International Journal of Science and Research (IJSR)
ISSN: 2319-7064
ResearchGate Impact Factor (2018): 0.28 | SJIF (2018): 7.426

A Clinical Study to Evaluate the Pulp's Ice Vitality Tester (As an Cryoagent) in Treating the Physiological Gingival Melanin Pigmentations

Ghaith Ali Haydar

Abstract: ***The gingival pigmentations is Considered to be a cosmeticissue and causes discomfortfor patients especially who has gummy smile. This study aimed to evaluating the cryosurgery for treatment gingival melanin pigmentation using a new cooling agent (Frisco Spray). The material was applied on pigmented gingival oral mucousa in 12 patients depending on open spray system. 7 days after applying the material; the gingival pigmentations disappeared and the gingival oral mucousa completely healed. We recommend applying this material by general Practitionerand specialist because of its easinessin applying and storage, low cost and patients' Acceptance in comparison withother surgical procedureswhich used for treatment the melano gingival pigmentations***

Keywords: physiological gingival melanin Pigmentations, cryosurgery, open spray system

1. Introduction

1) The shade of gingiva is determined according to many factors : the number and the size of blood vessels , thickness of epithelium , the amount of keratin and the dyes in its epithelium such as carotene, melanine , hemoglobin and oxi-hemoglobin.
2) Melanocytes differentiate from the neural crest (NC), which is a transient population of cells that delaminates from the neural tube and migrates extensively throughout the embryo during vertebrate development
3) The melanocytes' roles are to determine the color of hair, skin and eyes and to protect from the UV.
4) Gingival pigmentationsclassification : there are many classifications such as DOPI and HEDIN.

In this research we used HEDIN classification

Gingival depigmentation methods:
5) Deepithelization (Scalpel technique)
6) Gingivectomy
7) Laser
8) Cryosurgery

Cryosurgery:cryotherapy is the deliberate destruction of tissue by application of extreme cold. It has been used in oral medicine and pathology for over 30 years. Reports of tissue destruction by freezing date back to the British physician, Arnott in 1851 .(9)

Cryotherapy is well received by patients due to a relative lack of discomfort, the absence of bleeding and minimal to no scarring.(10)

Clinical advantages include the ease of application, preservation of inorganic structure of bone, and very low incidence of infection. It can be repeated without permanent side effects and is more localized in action than radiotherapy or chemotherapy.(11)

Perhaps its greatest advantage is its usefulness in candidates for whom surgery is contraindicated due to either age or medical history.(12)

Mechanisms of tissue damage in the cryolesion tissue damage by cryotherapy involves several mechanisms.

At present, the optimal temperature of cell death is unclear, however, it has been determined that most tissues freeze at -2.2ºC and that the temperature must fall below -20ºC for cell death to occur.(12)

Tissue destruction following cryotherapy is believed to be a multifactorial process.(13)

Accumulation of damage occurs as the lesion undergoes repetitive freeze and thaw cycles. Immediately following treatment,
cryolesions are indistinguishable from the original tissue.

However, latent damage is produced which progresses to severe damage and subsequent necrosis tothe tissues in following days.

During the freeze cycle as the temperature drops, it is believed that extracellular water undergoes crystallization.(14)

In addition, membrane lipids harden at low temperatures decreasing cell resistance to shrinkage. As extracellular stores of water diminish, the electrolyte concentration increases.

In order to counteract this concentration gradient, intracellular water moves out of the cell, and this water becomes involved in the crystallization process.

Also, intracellular ice formed remains trapped within the cellular membrane.

As a result of these processes, intracellular electrolytes reach toxic levels, which become lethal to the cell.

During a slow thaw cycle, cells at the periphery of the cryolesion will take up excess electrolytes. To equalize this gradient, water enters the cell and can lead to swelling and lysis.(13)(14).

Damage to tissues in the cryolesion:
Evidence shows that the epithelial basal layer is severely damaged following cryotherapy, while the parabasal and intermediate layers of epithelium are affected less. Re-epithelialization occurs within 7–12 days in the mouth and 10–20 days on the skin.(13)

It is generally believed that while larger vessels may survive freezing to lower temperatures, capillaries, venules and arterioles are less likely to. This is in accordance with consistent findings of increased permeability and oedema within 1–6 hours postoperatively following cryotherapy. Studies have determined that microvasculature follows a process of dilatation and increased flow of erythrocytes through the vessel.

