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ORIGINAL ARTICLE

An investigation. antibacterial effects Nd:YAG Laser. Porphyromonas gingivalis

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Abstract:AIM:. Investigate. antibacterial effects Nd:YAG laser. Porphyromonas gingivalisFilm, deconstruction. becterium became distincted. iradiation time increased.. Major destructional form. evaporation.Conclusion:Nd:YAG laser may inhibit. biofilm formation. planktonic P.Gingivalis, destroy. construction. mature biofilm, Bacteria.

KeyWords: Periodontal pathogens;Single bacteria biofilm;Nd:YAG

In addition to the above traditional methods the laser in oral clinical control bacteria spot in use is also a new of research hot.Self-1964Years-doped Neodymium Yttrium aluminum garnet (Nd:YAG)The advent of laser since for its excellent of soft and hard organization Cutting Ability and hemostatic sterilization ability and was use to oral treatment[3].HoweverNatural 20Century90Age with the flexible laser fiber of Development,Nd:YAGLaser was use in periodontal pocket of non-surgical treatment in and gradually expand.Nd:YAGLaser belongs to solid laser of a kind of the laser close to infrared laser (Wavelength1 064 nm)Easy to be melanin organization Absorption.Most periodontal advantage pathogenic bacteria suchP.GingivalisFor can aggregation heme and hemoglobin protein and the blackG[4-5]Bacteria.P.GingivalisIn vitro Culture48~72 hCan formation biofilm by cell count crystal violet staining experimental,Fluorescence staining laser confocal microscope observation means can inspection has been Formation This experiment to observeNd:YAGLaser on periodontal pathogenic bacteria of sterilization role explore the laser of planktonic bacteria of film forming ability and biofilm state under of bacteria activity and structure of suppression role for laser of clinical application provide experimental data.

1. Material and Methods

1.1 Main material and Instrument

P.Gingivalis ATCC 33277(Our hospital oral microbial laboratory provide);Live/Dead fluorescence dye;Gram-stain ; brain heart infusion Laser Confocal Microscope ;JSM-6360LVScanning electronic microscope

1.2 Methods

1.2.1 Bacteria Culture and Identification

At room temperature underP.GingivalisStandard strain in super-clean Taichung conventional recovery.Learn30MuLBacteria to four division line method inBHISolid Medium on the coating again will petri dish inverted in37Constant Temperature Box in anaerobigen Training.

1.2.2 Laser on phytoplanktonP.GingivalisFilm Forming Ability of influence

Will the trainingP.GingivalisInoculationBHILiquid Medium in anaerobic enrichment culture48 h."BHICulture Me-

dium dilution bacteria with UV spectrophotometer measurement bacteria DilutionODValue(Set Wavelength= 600 nm)WillOD =(0.1350.150)Of bacteria dilution liquid as an liquid adjustment bacteria concentration3.0 × 10^8CFU/mL.Respectively1 1And1 5Dilution liquid

After1.5 × 10^8CFU/mLAnd5 × $10^{7/}$CFU/mLOf concentration respectively inoculation96Orifice plate every hole200MuL.

Experimental group:ByNd:YAGLaser Irradiation time will Bacteria

Divided5A Experimental group respectively for group1:Light15 s;Group2:Light

S;Group3:Light35 S;Group4.:Illumination45 s;Group5.:Illumination

S;Per group4.A complex hole.The prepared bacteria liquid was taken as the control group without laser irradiation..

Nd:YAGLaser Irradiation Method:Laser set to Anhydrous airless mode with intensity of power6 WSet the scheduled time according to the experimental grouping.

There will be two concentrationsP.GingivalisOf96Plate in ice box after cooling for laser irradiation.Laser-guided fiber extends into the bacteria liquid to illuminate and move without touching the hole wall and the hole bottom.Done1.After irradiation with a culture hole750/LWipe the contact part of ethanol, continue to illuminate after Ethanol volatilization, and then finish the irradiation of all the holes in turn..If the optical fiber degeneration is cut off the tip, activated with carbon pen and750/LEthanol wipe, continue to operate after drying.

