Effect of Cryotherapy on Physiologic Pigmentation of Oral Mucosa
A Preliminary Study

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Statement of Problem: Physiologic pigmentation of oral mucosa is considered as a prevalent entity among black people and those having relatively dark skin. Gingival physiologic pigmentation may cause problems for some patients specially ladies as far as esthetics is concerned. To overcome the issue, the surgery might be suggested which can cause some problems due to its side effects. Cryotherapy which is recently suggested for removal of such pigmentations has more advantages like quickness, simplicity, lack of bleeding and scar compared to other methods.
Purpose: In this research, the objective was to analyze the effects of cryotherapy on physiologic pigmentations of oral mucosa.
Materials and Methods: In this study, ten patients who had oral mucousa physiologic pigmentation were selected and a questionnaire was filled out for every one of them. The location and extent of every lesion was determined and local anesthesia was obtained by supraperiostal infiltration. By applying nitrogen oxide (with the temperature of 89.5°C) and using a suitable probe of equal size of lesions, they were frozen for 20-30 seconds.
Then patient were examined on the 2nd and 7th day, 2nd and 4th week post-operatively.
Results: After four weeks all pigmented parts were cured and no recurrent lesion was observed in any of patients.
Conclusion: Oral cavity is an ideal environment for cryotherapy and it can be used as an effective method for treating oral pigmentation and some other oral lesions.

Key words: Melanin pigmentation; Cryotherapy

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There is a wide variety of skin colors among people of the world. Normally, several pigments such as melanin, hemoglobin, and carotenoides create skin color, but original color of the skin would be determined by melanin pigments.(1) Physiologic pigmentation of oral mucosa is a common clinical feature that is related with extra activity of melanocytes and most often appears on the attached gingiva and impairs the patient's beauty. Most patients, particularly women, try different treatment methods to remove these discolorations. One of these therapeutical methods is "cryotherapy". Cryotherapy is a treatment method in which the tissue undergoes inflammation and/or causes demolition responses and finally necrosis of the area through fast freezing.(2)

Taking advantage of cold and its effects has an

old history in medicine and it refers to ancient Egyptians. They were the pioneers who took advantage of cryotherapy as a pain relieving and anti-inflammatory remedy in trauma.[3]

In 19th century, Baron Lorrey explained the usefulness of cold in paralysis, and amputation of a limb and treatment of skull fracture among soldiers in the war;[4] and John Gorieh in Florida kept the room of patients who were suffering from malaria cold so they felt more comfortable. By taking advantage of coldness in air expansion, he succeeded to produce ice. Achieving this success resulted in developments in gas liquidation.[5]

In 1899, the first case of using cryogens on wart, nevous, precancerous and carcinomatous lesions was examined. At the beginning of 20th century, Zacarin and Torres introduced liquid nitrogen spray for treating different lesions like neoplasms. The use of cryotherapy in treating oral cancer refers to 1967 when liquid nitrogen was used to freeze blood vessels, which were close to oral tumors.[6]

Discolorations caused by melanin pigments can be seen in oral mucosa, and areas where melanosis is more common include gingiva, tongue, and hard palate. It can appear in the form of small or big spots. Various treatment methods like surgery have been offered to remove pigmented areas, however, in most cases pigmentations reaccure.

Cryotherapy has been introduced as an effective therapeutical method in treating oral mucosa diseases such as leukoplakias, pyogenic granulomas, peripheral giant cell granulomas. This research tried to investigate the effects of cryotherapy on physiologic pigmentations of oral mucosa and hoping to use the results for suggesting an effective method for treating similar oral mucosa diseases.

Materials and Methods

This study conducted as a non-controlled clinical trial. Study group were chosen from patients who were referred to department of oral medicine, faculty of dentistry. Shahed University.

A questionnaire was filled for every patient who had pigmentation of oral mucosa and discolorations caused by drugs and systemic diseases were excluded from the study.

At last 10 volunteers (nine women and a man) with physiologic pigmentation were selected. The age of study group ranged between 16-38 year old. They neither had systemic diseases nor experienced any treatment for their pigmentations.

Pigmentation in six cases were in the anterior mandibular gingiva, in three cases in anterior maxillary gingiva, and only one case showed the pigmentation in buccal mucosa. The width of melanosis were between 2-30mm, and their pigmentation's color were dark brown except in one case which was pale brown. Eight patients suffered from pigmentation in more than one area.

In order to have a pain free operation, 2% lidocaine with 1:100000 epinephrine was injected. Depend on the size of lesion, proper probe was selected and the pigmented area was frozen with nitrogen gas for 20-30 seconds. Due to the treatment method, a white line caused by necrosis of the mocusa, appeared around the probe.

In this study, all pigmented areas, which existed in each quadrant of maxilla or mandible, were treated in one session.

