



International Doctoral School

Medical University of Lodz

**THE EVALUATION OF ER:YAG LASER TREATMENT USED IN DENTIN
HYPERSENSITIVITY IN TEETH WITH NON-CARIOUS CERVICAL LESIONS**

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IMPORTANT TERMS

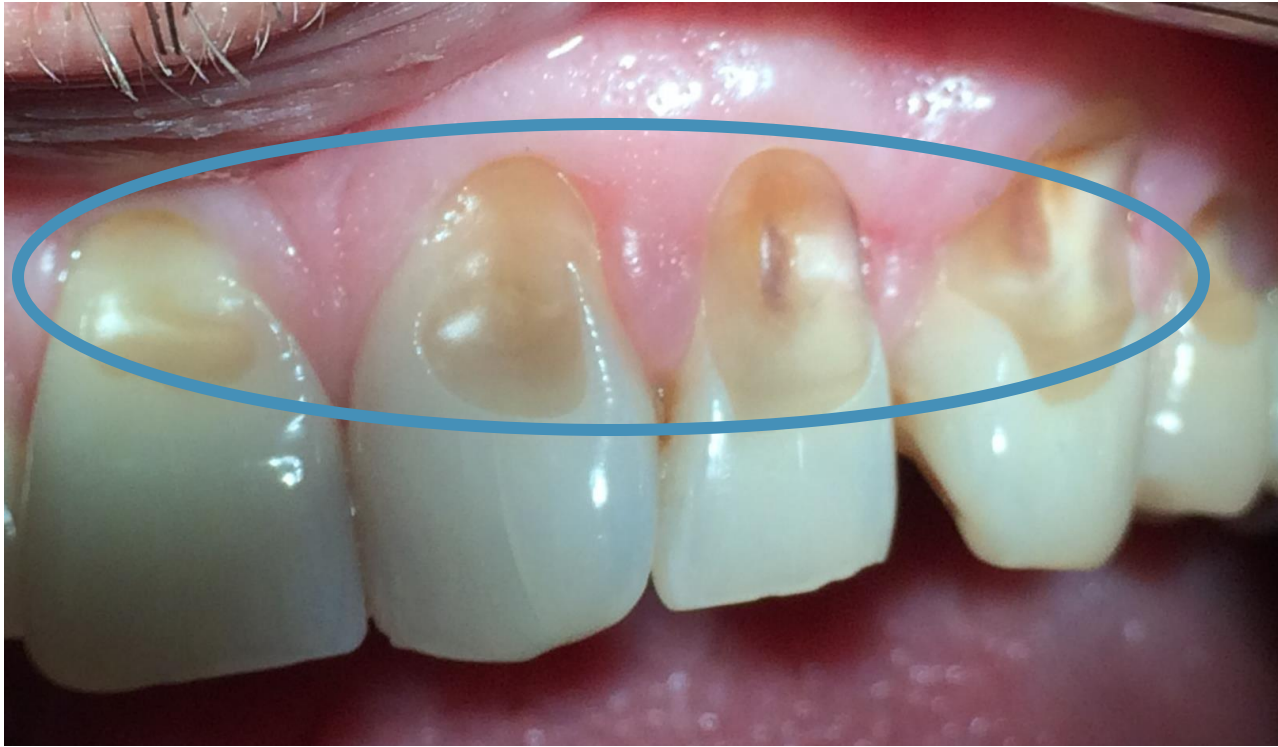
- **Dentin Hypersensitivity** - pain derived from exposed dentin in response to chemical, thermal tactile or osmotic stimuli which cannot be explained as arising from any other dental defect or disease [1]

Prevalence of dentin hypersensitivity is 4 to 69% and it is correlated with non caries cervical lesions.



Fig. 1 Non-carious cervical lesions complicated by hypersensitivity.

IMPORTANT TERMS



- **Non-carious cervical lesion** is a loss of tooth hard tissue as a result of the chronic action of factors occurring in the oral cavity. The etiology of non-carious cervical lesions is multifactorial.

