Clinical use of Cryotherapy to treat oral inflammatory hyperplasia

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Abstract

Aims & Objectives: The aim of this study was to evaluate a protocol for clinical use of cryosurgery in the treatment of oral inflammatory hyperplasia. Trans and postoperative pain and duration of surgery were also assessed.
Methods: Twelve patients underwent liquid nitrogen cryotherapy with a closed probe. Two 60-second treatment applications were performed, and thawing was allowed to proceed for 2 minutes.
Results: Cure of hyperplasia was achieved in six patients (successful group), whereas three patients had no decrease in the size of the lesion (unsuccessful group). Three patients did not return for follow-up.
Conclusion: It is possible to conclude that cryosurgery is an effective therapy for up to 12-mm long pedunculated hyperplasias and can be considered an alternative, useful, fast and painless method for treatment of inflammatory hyperplasia.

KEYWORDS: Cryotherapy; Liquid nitrogen; Oral inflammatory hyperplasia

Introduction

Inflammatory hyperplasia is a low-intensity local response of tissue to injury associated with the use of ill-fitting prosthesis. It is generally characterized by single or multiple, sessile or pedunculated tissue growth located on the palate or vestibule of the mouth. Treatment is based on removal of etiologic agent and excision of the lesion by conventional surgery (surgical knife), electrosurgery, abrasion, or cryotherapy (1-3).

Cryotherapy is an effective method of tissue destruction by means of freezing and has been used in the treatment of several lesions, such as pyogenic granuloma, actinic cheilitis, leukoplakia, vascular lesion, mucocele, keratoacanthoma, and papillomatous hyperplasia of the palate (4-12). The available cryotherapy apparatus is classified into open and closed systems. Open systems involve the direct application of the cryogenic fluid (usually liquid nitrogen) to the lesion with a cotton swab or spray. In closed systems the tissue is frozen by a cryoprobe (11,13-15).

The combination of direct (rapid buildup of toxic electrolyte concentrations, pH alteration, protein denaturation, and direct disruption of cell membranes) and indirect (vascular and immunological effects) cellular effects can lead to tissue death (4-7,14,15,17).

Cryotherapy has some advantages, such as absence of bleeding, low incidence of secondary infection, minimal scarring and pain, and low treatment cost (4-9,18,19). However, reports in the literature refer to many different generalized protocols, usually based on "self-experience", thereby leading to questions on how to best use cryosurgery.

The objective of this study was to establish an efficient protocol for use of liquid nitrogen cryotherapy with closed probes in the treatment of inflammatory hyperplasia by assessing trans and postoperative pain as well as efficacy and clinical success of the proposed protocol.

Materials and Methods

Study design

This case-control study included volunteers aged 50 to 62 years, according to the following criteria: clinical presentation of inflammatory hyperplasia with compatible clinical history, presence of causal agent (removable complete denture), and absence of clinical signs of candidiasis, ulcer and erythroplasia. The lesions were clinically diagnosed and measured approximately 5.5 x 3.5 cm. The final sample (n=12) was composed of two men and 10 women.

The protocol was approved by the Institutional Review Board, and written informed consent was obtained from all patients.

Surgical procedure

Before surgery, all lesions were photographed with a Sony F717 digital camera (Sony Inc., Tokyo, Japan) in a standardized manual mode and measured using a digital caliper (Mitutoyo®; Mitutoyo Corp., Suzano, SP, Brazil) to determine the highest lesion diameter and, therefore, the number of application sites (1 to 5).

All procedures were performed on an outpatient basis. No anesthesia was required. The lesions were treated by direct application of liquid nitrogen using the CRY-AC®-3 #B-700 storage device adapted to a 6-mm closed probe #215 (Brymill Cryogenics Systems, Connecticut, USA) for 60 seconds until an ice-ball has formed. This procedure was repeated and overlapping freezes were used for larger lesions. Spontaneous thawing was allowed to proceed for 2 minutes between two consecutive freeze-thaw cycles. This protocol is based on that of Beltrão.[20]

Data on clinical aspects, lesion site and size, and duration of surgery were recorded. Duration of surgery was measured from the beginning of the first cycle until the end of the second cycle of the last application site.

Clinical response and assessment of trans and postoperative pain

The patients were asked to record their pain severity during the procedure and on the 7th postoperative day on an 11-point pain intensity numerical rating scale ranging from 0 = no pain to 10 = unbearable pain. A secondary treatment was performed after two weeks if necessary. If any residual lesion remained after two treatment sessions, with no decrease in size, the patient was referred to conventional treatment.

After a 14-day follow-up period, the lesions were again photographed and a clinical evaluation was performed according to the following criteria:

- Unsuccessful: absence of lesion regression or clinical alteration after two procedures.
- Successful: lesion regression or some clinical alteration with the need for complementary procedure.

