# Clinical Trial Protocol
# Iranian Registry of Clinical Trials

17 Oct 2026

## A Comparison of 940 nm Diode Laser and Cryosurgery with Liquid Nitrogen in the Treatment of Gingival Physiologic Hyperpigmentation using Split Mouth Technique

## Protocol summary

**Study aim**

To determine the most effective method for ginigval depigmentation among 940 nm Diode Laser Therapy and Cryosurgery with Liquid N2

**Design**

Randomised clinical trial with double blinded outcome assessment, split mouth design of 15 patients, between February 2016 and February 2017 and followed for one year.

**Settings and conduct**

The two mentioned techniques were compared in terms of gingival depigmentation, postoperative pain, healing duration, pigmentation recurrence and patients' satisfaction. Gingiva of each patient was splitted into two halves and each half randomly received one treatment modality. I n theis double-blinded study patients and persons examining the treatment results were unaware of the type of treatment modalities each half received. This study was conducted in Arak University of Medical Sciences. Patients were followed up to 21 days for the assessment of gingival healing and up to 12 months after the treatments to detect any sign of pigmentation recurrence.

**Participants/Inclusion and exclusion criteria**

Inclusion criteria: Physiologic Gingival Hyperpigmentation
Exclusion criteria: Oral melanotic macule, Malignant melanoma, Hemochromatosis, Pigmentation due to pharmaceutical and heavy metals, Pregnancy-related pigmentation, Amalgam tattoo, Drug-induced melanosis, Smoker's melanosis, etc.

**Intervention groups**

The efficacy of the two therapeutic methods in gingival physiologic pigmentation were compared: Intervention group 1: 940 nm Diode laser; Intervention group 2: Cryotherapy with liquid N2

**Main outcome variables**

Physiologic Gingival Pigmentation Index; Post-operative pain; Duration of Gingival Healing; Pigmentation recurrence; Patients' satisfaction

## General information

**Reason for update**

**Acronym**

**IRCT registration information**

IRCT registration number: **IRCT20160408027277N1**
Registration date: **2018-10-06, 1397/07/14**
Registration timing: **retrospective**

Last update: **2018-10-06, 1397/07/14**
Update count: **0**

**Registration date**

2018-10-06, 1397/07/14

**Registrant information**

**Name**
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**Recruitment status**

**Recruitment complete**

**Funding source**

**Expected recruitment start date**

2015-03-01, 1393/12/10

**Expected recruitment end date**

2016-04-03, 1395/01/15

**Actual recruitment start date**

2016-02-29, 1394/12/10

**Actual recruitment end date**
2016-04-03, 1395/01/15
**Trial completion date**
2016-04-03, 1395/01/15

**Scientific title**
A Comparison of 940 nm Diode Laser and Cryosurgery with Liquid Nitrogen in the Treatment of Gingival Physiologic Hyperpigmentation using Split Mouth Technique

**Public title**
Laser therapy and Cryosurgery in the treatment of Gingival Physiologic Hyperpigmentation
**Purpose**
Treatment
**Inclusion/Exclusion criteria**
**Inclusion criteria:**
Physiologic Gingival Hyperpigmentaion
**Exclusion criteria:**
Amalgam tattoo Oral melanotic macule Malignant melanoma Drug-induced melanosis Smoker's melanosis Melanosis associated with systemic and genetic diseases Hemochromatosis Graphite tattoo Decorative tattoos Pigmentation due to pharmaceutical and heavy metals Pregnancy-related pigmentation
**Age**
From **17 years** old to **35 years** old
**Gender**
Both

**Phase**
N/A
**Groups that have been masked**

- Participant
- Investigator
- Outcome assessor
- Data analyser

**Sample size**
Target sample size: **15**
More than 1 sample in each individual
Number of samples in each individual: **2**
Each individual receives two types of treatments (Laser and Cryosurgery)
Actual sample size reached: **15**
More than 1 sample in each individual
Actual sample size in each individual: **2**
Each individual received two types of treatments (Laser and Cryosurgery)
**Randomization (investigator's opinion)**
Randomized
**Randomization description**
Maxillary gingiva of each patient was split into right and left halves (Split Mouth technique). One half was treated by 940 nm diode laser and the other half by cryosurgery. The divided areas were randomly allotted for depigmentation by coin toss.
**Blinding (investigator's opinion)**
Double blinded
**Blinding description**
The study is designed double blinded so that the participants in the study (patients) are unaware of the type of intervention implemented on their gums and the experts reviewing the results of the two interventions are also unaware of the type of intervention done on the patients' gingival sites. In order to achieve the goals of blindness in this study, it needs to be explained that the expert doing the surgical procedure is different from the one evaluating the results of the two surgical procedures and the expert evaluator is completely unaware of the type of surgical method used in the surgical sites and is selected from outside of the surgical team.
**Placebo**
Not used
**Assignment**
Parallel
**Other design features**