The main factors are: bruxism, excessive consumption of acidic drinks and foods, poor brushing technique, use of abrasive pastes and hard toothbrushes.

Prevalence of non caries cervical lesions is around **67,8%**.

IMPORTANT TERMS



The word **LASER** is an acronym for the English words *Light Amplification by Stimulated Emission of Radiation* meaning the amplification of light by stimulated emission of radiation.

The wavelength of the Er:YAG laser coincides with the water absorption peak and is well absorbed by hydroxyapatites. This allows for the effective use of this type of laser in both soft and hard tissue treatments, e.g., dentine.

The effect of the Er:YAG laser on the dentine surface is an increase in temperature, which leads to melting and recrystallization of its surface.

AIM AND HYPOTHESIS

Aim: The evaluation of Er:YAG laser used in treatment of dentin hypersensitivity in teeth with non-carious cervical lesions.

Hypothesis: Er:YAG laser therapy **reduces** dentine hypersensitivity in teeth with non-carious cervical lesions.



LITERATURE ANALYSIS



SAFETY OF THE USE OF THE ER:YAG LASER

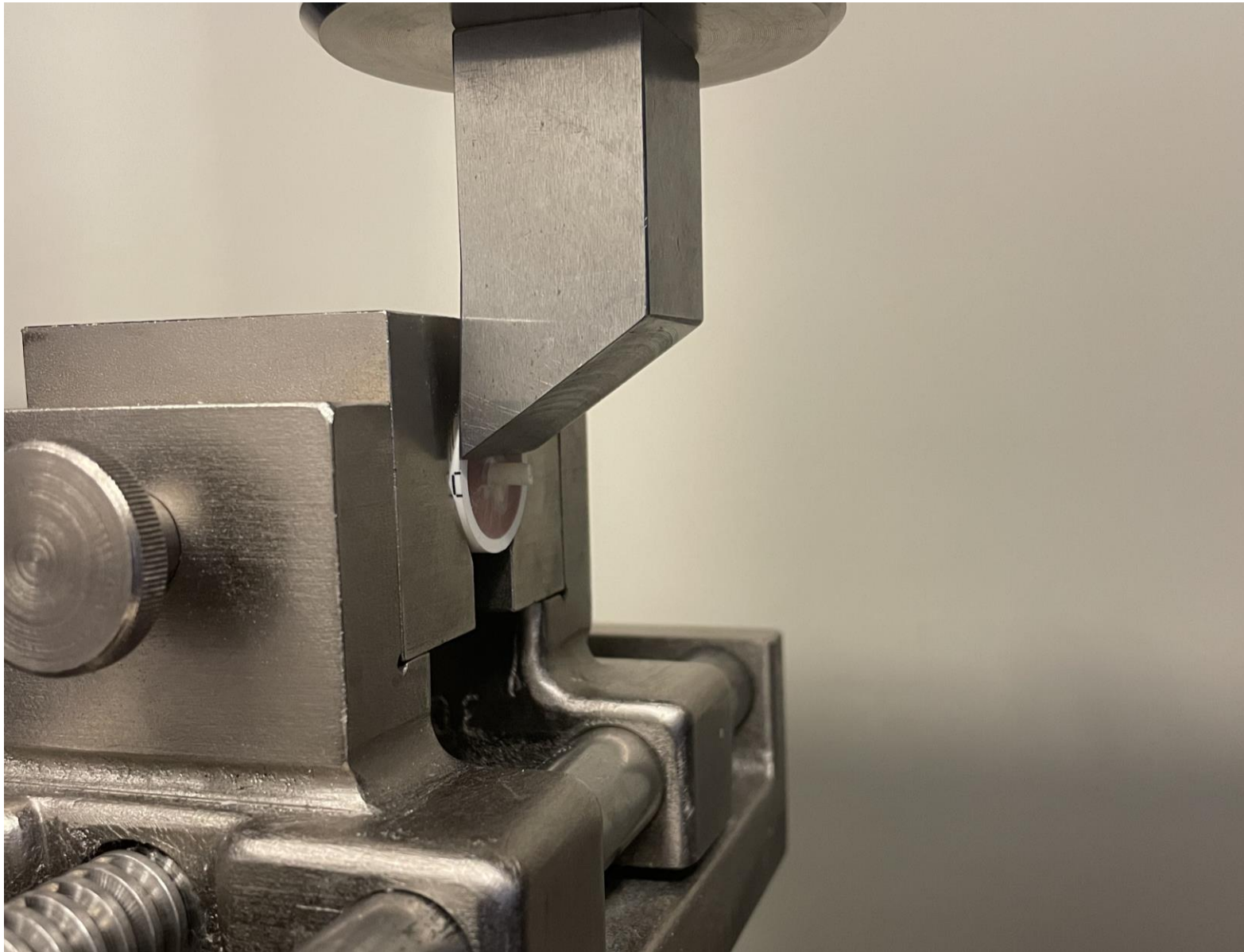
- In 1997 FDA approved ER:YAG laser for human teeth preparation. [3]
- There was **no morphological alterations** of the pulp and odontoblasts after the use of Er:YAG laser for dentinal tubules occlusion (0.5 W; 167 J/cm²; 1 cm distance, under a water spray at level I for 30 s). [4]
- There are **no statistically significant differences** in the compositional structure of the mineral content after the use of the Er:YAG laser when treating ablation of the dentin tubules. [5]