Patients were recalled two months after cryosurgery for evaluation of absence of lesion recurrence.

Results

Clinical response

From the initial sample of 12 patients, three did not attend all follow-up examinations due to change of address and/or telephone number or refusal to participate. Of the remaining patients, six had successful treatment (Figure 1) and three had unsuccessful results. Patients in the successful group had pedunculated lesions up to 12 mm in length. In the unsuccessful group, patients had sessile lesions ranging from 9 to 25 mm in length. Data regarding lesion shape, site and size, number of procedures, and clinical evaluation are summarized in Table 1.

The mean duration of surgery was 6 to 10 minutes in most cases (43.5%), followed by 11 to 15 minutes (30.5%).

Transoperative pain

During the procedure two patients (16.66%) reported some pain (a score of 2 in the 11-point numerical rating scale for pain), but no anesthesia was required. Data regarding transoperative pain are summarized in Table 2.

Postoperative pain

For most patients, postoperative pain, if present, was usually mild (a score ≤ 2 in the 11-point numerical rating scale for pain) and easily controlled with medication.

Among patients reporting pain, 89.76% reported pain within the first 24 hours of surgery: most patients rated pain as 1 (48.80%), followed by a score of 2 (44.20%) (Table 1). On the second postoperative day, 6.8% of patients rated pain as 1 or 2; on the third postoperative day, 3.44% rated pain as 1 or 2. After this period, all patients reported no pain.

According to the pain scores recorded by patients, pain was minimal and tolerable: a score of 1 was the most frequently recorded (n=21, 48.8%), followed by 2 (n=19, 44.20%), 3 (n=2, 4.7%), and 5 (n=1, 2.3%). Data regarding postoperative pain are summarized in Table 2.

Discussion

Cryotherapy is the deliberate destruction of tissue by application of extreme cold and has been used in oral medicine and pathology for over 30 years (5). Reports of tissue destruction by freezing date back to the British physician, Arnott in 1851 (5). Initially, its use was limited to the treatment of cancer of the lip and oral cavity. At present, cryotherapy has a wide application in the treatment of both benign and malignant lesions in the head and neck region. In fact, over 40 different dermatological conditions of the head and neck have been described as being amenable to cryotherapy (5). It is worth mentioning that cryotherapy should be indicated to clinically

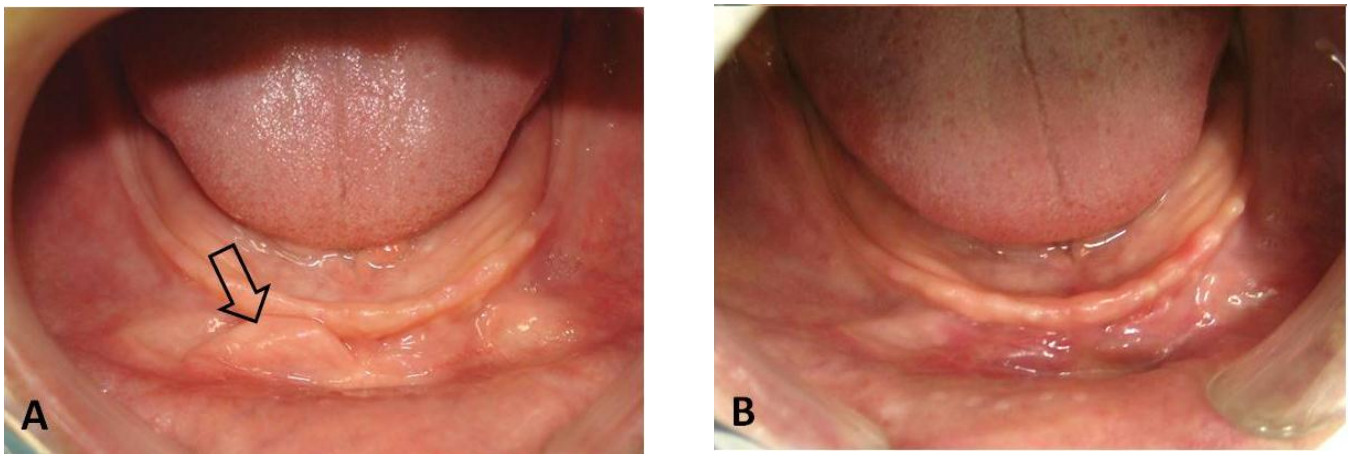

Figure 1: Preoperative (A) and postoperative (B) image of pedunculated lesion in a successful group of cryotherapy patients.