Crystal violet staining:After the light ends,96The plate was placed in the anaerobic incubator for further incubation,48 hCrystal violet staining after Removal.Measuring holes with enzyme marker550 nmAbsorbance at wavelength (Od)Value.1..2..3 nd:YAGLaser Irradiation on BiofilmP.GingivalisLive

Observe the different light time under each group of laser of focus image at the same time record each group each different view of average fluorescence strength (Figure3).The change of fluorescence intensity showed that with the extension of laser irradiation time, the number of viable bacteria (green fluorescence) in the biofilm gradually decreased, the number of dead bacteria (red fluorescence) gradually increased, and the total number of bacteria decreased, the biofilm becomes thin.

Arrow shown Optical Fiber across the path; Group1Arrow shown path on the bacteria quantity reduce on both sides of the bacteria form complete; Group2,Group3Arrow shown path does not exist on the complete cell junction visible part cell damage path outside cell basic complete

3. Discussion

P.GingivalisCan adhesion or invasion host cells produce virulence factor influence host immune.At the same time promote periodontal pathogenic bacteria of symbiotic formation plaque biofilm in periodontal disease of the development has

Kill periodontal pathogenic bacteria reduce periodontitis of make probing depth,Probing Bleeding Index,Periodontal attachment level and clinical index get improve.But moreNd:YAGLaser for periodontal pathogenic bacteria of study for laboratory of airborne microbe research or clinical research so this research mainNd:YAGLaser for in vitro biofilm state underP.Gingi-valis.The role and mechanism the Observation Analysis.Relative planktonic bacteria for bacteria biofilm state more close to clinical actual; Relative Clinical Experimental for Laboratory Study on Influence Factors of controllability more easy to master, so this experiment for the laser of clinical use provide the laboratory data support.

× $10^{7/}$CFU/mLWhen,Nd:YAGLaser Irradiation45 sAfter the planktonic bacteria formation biofilm ability influence; When bacteria concentration increase

1.5 × 10^8CFU/mLWhen laser irradiation35 SCan suppression bacteria of film forming ability.Tips bacteria concentration the higher the laser irradiation required time the short.Nd:YAGLaser need to Threshold After to produce sterilization role and to threshold after extended light time of suppression bacteria of film forming ability no obvious influence.Concentration1.5 × 10^8CFU/mLOf bacteria film forming ability andNd:YAGLaser Irradiation more sensitive

so experimental1.2.2And experimental1.2.4In "with the concentration

On the Formation colony and15 sAfter extended light time results no change and this experimental similar.

This results found,Nd:YAGLaser Irradiation45 sCan influence Single strain mature biofilm in bacteria vitality.Studies have shown that plaque biofilm can enhance bacteria on the outside world adverse factors of Resistance

Found that in patients with of periodontal pocket in"Nd:YAGLaser-assisted treatment need longer of light time (60~120 s)To Nd:YAGLaser can eliminate the infection epithelial dueP.Gingi-valis.Can into host cells so remove the bags in infection epithelial can reduce inflammation recurrence risk can achieve good of long-term treatment effect.This results also found,Nd:YAGLaser Optical Fiber scratch Road

Diameter outside of bacteria relative complete and path on the bacteria all disappear; main of damage style is contact of Vaporization disappear.The reason for bacteria in absorption the laser of energy after vaporization occurs cell wall rupture protein denaturation,Solidification,Necrosis to kill fine

Phytoplankton stateP.GingivalisFormation biofilm of ability also can on a single strain biofilm state periodontal pathogenic bacteria produce kill role can as an periodontal disease non-surgical treatment of Auxiliary Treatment means.But clinical treatment in gingival under bacteria spot biological membrane structure more complex bacteria of style more rich.So still need more of in vitro and Clinical Experimental further study.

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