ER:YAG LASER IN THE TREATMENT OF DENTIN HYPERSENSITIVITY

- In 2002 – first year of publication of a research about the use of Er:YAG laser for dentin hypersensitivity [6]
- Er:YAG laser may efficiently obliterate the dentinal tubules. [7]
- The effects are thought to be related to the mechanism of thermo-mechanical ablation as well as to the high absorption of their wavelengths by water. [8]
- The dental surface after the use of Er:YAG laser is less susceptible to dissolution by acids. [9]





First Laboratory Study

ASSESSMENT ABLATION OF
DENTINAL TUBULES
AFTER THE USE OF
THE ER:YAG LASER
AND THE ER:YAG LASER IN
COMBINATION WITH VARIOUS
AGENTS.

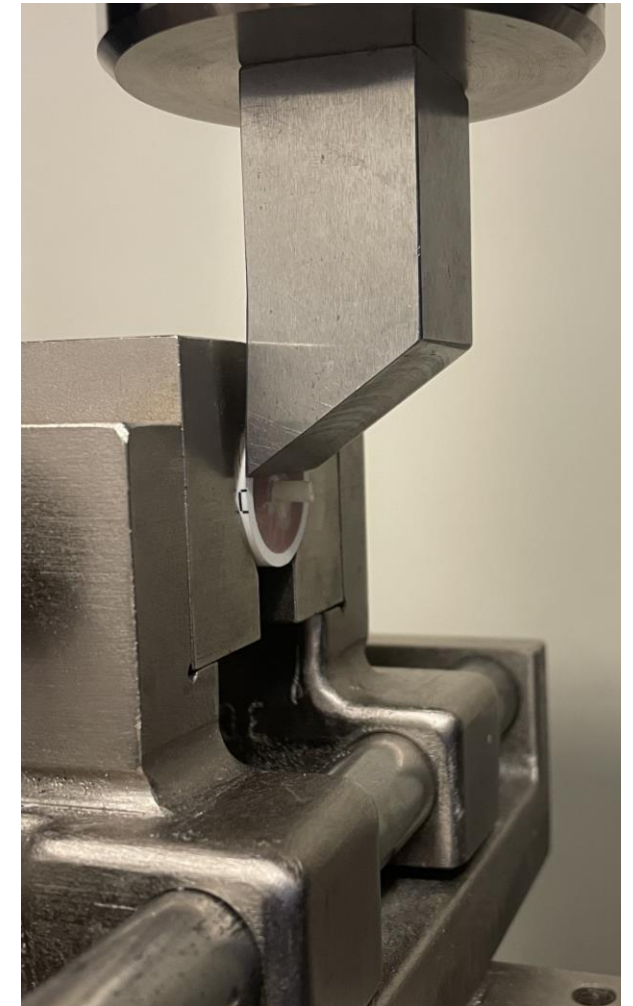
AIM AND HYPOTHESIS

Aim: Assessment of shear bond strength to the dentin surface after the use of Er:YAG laser and Er:YAG laser in combination with various agents.