Eventually disturbances in flow lead to slowing of cells and finally stasis and thrombosis. Ischaemia of this nature may contribute to necrosis of the target tissue(12)

2. Materials and Methods

The material is a mixture of many gases including butane, propane, isobuteneandDimethylether

Its density at 20 °C: 0,56 g/cm³

Temperatures: up to minus 45° can be reached

This material is odourless ,colourless ,flamable and atoxic ice spray for vitality tests in dentistry

Pressurized sprayer containes 200 ml of gases mixture(Propane_IsoButane_Dimethylether)

Provided with plastic fine tube (20 cm) long and 0.5 mm diameter

12 patients have melanin gingival pigmentations

The pigmented gingiva wasdried in order toapply the cryoagent on it depending on open spray system the cryoagent was sprayed on gingva a distance 1 cm, for 50 seconds photos were taken for each case before applying the cryoagent 7 days later another photo was taken and a comparison was made between the results

3. Results

After 7 days the gingival pigmentations were gone from all of thepatients and the mucousa were healed completely

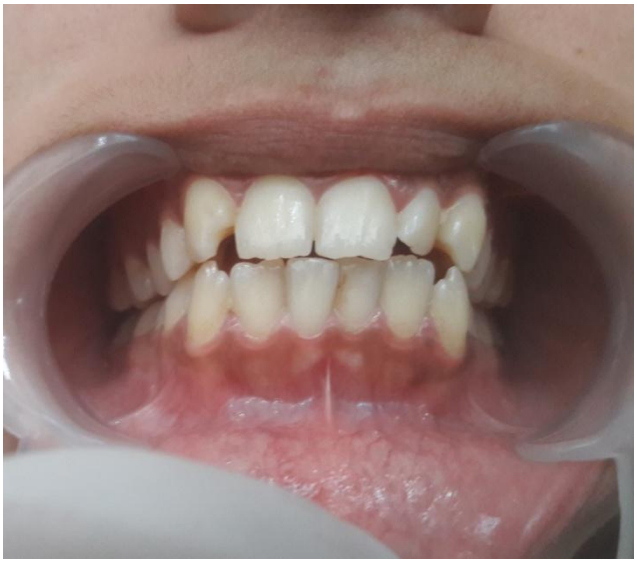

Figure 1: Pigmented gingiva before applying the cryoagent

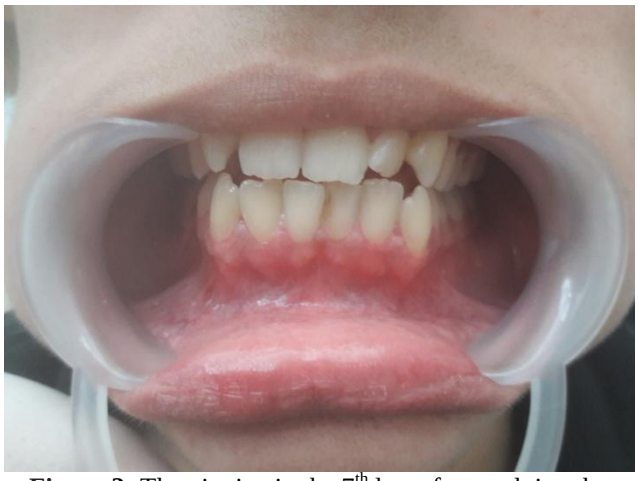

Figure 2: The gingiva in the 7th day after applying the cryoagent (pigment-free gingiva)

Index Hedin

Table 1: The values of Hedin index before and after applying the cryoagent

Hedin		
7days later	Before	Patient
0	4	1
0	3	2
0	4	3
0	4	4
0	4	5
0	3	6
0	3	7
0	2	8
0	3	9
0	4	10
1	4	11
1	4	12
2	42	Total
0.16	3.5	

Table 2: T student test for Hedin index means before and after 7 days of applying the cryoagent

P-value	T	Standard error	Standard deviation	Mean	no	
0.000	14.832	.19462	.67420	3.5000	12	Before
		.11237	.38925	0.1667	12	7days later

According to the previous table it was noticed that Hedin Index means value was 3.5000 before applying the cryoagent but after applying the cryoagent it became 0.1667 and it is very low value.

P value was 0.000 and it is less than 0.01, this means there is statically significant difference between Hedin index means values before and after 7 days of applying the cryoagent

4. Discussion

The cryoagent caused to remove all the gingival pigmentations in 10 patients after 7 days , thisindicates the efficiency of the cryoagentand its ability to make epithelial regeneration without any complications exept some dental sensitivity in patients who have gingival recession or cervical decays

On the other hand , a slight amount of gingival pigmentation (grade 1 on Hedin index) has been noticed on 2 patients , it may attributed to the variation of the thickness of keratinized gingiva which can reduce the depth and the duration of the applied cooling , or it may be related to hormonal incitation to the gingival melanocytes .

5. Conclusion

The cryoagent has the ability to remove the physiological melanin pigmentations in gingival. We recommend applying this material from general Practitioner and specialist because of its easinessin applying and storage, low cost and patients' Acceptance in comparison withother surgical procedureswhich are used for treating the melano gingival pigmentations.

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