ORIGINAL RESEARCH PAPER

Volume-7 | Issue-12 | December-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

CRYOABLATION FOR ORO-MUCOSAL LESIONS- A SIMPLE ALTERNATIVE

Dental Science

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ABSTRACT

The advancing technical sciences in recent years have made the application of controlled low temperatures an easy option in many branches of dentistry. From the past few years the uses of cryoablation have been proliferating immensely; nevertheless, many of the applications further require experimental evidence.

Cryotherapy is the local application of low temperatures resulting in necrosis of the tissues. The aim of the study includes application of liquid nitrogen using cryogun, locally to ablade oro-mucosal lesions. This process of Cryotherapy not only provided a blood free operative site but it also hastened the healing process with no scar formation and post-operative infection.

This controlled destruction by freezing is very economical, easy, and safe treatment which is being widely practiced in medicine.

KEYWORDS

INTRODUCTION:

Cryotherapy is a pristine treatment modality for oral lesions. It is an intended destruction of tissue by applying extreme cold. It has a wide variety of application in the field of head and neck region which include treatment of various benign skin growths as well as malignant lesions [1, 2]. Cryotherapy is a noninvasive, simple, safe method with ease of application, lack of discomfort, absence of bleeding, minimal to no scaring and has very low incidence of infection [3, 4].

This article encompasses management of few oral lesions with an alternative modality of cryotherapy. The basic principle of cryotherapy is, the rapid cooling produced causes immense stress at the site, resulting in slow thawing and repetition of the freezing process leading to increased cell death. 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 [5].

This present study was done using open system Cryotherapy (liquid nitrogen spray).

MATERIALS AND METHODS:

This present study was carried out in the department of oral medicine and radiology to determine the efficacy of Cryotherapy in the management of oral lesions. The study progressed after obtaining an informed consent from the patients. Cryotherapy was done on five different lesions which included fibroma, mucocele, actinic chelitis, leukoplakia and lichen planus. This procedure was carried out using a cryogun which emitted liquid nitrogen.

PROCEDURE:

Patients with the above mentioned oral benign lesions were included in the study and the findings of the patients were recorded in a case history proforma. Prior to the commencement of cryotherapy both the operator and the patient were made to wear protective eye glasses to shield the eyes from the untoward effects of liquid nitrogen (-181♘c). While the liquid nitrogen spray is applied, the tip of the straight spray needle will be positioned 1 cm from the target site and at an angle of 90 degrees to the lesion. During the treatment procedure, high-power suction will be used to remove the saliva and vapour fog and to improve visibility.

In each patient the lesion was air-dried and sprayed with liquid nitrogen for a few seconds to form an ice ball or field that will be extended 1 to 2 mm beyond the visible pathologic border of the lesion.The frozen field will then be allowed to thaw for at least 20 seconds. Each lesion was cryogunned for different durations i.e., liquid nitrogen spray for fibroma was done for 60 sec in 3 consecutive freeze–thaw cycles; mucocele was done for 45 sec in 3 consecutive freeze–thaw cycles; actinic chelitis was done for 60 sec in one consecutive freeze–thaw cycle; leukoplakia and reticular lichen planus were done for 20 sec in 3 consecutive freeze–thaw cycles. Post-operative instructions were given and the patient was kept under follow-up.

RESULTS:

The results for the present study are as such:

Mucocele- immediate dimpling of the cyst noticed followed by scab formation on the 4th day with neo-epithelization noticed by the end of 1st week.

Figure 1: ***Series of pictures depicting complete regression of mucocele***

Actinic chelitis- operated day showed edema and blistering of lesion followed by scab formation on 4th day later on hypopigmentation by the end of 2nd week and 6th week showed complete healing of the lesion.

Figure 2: ***Series of pictures depicting complete regression of actinic chelitis***

Leukoplakia and lichen planus - postcryotherapy presented with mild hyperemia around the lesion followed by yellowish pseudo membrane on 4th day and 10th day revealed neo-epithelization. Later complete remission of the lesion was achieved by the end of 2 weeks.

Figure 3: ***Series of pictures depicting complete regression of hyerkeratotic lesions***

Fibroma- lesion on the 4th day presented with necrosis followed by wearing off of the lesion on the 7th day and by 12th day neo-epithelization was noticed.

Figure 4 : ***Series of pictures depicting complete regression of fibroma***

All the above lesions had a follow up period of 2 years with no recurrence.