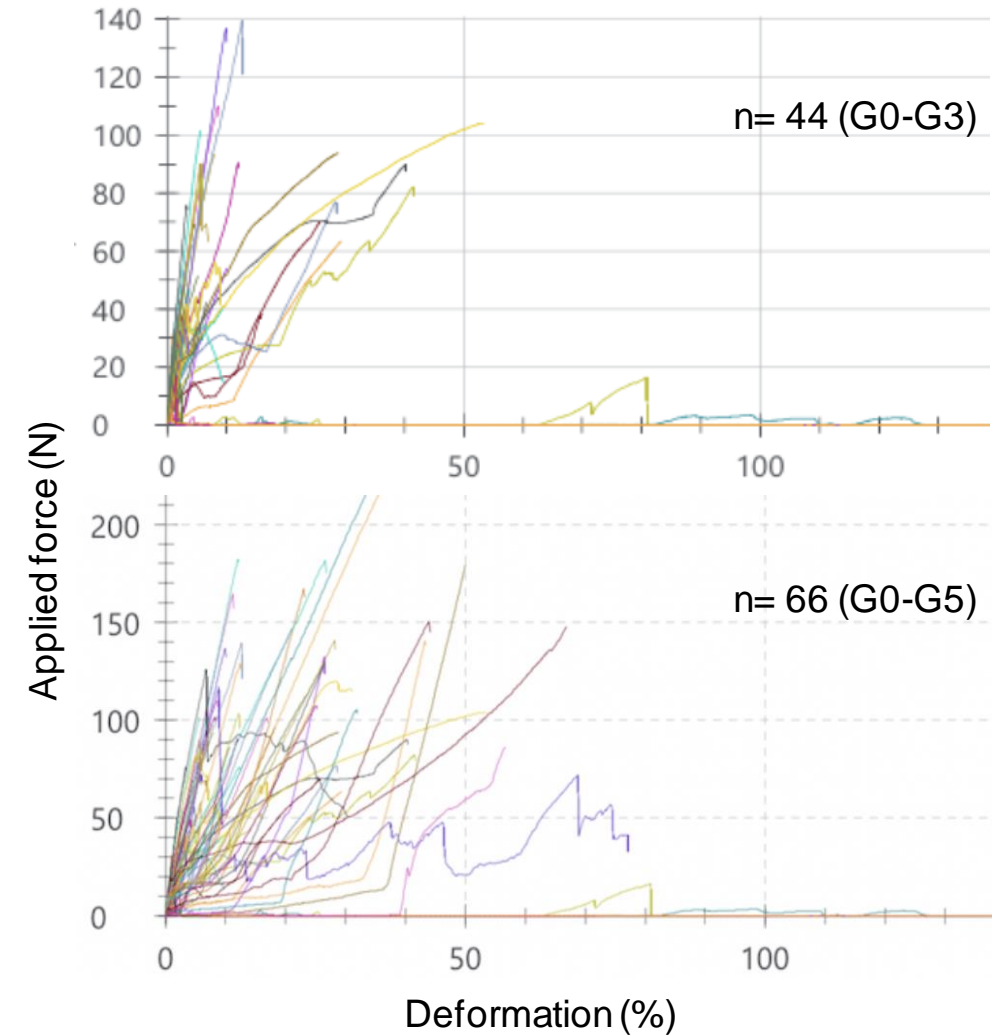
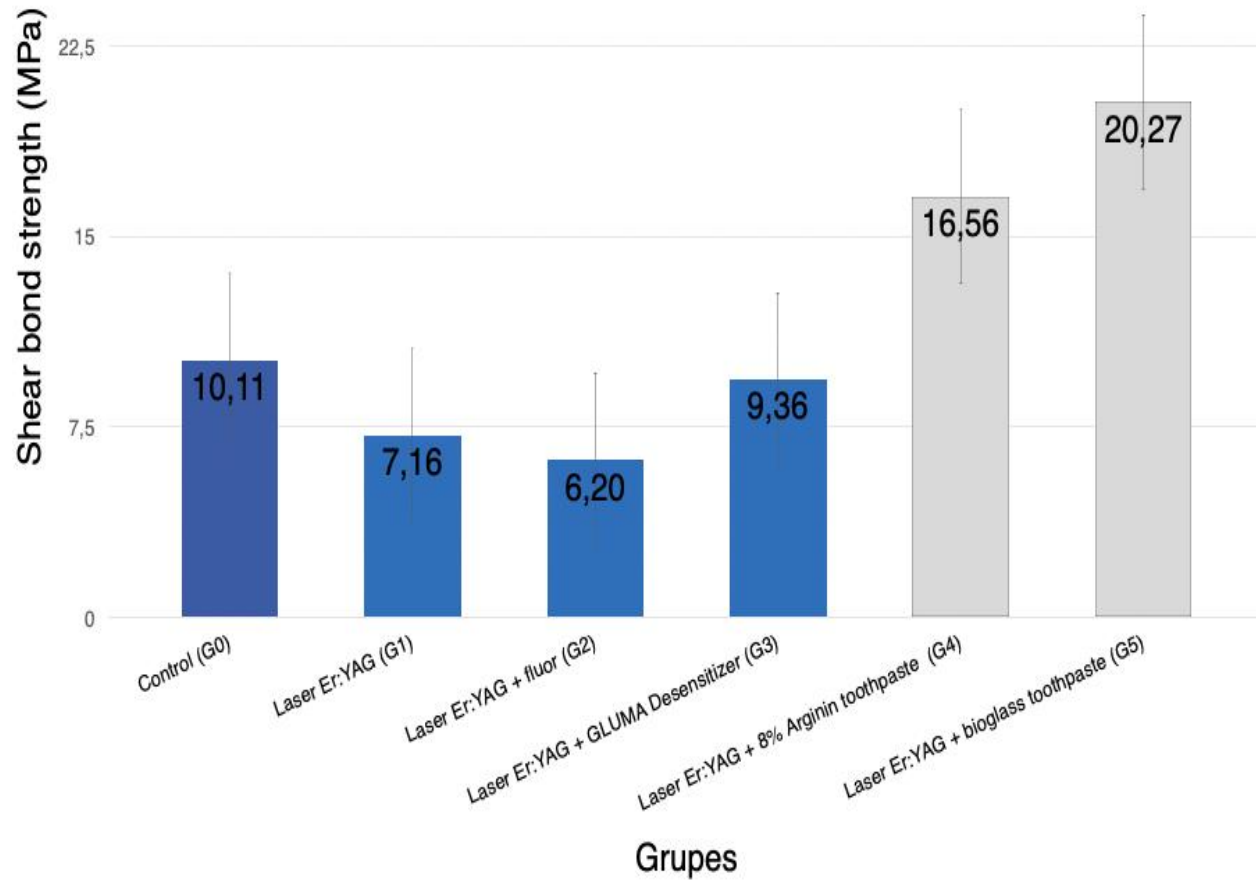
Hypothesis: Er:Yag Laser reduce shear bond strength to the dentin surface.