Patient	Age	Sex	Shape	Site	Size (mm)	Number of procedures	Clinical evaluation
1	45	M	Pedunculated	Maxillary alveolobuccal sulcus	09	5	Successful
2	64	F	Pedunculated	Maxillary alveolar ridge	03	1	Successful
			Sessile	Palate	03	2	Successful
3	58	F	Pedunculated	Buccal mucosa	04	1	Successful
4	62	F	Pedunculated	Mandibular alveolobuccal sulcus	09	2	Successful
5	67	F	Pedunculated	Mandibular alveolobuccal sulcus	12	6	Successful
6	53	F	Pedunculated	Maxillary alveolar ridge	12	6	Successful
7	65	F	Sessile	Mandibular alveolar ridge	25	2	Unsuccessful
8	49	F	Sessile	Maxillary alveolar ridge	09	2	Unsuccessful
9	56	F	Sessile	Maxillary alveolar ridge	12	2	Unsuccessful

Table1: Patient profile data, lesion shape, site and size, number of procedures, and clinical evaluation of a protocol for use of cryotherapy in the treatment of inflammatory hyperplasia

Pain (numerical scale)	Transoperative	Postoperative
0	83.33%	----
1	-----	48.8%
2	16.66%	44.2%
3	-----	4.7%
4	-----	-----
5	-----	2.3%

Table2: Scores on pain intensity during and after cryosurgery

diagnosable lesions, such as hemangioma and inflammatory hyperplasia, the lesion investigated in this study. For other oral lesions, such as leukoplakia, actinic cheilitis, and keratoacanthoma, incisional biopsy is imperative and can often serve as a treatment, cryotherapy being indicated to larger lesions after histopathological diagnosis.

Studies have shown the effective use of cryotherapy in a variety of soft tissue lesions affecting the oral cavity (11,12,21,22). However, an established protocol for different lesions is lacking, as well as a description of the events and symptoms that occur during the healing process; aspects evaluated in this study.

Current protocols suggest that for most benign oral mucosal lesions a 1–2 minute freeze-thaw cycle using a cryoprobe is sufficient. For smaller lesions, shorter freeze cycles (20–30 seconds) are adequate. In cases where hyperplastic tissue exists, freezing of the mass and then removing the bulk of tissue, followed by further freezing of the tissue base results in higher success rates.

A number of authors have reported the use of cryotherapy to treat oral hyperplasia (4,6,10,13,23,24). Nevertheless, none of them determined criteria for the indication of cryotherapy, thus hindering the reproducibility of the protocols. In the present study, hyperplasia with a pedunculated base, measuring up to 12 mm in length, showed good response to cryotherapy. However, sessile-based hyperplastic lesions did not respond to treatment. The protocol proposed in this study, using two 60-second cycles with a 2-minute interval, was successful in 66.66% of cases (Table 1).

Cryotherapy is well accepted by patients due to a relative lack of discomfort, absence of bleeding, and minimal to no scarring (17). Apparently, postoperative healing does not cause tissue retraction in the alveolar ridge, which is beneficial to prosthetic rehabilitation. Cryotherapy is a relatively painless procedure. This is due to the immediate blockage to neural transmission in the area. Within one minute of the thaw cycle, earliest signs of nerve damage are apparent. This is due to a combination of the freezing episode itself, as well as ischemic changes resulting in energy deprivation. The neuron itself is devitalized by freezing, but the axon sheath is resistant to freezing and remains intact. This allows growth of a new neuron and regeneration is apparent in one week. Normal function can be expected to return within 1–2 months.

Some reports have addressed the use of anesthesia in the treatment of hyperplasia by cryotherapy, including topical anesthesia (7,13), local anesthesia (4,7,10,13,23), as well as no anesthesia at all (10.14.24). In the present study, patients were free to ask for local anesthesia during the cryotherapy sessions, but none of them required anesthesia.

Some studies refer to minimal to no pain during cryotherapy (4,13,23). In this study, 27.58% of patients in all sessions reported mild surgical pain (a score of 2 in the numerical rating scale for pain). Yet, none of these patients required anesthesia.

After surgery, little or no pain was observed in some studies using cryotherapy in the treatment of hyperplasia, which indicates that this therapy provides the patient with more comfort when compared to other therapies, such as conventional excision, laser ablation, and mucosal abrasion (4,8.13,23). Our results show that, among patients reporting pain, 89.76% reported pain (scores of 1 and 2) within the first 24 hours of surgery. Therefore, clinicians should be aware that cryotherapy may be a practical and feasible method for treating inflammatory hyperplasia, in addition to being considered easier, more comfortable and more acceptable to patients. One limitation of this technique is the requirement for further sessions and greater patient compliance when treating larger lesions. The protocol proposed in this paper, considering the limitations of this study, appears to be effective.

Conclusion

The results obtained allow us to conclude that cryotherapy is an alternative, useful, fast and painless method for treatment of inflammatory hyperplasia.

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