treatment with Nd:YAG laser surgery) and G2- Group 2 (Treatment with conventional surgery)

DISCUSSION

Nd:YAG laser have been used in several areas of dentistry, allowing the establishment of ideal parameters (power, pulse mode, frequency, energy) to make procedures more effective, resolute and safe [10,16]. However, to the best of our knowledge there is no comparative study with Nd:YAG laser in the treatment of IFH, which demonstrates the need for establishing adequate treatment protocols and a better knowledge of patient's perception of of treatment modalities. Thus, the objective of this study was to evaluate and compare, through an open clinical trial, the results presented pre-, trans and postoperative in patients with indication of exeresis of IFH lesions performed through conventional or with Nd:YAG laser. A preliminary study was performed with 20 patients were divided into 2 groups (Nd:YAG laser and conventional surgery). The results of the present study pointed to the possibles clinical advantages and safety on performing Nd:YAG laser surgery for the removal of IFH. A significant reduction of surgical time, little or no intraoperative bleeding and no need for suturing are reported as the main outcomes of this study.

IFH affects mainly mature adults due to their correlation with ill-fitting dentures, being equally distributed by the maxilla and mandible [3]. In addition, there is a greater occurrence in women, as observed in the present study. Female patients seek oral health care services more frequently [1], possibly leading to this difference. Also, the lesional tissue present a firm and fibrous consistency, as observed in in most of the patients of the present study.

Dental procedures, especially surgeries, generate anxiety, excitement and fear in patients, which are some of the reasons for the poor maintenance of the oral health of the population [17]. Interestingly, we could observe a similar report of fear regardless of the

treatment. Previous studies have revealed a significant decrease in the degree of fear in oral surgeries of the frenectomy type performed with Nd:YAG laser compared to the conventional technique [10]. However, as previously reported by Medeiros Junior et al., (2015) [13], pre-surgical fear is not affected by treatment option in patients of this same oral medicine unit. Since laser surgery is not a well-known and widespread treatment in Brazil, lack of knowledge regarding clinical advantages of laser surgery may influence this outcome.

Despite being an invasive procedure, some authors have reported the use of topical anesthesia for performing oral laser surgeries [10, 18]. However, the present study pointed to the need for local anesthetic infiltration in all cases of laser surgery, especially for lesions with significant size. These aspects are related to a greater surgical trauma in which only the use of topical anesthesia becomes not indicated. Other authors [21] reported the reduction of the need for anesthesia in approximately 55% of soft tissue laser procedures (incision and drainage of abscesses, ulectomy, frenotomy, ankylotomy, gingivectomy, gingivoplasty, curettage of the periodontal pocket, excision of pedicled tumors). However, in this study there was no statistically significant difference between the number of tubes used in conventional surgeries and Nd:YAG laser surgeries. Nevertheless, most of the patients of the laser group needed of 1 complete anesthetic cartridge, while the majority of patients on the conventional surgery needed half of a cartridge. This fact can be attributed to the power density of 5W/cm² used in this study, considered relatively high and leading to elevation of local temperature and consequent pain.

More importantly, the duration of the surgery was significantly affected by the surgical technique. Conventional surgeries required five additional minutes when compared to laser surgery, which lasted less than three minutes. Surgical duration was influenced by scarce or absent bleeding and no suturing in the laser group, while most patients submitted to the conventional surgery presented abundant bleeding and all patients required suture. Reduction of bleeding and no need for suture contribute to a less traumatic transoperative period and a reduction in surgical time, which is in line with the main advantages of using lasers reported in the literature. They include hemostasis, blocking and coagulating of small vessels, ensuring a cleaner and more predictable surgical site, reduction of surgical time, reduction of trauma during surgery, and reduction of postoperative symptoms [20-21], which makes this approach. The immediate postoperative evaluation showed a higher frequency of pain reported by patients treated with conventional surgery. This lower reported pain in the laser group was attributed to the greater amount of anesthetics used in these patients, which contributed to better pain control immediately after the surgical procedure. However, after seven days, there was a reversal of the condition: 10% of patients in the conventional surgery group had pain compared to 40% in the laser group. The Nd:YAG laser is characterized by significant dissipation of thermal energy, this high energy deposited in the tissue generates an increase in local temperature, which can cause greater tissue damage and consequent painful stimulus. These postoperative findings go against the results of other studies that normally point to an

absolute superiority in the clinical outcomes of patients treated with laser [11,21].