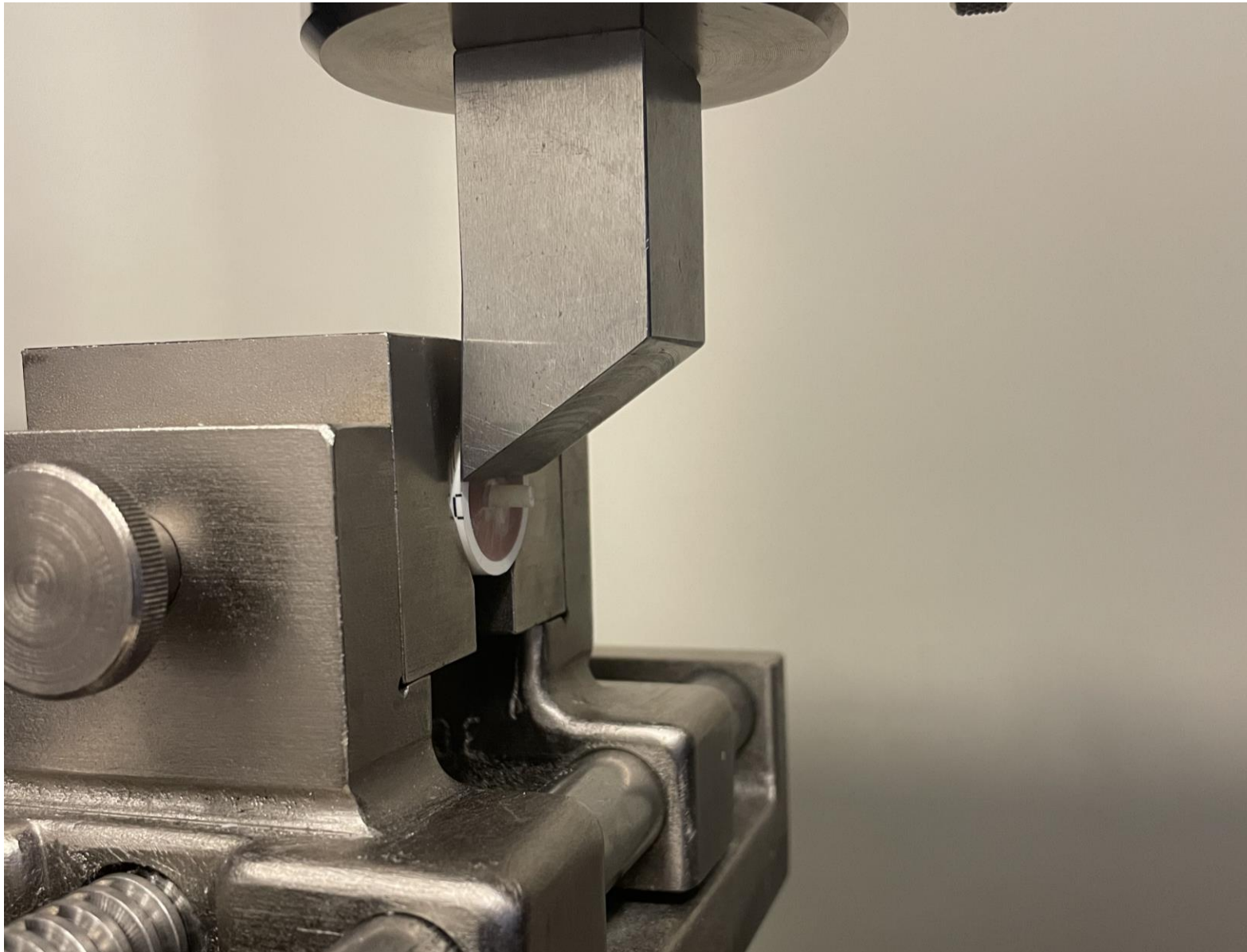
METHODOLOGY

Control group	I Study group	II Study group	III Study group	IV Study group	V Study group
Removal of enamel with a diamond drill mounted on a water-cooled turbine. Preparation of the dentine layer with 3 gradations of wet abrasive paper.					
Without laser	Laser Er:YAG	Laser Er:YAG + fluoride varnish	Laser Er:YAG + Gluma Desensitizer	Laser Er:YAG + bioglass past	Laser Er:YAG + paste with arginine
Application of the Single Bond Universal 3M ESPE bonding system. Polymerization Application of Filtek Ultimate Flow 3M ESPE composite material. Polymerization					
Storage of samples in water at room temperature for 24 hours.					
Shear test with Zwick-Roell Z020 at 2 mm / min					



RESULTS





Second Laboratory Study

ASSESSMENT ABLATION OF DENTINAL TUBULES AFTER THE USE OF THE ER:YAG LASER AND THE ER:YAG LASER IN COMBINATION WITH VARIOUS AGENTS.