Table 1: ***Clinical findings of the oro-mucosal lesions on consecutive follow ups***

Type of Lesion	Operated day	Findings on 4th day	Findings after 1st week	Findings at end of 2nd week	Findings at end of 6th week	After 2 years
Fibroma	Mild erythema	necrosis	Wear off of the lesion	Neo epithelisation	----	No recurrence
Mucocele	Dimpling of cyst	Scab formation	neoepithelisation	----	----	No recurrence
Actinic chelitis	Oedema and blistering	Scab formation	neoepithelisation	hyperpigmentation	----	No recurrence
Leukoplakia	Mild erythema	Pseudo membrane formation	neoepithelisation	----	----	No recurrence
Lichen planus	Mild erythema	Pseudo membrane formation	neoepithelisation	----	----	No recurrence

DISCUSSION:

James Arnott in 1851 first described cryotherapy which is derived from the Greek word "kryos" meaning frost [6], thus it is local destruction of tissue through the process of freezing. He demonstrated this freezing therapy by using a combination of salt and ice in malignant disease [7]. Cryosurgery earlier was restricted to oral cavity and lips later its use was expanded to benign skin growth like viral warts, skin tags, verrucae, seborrhoeic warts and solar keratosis etc. [8].Any biological tissue exposed to temperature below -20 degree centigrade will undergo cryogenic coagulation and necrosis [9].

The principle on which cryotherapy is based on is called the Joule-Thompson principle substances undergo a drop in temperature when moved from a high pressure area to a lower pressure area resulting in their expansion [10].

Cryotherapy is performed in an open or closed system using cryogens. Open system is a direct application of liquid nitrogen cryogens (-181♘c) while closed system uses nitrous oxide (-81♘c).

Toida M *et al.,* described a simple and easy method to treat intraoral mucous cysts on the lower lip and tip of the tongue by direct application of liquid nitrogen with cotton swab. Each lesion was exposed to four of five cycles composed of freezing of 10-30 seconds and thawing of double the freezing times. All lesions have disappeared completely 2-4 weeks after one or two treatment of cryosurgery [11]. In accordance with this study, we here applied liquid nitrogen on the Mucocele which showed immediate dimpling followed by neo-epithelization by the end of 1st week with reduced recurrence observed. In the study conducted by **Praveen,** *et al*., patient were reported with leukoplakia alone and patient with oral sub mucous fibrosis associated with leukoplakia after being treated with cryosurgery showed complete remission within 3 weeks after the treatment and patient was under regular follow-up for about 3 months and no signs of recurrence were noticed with in this period [12]. A study conducted by Dariush *et al*., states that Thirty patients with bilateral OLP lesions treated lesion on one side for a single sitting of cryotherapy with nitrous oxide gas and the lesion on the other side received triamcinolone acetonide 0.1% ointment in orabase. Results of the treatment revealed that the sign score, pain score and severity of lesions significantly reduced in all follow-up sessions ($P < 0.05$)[13].

Considering these studies both the leukoplakia and oral lichen planus lesions treated with cryotherapy presented with mild hyperemia .Complete remission of the lesion was achieved by the end of 2 weeks with no side effects.

Ashok *et al.,* (2012) in his review stated that cryosurgery is a very safe, easy to perform and relatively inexpensive technique for treating various oral lesions in an out-patient clinic. Liquid nitrogen spray or cryoprobe have been used alone or associated with other surgical methods in various types of oral lesions such as fibroma, pyogenic granuloma, angioma, actinic cheilitis, and keratoacantoma, showing good patient acceptance[14], with this available literature we applied cryotherapy on a fibroma present on the anterior gingiva which showed neo-epithelization by the end of 12th day with better patient compliance.

Cryotherapy uses several mechanisms for the destruction of pathological tissue. The mechanisms for cell destruction after cryotherapy are complex, involving a combination of direct and indirect effects [15].

Direct effects include extracellular and intracellular formation of ice crystals which disrupt cell membranes; cellular dehydration; toxic intracellular electrolyte concentration; inhibition of enzymes; protein damage; thawing effects that result in a vacuolated, swollen ,and ruptured cell.

Indirect effects include changes in the vascularity resulting in ischemic necrosis of the treated tissue and immunologic responses that cause cell damage through an immune mechanism which is cytotoxic [15].

CONCLUSION:

Among the available treatment options surgical modality remains the gold standard for oral lesions, but with the evolution of science there is a need of atraumatic bloodless procedure, which could give, same or better results than surgical modality and cryotherapy is one of these modalities.

As cryotherapy is a simple, cost effective technique with good esthetic results it can be used in managing oro-mucosal lesions in our everyday practice.

Here cryotherapy was done in all the above mentioned lesions in a bloodless field, where we could attain remission within short periods. Applying this procedure to a greater number of oral lesions might help us ascertain its efficacy.

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