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

Pengyu Ji
Beijing Institute of Civil Engineering and Architecture


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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-1964 Years-doped Neodymium Yttrium 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], However Natural 20 Century 90 Age with the flexible laser fiber of Development, Nd:YAG Laser was use in periodontal pocket of non-surgical treatment in and gradually expand. Nd:YAG Laser belongs to solid laser of a kind of the laser close to infrared laser (Wavelength 1 064 nm) Easy to be melanin organization Absorption. Most periodontal advantage pathogenic bacteria such P. Gingivalis For can aggregation heme and hemoglobin protein and the black G[4-5] Bacteria. P. Gingivalis In vitro Culture 48~72 h Can formation biofilm by cell count crystal violet staining experimental, Fluorescence staining laser confocal microscope observation means can inspection has been Formation This experiment to observe Nd:YAG Laser 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-6360LV Scanning electronic microscope

1.2 Methods
1.2.1 Bacteria Culture and Identification
At room temperature under P. Gingivalis Standard strain in super-clean Taichung conventional recovery. Learn 30 Mu LBacteria to four division line method in BHI Solid Medium on the coating again will petri dish inverted in 37 Constant Temperature Box in anaerobigen Training.

1.2.2 Laser on phytoplankton P. Gingivalis Film Forming Ability of influence
Will the training P. Gingivalis Inoculation BHI Liquid Medium in anaerobic enrichment culture 48 h. "BHI Culture 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 concentration\(3.0 \times 10^6\)CFU/mL.Respectively1 And 1 5Dilution liquid

After\(1.5 \times 10^6\)CFU/mL And\(5 \times 10^6\)CFU/mL Of 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 W Set the scheduled time according to the experimental grouping.

There will be two concentrationsP. Gingivalis Of 96 Plate 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/L Wipe 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/L Ethanol wipe, continue to operate after drying.

Crystal violet staining: After the light ends, 96 The plate was placed in the anaerobic incubator for further incubation, 48 h Crystal violet staining after Removal. Measuring holes with enzyme marker 550 nm Absorbance at wavelength (Od) Value 1...2...3 nd: YAGLaser Irradiation on Biofilm P. Gingivalis Live

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; Group1 Arrow shown path on the bacteria quantity reduce on both sides of the bacteria form complete; Group2, Group3 Arrow shown path does not exist on the complete cell junction visible part cell damage path outside cell basic complete

3. Discussion

P. Gingivalis Can 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 more Nd: YAGLaser for periodontal pathogenic bacteria of study for laboratory of airborne microbe research or clinical research so this research main Nd: YAGLaser for in vitro biofilm state under P. Gingivalis. 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.

\(\times 10^7\)CFU/mL When, Nd: YAGLaser Irradiation 45 s After the planktonic bacteria formation biofilm ability influence; When bacteria concentration increase

\(1.5 \times 10^6\)CFU/mL When laser irradiation 35 S. Can 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 \(\times 10^6\)CFU/mL Of bacteria film forming ability and Nd: YAGLaser Irradiation more sensitive
so experimental1.2.2 And experimental1.2.4 In "with the concentration

On the Formation colony and 15 s After extended light time results no change and this experimental similar.

This results found, Nd: YAG Laser Irradiation 45 s Can 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 periodontal pocket in "Nd: YAG Laser-assisted treatment need longer of light time (60~120 s) To Nd: YAG Laser can eliminate the infection epithelial due P. gingivalis. 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: YAG Laser 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 state P. gingivalis Formation biofilm of ability also can on a single strain biofilm state periodontal pathogenic bacteria produce kill role can as a 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.

References