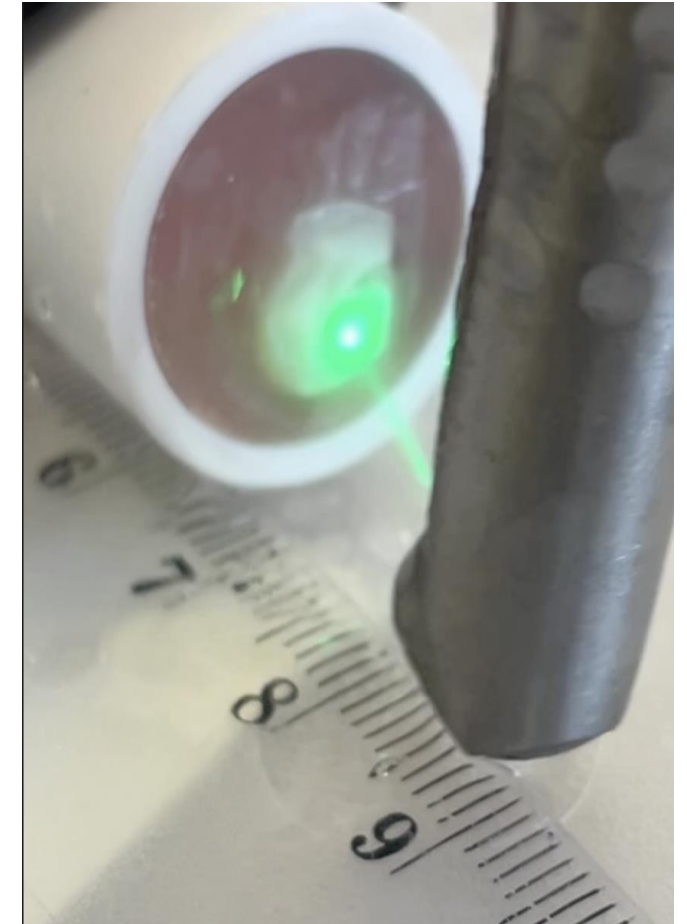
AIM AND HYPOTHESIS

Aim: Assessment of the dentinal tubule ablation after the use of Er: YAG laser and Er: YAG laser in combination with various agents.

Hypothesis: Use Er-Yag laser and Er-Yag Laser with in combination with various agents alate dental tubules.

METHODOLOGY

0 Control group	I Study group	II Study group	III Study group	IV Study group	V Study group
Cutting the samples (Mecatome T201A (Paris, France)) Dentin exposure using 600 C sandpaper discs					
Application of orthophosphoric acid for 15 seconds Placing the samples in distilled water in an ultrasonic bath for 30 min					
Without laser	Laser Er:YAG	Laser Er:YAG + fluoride varnish	Laser Er:YAG + Gluma Desensitizer	Laser Er:YAG + bioglass past	Laser Er:YAG + paste with arginine
Sputtering with a layer of gold in the JEE-4X sputter from Jeol (Tokyo, Japan)					
Taking photos using a Hitachi S-3000N Scanning Electron Microscope (SEM) (Tokyo, Japan)					





RESULTS

ACHIEVEMENTS IN THE ACADEMIC YEAR 2023/2024

- Speaker at "Differential diagnosis of dentin hypersensitivity"; Dentin hypersensitivity - predict, don't guess. Warsaw, Online 2023;
- Conducting workshops for dentistry students: "Working with dental loupes", Łódź 2023.

