



RESEARCH ARTICLE

LIQUID NITROGEN CRYOTHERAPY IN MANAGEMENT OF ORAL LESIONS

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ABSTRACT

Potentially malignant disease of the oral mucosa, with the risk of conversion to Oral Squamous cell carcinoma (OSCC) is described as premalignant or precursor lesions. The lesions like leukoplakia, erosive lichen planus, retention cysts like mucocele, and hyperplastic growths like traumatic fibroma are predominantly seen intra orally. A prospective study was done on 10 consenting patients to evaluate the effectiveness of open cryosurgical method in treating intra oral lesions with liquid nitrogen. Cotton swabs, 5-10 mm in diameter, were dipped in liquid nitrogen for 1-2 seconds and applied directly to the lesions after local anesthetic infiltration. Each site was directly exposed to 4 or 5 consecutive freeze-thaw cycles. The patients were examined on the 3rd day, 1st week, 2nd week and one month post operatively, to evaluate the parameters like pain, swelling, erythema, sloughing, formation of granulation tissue and epithelization. Atraumatic bloodless procedures which could give same or better results than surgical technique was introduced in the recent past. Cryosurgery is one of the modalities which fulfills these criteria. This technique provides a bloodless field, causes less pain, decreases operating time and causes minimal surgical morbidity. Cotton swab cryotherapy (CSC) with liquid nitrogen has shown significantly good results in achieving complete regression (CR) of the benign and premalignant lesions of the oral cavity.

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INTRODUCTION

Oral cavity accounts for approximately 3% of all malignancies and is a significant worldwide health problem. Potentially a malignant disease of the oral mucosa, with the risk of conversion to oral squamous cell carcinoma (OSCC) is described as a premalignant or precursor lesion. Satisfactory removal of diseased tissue by the surgeon depends upon the use of the simplest of instruments, the knife. In the present study, oral lesions were treated by open method of Cryosurgery in which nothing is excised, rather the lesion is allowed to undergo freezing and thawing, a certain number of times, by the application of cotton swabs dipped in liquid nitrogen and the resultant necrotic tissue is allowed to slough spontaneously. Perhaps, the absence of bleeding during the procedure, together with complete absence of secondary infection after the procedure, makes it the most suitable procedure for patients of any age and for medically compromised patients.

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MATERIALS AND METHODS

A prospective study was done on 30 consenting patients, who were randomly selected from the outpatient department of Oral and Maxillofacial Surgery, GITAM Dental College and Hospital, Visakhapatnam, to evaluate the effectiveness of cryosurgical method of treating oral lesions with liquid nitrogen. Intra oral lesions greater than 1 cm in diameter were included in the study. Cryosurgery basically consists of two methods. An open method in which the cryogen is applied to the lesions by cotton swabs or cryogun and a closed method in which the cryogen is applied to the lesion by using Cryo-probes. In the present study, an open method was used to treat the lesions via direct application of liquid nitrogen with cotton swab. Intra oral lesions like premalignant leukoplakia patches, lichen planus, irritational growths, pleomorphic adenoma and mucoceles were selected. Local anesthetic infiltration was given around the lesion. The cotton swabs, 5-10 mm in diameter, was dipped in liquid nitrogen for 1-2 seconds and applied directly to the lesions with moderate pressure. A swab

which closely corresponds to the size of the lesion was used. The method of application should start from the center to the periphery. Lesions too large to be frozen by single dip of a swab were managed by multiple overlapping applications. Since the oral mucosa was sufficiently moist, no watersoluble gel was required to improve the contact between the cotton swab and the mucosa. Each site was directly exposed to 4 or 5 consecutive freeze-thaw cycles. Freezing time was 30-50 seconds for mucocoeles, erosive lichen planus and 60-70 seconds for fibromas, leukoplakia and pleomorphic adenoma. This was spontaneously followed by Thawing for 30-60 seconds. After the ice ball produced during freezing was completely thawed, the next freezing was performed. High speed suction is necessary during treatment to control visual obstruction of the vapour fog. Secondary treatment was performed after 1 -2 weeks, if any residual lesions remained. Liquid nitrogen being a highly volatile substance must be used instantly from the time of dispensing it. Post operatively the patients were prescribed analgesics. The patients were examined on the 3rd day, 1st week, 2nd week and 1 month post operatively to assess the parameters like pain, swelling, erythema, sloughing, formation of granulation tissue and epithelization. Additional parameters like number of applications per appointment and the total number of appointments were also assessed.

RESULTS

Pain: The pain score was significantly different from post-operative score through 1 week. The post-operative and 3 days pain score was significantly higher than 1 week but there was no significant difference between post-operative and 3 days pain score.

Swelling: In this study 50% of the patients had slight swelling, 40% had mild swelling and 10% had severe swelling on the 3rd post-operative day. One week post operatively 60% of the patients had no swelling and 40% of the patients had slight swelling.

Erythema: Erythema was evaluated immediately after the procedure. 50% of the patients had mild erythema, 40% of the patients had moderate erythema and 10% of the patients had severe erythema.

Sloughing: The presence of sloughing was noted at the end of 1 week as present or absent. 80% of the patients had sloughing at the end of 1 week post operatively and 20% had no sloughing.