Nevertheless, as previous reported by Amaral et al., (2015) [21], the present study found no differences regarding the need for analgesia. However, it was observed that patients treated by laser surgery consumed analgesics for a shorter period of time. The administration of analgesics in the postoperative period is a result of the trauma caused by conventional surgery. The surgical laser coagulates the blood vessels inside the tissues, preventing the extravasation of blood cells in the repair of the wound. In addition, epithelial formation and connective tissue regeneration are slower in laser wounds, allowing better regeneration, less scarring and asymptomatic results. At the edges of the wound, rapid temperature rise results in denaturation of vasculogenic peptides, released in response to tissue destruction, contributing to immediate vascular response in the wound [22].

In summary, the results of the present study point to the advantages of performing exeresis of IFH lesions with Nd:YAG laser as the reduction of the surgical time when compared to the conventional technique, the little or no intraoperative bleeding and no need for suture. There is no difference in post operative pain or use of analgesics. Nevertheless, the need for intensive training, the high cost of the laser, and the different parameters reported by distinctive studies can still be considered as obstacles to the extensive use of this surgical technique. Therefore, it is necessary to look for adequate evidence to establish the most useful method for each of kind of lesion; considering advantages, disadvantages and difficulties observed by the dentist in the use of this surgical modality.

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ÍNDICE REMISSIVO

A

Alteração de cor 64, 116

Anatomia 14, 71, 73, 76, 77, 78, 95, 96, 103, 112, 143

Ansiedade 21, 22, 23, 24, 25, 26, 27

C

Cisto dentígero 56, 57, 58, 59, 60, 61

Cistos odontogênicos 56

Clareamento 62, 63, 64, 66, 67, 68, 69, 70, 114

Contenção 28, 29

Coronavirus 29

D

Dente 3, 13, 16, 17, 42, 56, 57, 59, 60, 69, 71, 73, 99, 108, 110, 111, 146, 147, 149, 150

Design 30, 31, 33, 36, 39, 41, 42, 43, 44, 46, 47, 48, 49, 50, 51, 52, 126, 136, 137, 156

Diagnóstico bucal 56

Disfunção temporomandibular 21, 22, 23, 24, 25, 26, 27

E

Educação 2, 4, 5, 8, 24, 115

Estética dentária 63

Evolução 22, 28, 34, 40, 46, 71, 72, 73, 74, 75, 76, 77, 78, 79, 107, 109, 117, 143

F

Filogenia 71, 72, 73

G

Gestantes 2, 3, 4, 5, 6, 7, 8, 9

H

Humanos 37, 71, 72, 73, 74, 75, 76, 77, 78, 79

I

Implantes dentários 10, 13, 17, 18, 20, 118, 120, 121

Infecções 7, 8, 29, 119

Instrumentação rotatória 30, 32, 33, 45

Instrumentos endodônticos 30, 32, 34, 35, 39, 40, 42, 44, 47, 49, 51, 52

O

Odontólogos 8, 29, 83, 86, 87, 88, 89

Osseointegração 10

P

Pandemias 29

Peróxido de Carbamida 63, 66

R

Riscos biológicos 28, 29

S

Saúde 1, 2, 3, 4, 5, 6, 7, 8, 9, 23, 25, 27, 28, 30, 63, 65, 69, 70, 71, 74, 78, 103, 110, 113, 114, 115, 147

Saúde bucal 1, 2, 3, 4, 5, 6, 7, 8, 9, 25, 27

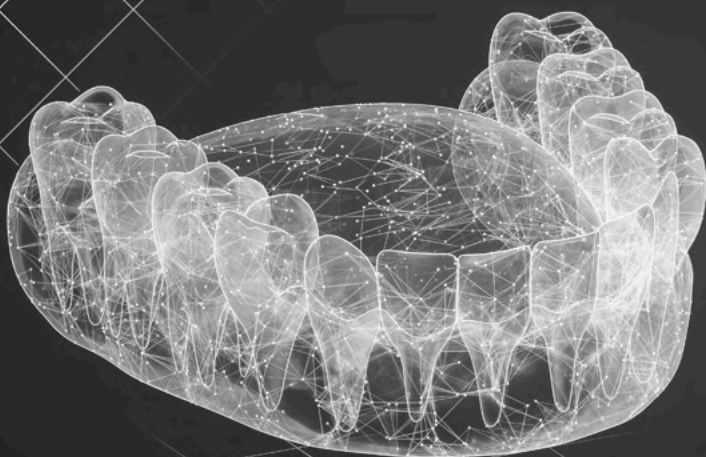
Síndrome de DTM 22, 23

Substitutos ósseos 10

T

Transplante ósseo 10

Novas tecnologias e
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