## Secondary Ids

empty

## Ethics committees

### 1

**Ethics committee**
**Name of ethics committee**
Ethics committee of Arak University of Medical Sciences
**Street address**
Arak University of Medical Sciences, Basij Square, Sardasht, Khalij Fars Boulevard
**City**
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**Province**
Markazi
**Postal code**
3819693345
**Approval date**
2016-02-20, 1394/12/01
**Ethics committee reference number**
IR.ARAKMU.REC.1395.7

## Health conditions studied

### 1

**Description of health condition studied**
Physiologic Gingival Hyperpigmentation
**ICD-10 code**
**ICD-10 code description**

## Primary outcomes

### 1

**Description**
Physiologic Gingival Pigmentation Index
**Timepoint**
Before treatment, 3, 7, 10, 17, 21 days and 1, 3, 6, 12 months post-operatively
**Method of measurement**
Observation

## Secondary outcomes

### 1

**Description**
Post-operative pain
**Timepoint**
On the day of treatment
**Method of measurement**
Questionnaire

### 2

**Description**
Duration of Gingival healing
**Timepoint**
Before treatment, 3, 7, 10, 14,17 and 21 days post-operatively
**Method of measurement**
Observation

### 3

**Description**
Pigmentation recurrence
**Timepoint**
1, 3, 6, 12 months after the treatment
**Method of measurement**
Observation

### 4

**Description**
Patient satisfaction
**Timepoint**
one year after treatment
**Method of measurement**
questionnaire

## Intervention groups

### 1

**Description**
Intervention group 1: 940 nm Diode Laser, EpicTM 10 diode type with wavelength of 940±10 nm, operating maximum power output of 10W, 0.01 ms to 20 s pulse duration, contact continuous mode, with 300 µm fiber tip diameter, spot size 30mm diameter (= 7.1 cm2 area) and manufactured by Biolase Company, USA. Firstly, gingiva received anesthesia with 2% lidocaine and the tip of laser was placed and moved on the entire pigmented area from the mucogingival line towards the free gingival margin, including the papillae until the pigmented area was de-epithelialized and a normal pink color of gingiva was apparent. The carbonized gingiva was wiped with a moist sterile gauze to ensure that no pigmented spots remained.
**Category**
Treatment - Devices

### 2

**Description**
Intervention group 2: Cryotherapy with liquid Nitrogen, a 10-liter three-chambered tank of liquid nitrogen (-196°C), made in China, was used. Some liquid nitrogen was poured inside a plastic cup and the tip of a cotton swab was dipped in the liquid and placed inside a small finger-like plastic and then placed on the pigmented gingiva for 3 to 5 seconds. Sessions of cryosurgery was repeated until depigmentation was satisfactory.
**Category**
Treatment - Devices

## Recruitment centers

### 1

**Recruitment center**
**Name of recruitment center**
Arak Dental School
**Full name of responsible person**
Research committee of Arak University of Medical Science . Dr. Mohammad Arjmandzadegan
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## Sponsors / Funding sources

### 1

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**Grant name**
**Grant code / Reference number**

**Is the source of funding the same sponsor organization/entity?**
Yes
**Title of funding source**
Arak University of Medical Sciences
**Proportion provided by this source**
100
**Public or private sector**
Public
**Domestic or foreign origin**
Domestic
**Category of foreign source of funding**
*empty*
**Country of origin**
**Type of organization providing the funding**
Academic

## Person responsible for general inquiries

**Contact**
**Name of organization / entity**
Arak University of Medical Sciences
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Dr. Mohammad Keivan
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Dentist
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## Person responsible for updating data

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## Sharing plan

**Deidentified Individual Participant Data Set (IPD)**
No - There is not a plan to make this available
**Justification/reason for indecision/not sharing IPD**
After the publication of this article in a journal if the privacy of patients is not invaded information will be given to the respected center.
**Study Protocol**
No - There is not a plan to make this available
**Statistical Analysis Plan**
No - There is not a plan to make this available
**Informed Consent Form**
No - There is not a plan to make this available
**Clinical Study Report**
No - There is not a plan to make this available
**Analytic Code**
No - There is not a plan to make this available
**Data Dictionary**
No - There is not a plan to make this available