Granulation tissue: The formation of granulation tissue was noted between 1st and 2nd weeks. Granulation was rated as GOOD in 50% of the cases, FAIR in 30% and POOR in 20% of the cases.

Epithelization: Epithelization of the lesion was evaluated after 1 month post-operatively and was rated as GOOD in 70%, FAIR in 10% and POOR in 20% of the cases.

DISCUSSION

Atraumatic bloodless procedures which could give same or better results than surgical technique was introduced in the recent past. Cryosurgery is one of the modalities which fulfills these criteria. The commonly used cryogens are liquid nitrogen

(-191°C), nitrous oxide (-81°C) and carbon dioxide snow (-79°C). Liquid nitrogen is most commonly used as it is the coldest, highly versatile and effective in eradicating soft tissue lesions. Cryotherapy is well accepted by patients due to relative lack of discomfort, as it is a less invasive procedure lower morbidity compared with surgical resection. The absence of bleeding, minimal operating time and complete lack of post-operative infection made cryosurgery a noble alternative to conventional scalpel. Cryosurgery is relatively a painless procedure. This is due to immediate blockage of neural transmission in the area. In this study 90% of the patients had slight pain immediately after the procedure. On the 3rd day post-operatively 70% had slight pain and 20% had moderate pain while 10% of the patients had no pain. At 1 week post-operatively 80% of the patients had no pain while 20% had slight pain. This is in accordance to the study done by *Chin-Jyh Yeh et al.* Localized swelling increased for 1-2 days and remained for 2 -3 days.

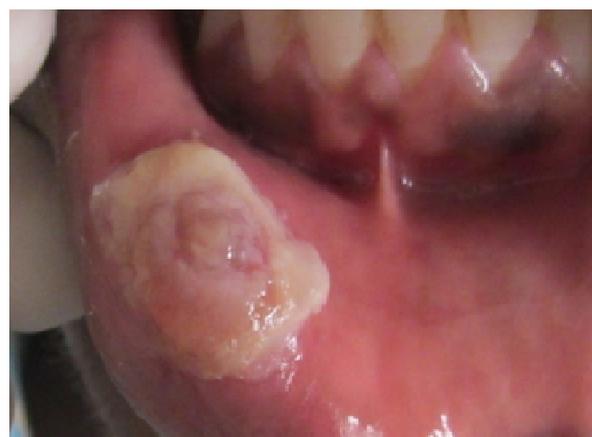
Pre operative photograph



Immediate post operative photograph



1 Week post operative



This is due to the difference in the osmotic gradients from the formation of extracellular and intracellular ice crystals. This is in accordance to the study done by *Chin-JyhYeh et al*, *Chuan – Hang Yu et al*, *Manu Prasad* and *Toida et al*. The effect of local vasoconstriction after cryotherapy and reduction in the blood flow results in erythema.

2 week post operative



1 month post operative



During the first hour after freezing and thawing mild erythema developed. In this study 50% of the patients had mild erythema, 40% had moderate and 10% had severe erythema. This is in accordance to the study done by *Toida et al* in which during the first hour after freezing mild erythema developed. The lesion and the overlying mucosa become necrotic and sloughed within 3-5 days following cryosurgery. In this study sloughing was classified as present or absent after 1 week post-operatively. In 80% of the patients sloughing of the lesion occurred at the end of 1st week post-operatively, while in 20% there was no sloughing. This is in accordance to the study done by *C.J. Yeh*, *Chen et al* and *Toida et al*. Formation of granulation tissue is one of the events during the healing period following cryosurgery. In this study formation of granulation tissue postoperatively occurred between the 1st and the 2nd weeks. 50% of the patients had good formation of granulation tissue, 30% had fair and 20% had poor formation of granulation tissue. This is in accordance to the study done by *Chin-JyhYeh et al* and *Toida et al*. Complete epithelization of the oral lesion after cryosurgery is the final step during the uneventful healing process. This process depends on the size and location of the lesion. In this study epithelization of the

mucosa overlying the lesion occurred after 1 month post-operatively. 70% of the patients had good epithelization, 10% had fair and 20% had poor epithelization. This is in accordance to the study done by *Chin-JyhYeh et al*, *Manu Prasad* and *Toida et al*. A nearly finding in clinical cryosurgery was that repeat freezes were more effective than a single freeze. In this study the oral premalignant and benign lesions were treated with an average of 3-4 cycles per appointment depending on the size of the lesion. The average number of appointments was 2-3 per patient. This is in accordance to the study done by *ValappilaNidhin et al*.

Conclusion

Cotton Swab Cryotherapy (CSC) with liquid nitrogen has shown significantly good results in achieving complete regression (CR) of the benign and premalignant lesions of the oral cavity. This technique provides a bloodless field, causes less pain, decreases the operating time and causes minimal surgical morbidity compared to the conventional methods of treating intra-oral lesions. The most common difficulty in this technique is the portability of the cryogenic agent. In this study liquid nitrogen which was used as the cryogen is highly volatile. It requires special storage container for short term storage and canisters for dispensing it from the container during its use. The time difference between dispensing the liquid to its application should be very minimal. This problem can be diligently dealt by planning the procedure very precisely with the help of experienced assistants.

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