The follow up appointments were arranged for 2 days, 2 and 4 weeks, and 4 months after treatment. In order to evaluate healing process a questionnaire was designed and for every patient marked. On the second day after cryotherapy, the treated area should have a light erythema and a white necrotic area.

If the healing process was as expected, "It is satisfactory" was marked, otherwise, depend on the appearance of the area "It has not changed" or "Should be concerned" was marked. On the 7th day after treatment, depending on the appearance and discoloration of treated areas,

one of the following choices was marked: "complete recovery of pigmentation", "brightness of pigmented areas", or "no change can be seen". At the second and 4th week, and 4th month appointments, the treated areas were checked and same questionnaires were marked for every patient. The χ^2 test was used to analyze the data.

Results

In the second day after treatment, lesions in all patients showed a satisfactory appearance and 60% of them recovered totally in the 7th day after treatment. In other 40%, underlying of treated areas became pale. The results two weeks after cryotherapy, which indicates only 10% of lesions showed a pale pigmentation. All patients were recovered and no recurrent pigmentation was seen 4 weeks after treatment. The last follow up visit arranged 4-6 months after cryotherapy and no recurrence have been detected.

Discussion

Pigmentation of oral mucosa in most dark-skinned people can be seen physiologically, however many factors like as consuming drugs, some pharmaceutical products, and systemic diseases can play an integral part in the etiology of the lesion.

Because these spots cause no particular problem for patients, so no special method for treating them has been suggested. However, usually surgical methods are used to gain more esthetic results. Although use of surgical methods in a single lesion may be easy, for multiple lesions can result in patient's discomfort. In these cases, cryotherapy can be used as an alternative method.

There are several reports on using cryotherapy to treat some of oral lesions.

In 1992, Tal studied the use of Cryo-machine CT-73 and nitrogen oxide for treating lip hemangioma. He reported successful recovery of lesions in 3 weeks without accruing any scar, and amount of bleeding and secondary infections were very low**.** [7]

In 1996, Dong studied the use of fast freezing of the jaws in patient suffering from benign jaw tumors. He took advantage of liquid nitrogen in his study and showed that after 4 years, no sign of recurrence of the patients' initial lesions were seen and mandibular movements in all the patients were normal.[8]

In 1998, Ishida published an article named “Cryotherapy Effect in oral lesions”. He introduced cryotherapy as a risk-free and inexpensive method for treating oral lesions. He found out oral mucosa is an ideal environment for applying this technique.[4]

In 2000, Yeh studied therapeutical effects of simple cryotherapy on some oral lesions like mucocele, leukoplakia, hemangioma, labial fibroma, and lichen planus. He used liquid nitrogen by means of a swab in his study. He suggested one treatment session for small and superficial lesions and two treatment sessions for deeper and bigger lesions and reported successful results in lesions, which were treated [2]. He also, studied cryotherapy treatment of oral melanin macula and by taking advantage of liquid nitrogen. He explained cryotherapy as an easy and proper method for treating oral melanin macules.[9].

In 2001, Schmidt and Pogrel used liquid nitrogen (cryotherapy) for treating odontogenic keratocyst. They reported only 11.5% recurrence for odontogenic keratocyst, which is considered to be a very low rate regarding to the nature of this lesion. They stated that by even more care during the treatment, this rate can be diminished.[10]

Ishida, implied some complications such as edema, appearing vesicles and bulla following cryotherapy,[4] but in this study, all the patients just showed a light erythema and a white necrotic area and no edema, vesicles and bullas were seen. None of patients, during the operation or after it complained about pain and burning in the operation area.

In this study, variables like age, sex, location of lesion, number of lesions, color intensity of lesions, size of lesions, systemic disease, and experiencing previous treatments were investigated. According to the patients' age, they were divided into two groups of 16-27 and 27-38 years old. The healing pattern was similar in both groups. Also the results of cryotherapy of oral melanosis in female and male patients had no significant difference. There fore it can be concluded that in this method age and sex are not influential factors. The location of pigmentation also had no effect on healing process.

In this study, 10% of patients had pale brown pigmentation and 90% had dark brown pigmentation, all of them responded well to the treatment and no difference was detected in response to therapy regarding color intensity. In the present study, lesions were divided into single and multiple pigmentation. The type of lesions, whether it's single or multiple, and the size of pigmentation also were evaluated in this study. No difference in healing pattern was found in them.

χ^2 (chi-square) test revealed that age, sex, size of lesion, and color intensity of lesion had no effect on responding to cryotherapy.

Conclusion

In all of the patients, the procedure was successful and results were satis factory. Cryotherapy is a safe, comfortable, and painless method which is without bleeding, infection, and scar. In this method recurrent lesions can be treated again very easily. Because of smooth surface and presence of saliva, oral cavity is an ideal inviroment for cryotherapy and it can be used as an effective method for treating oral pigmentation and some other oral lesions.

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