

Cryosurgery in the management of maxillofacial lesions: A review literature

Correspondance to: Dr. Vijay ebenezer¹, professor and head of the department of oral and maxillofacial surgery, Sree balaji dental college and hospital, pallikaranai, chennai-100.

Author Details:

1) Dr. Vijay ebenezer¹, professor and head of the department of oral and maxillofacial surgery, Sree balaji dental college and hospital, pallikaranai, chennai-100.

2) Dr. Balakrishnan Ramalingam², professor in the department of oral and maxillofacial surgery, Sree balaji dental college and hospital, pallikaranai, chennai-100.

Abstract:

Background:

There are various methods of tissue destruction have been employed in the field of oral and maxillofacial surgery like chemicals, irradiation by X-rays and high-frequency electric current and other methods. However any technique in question with the surgeon's scalpel should be painless, produce minimal damage to the surrounding tissues, should be selective against, for example, malignant cells, it is very much applied locally, promote uneventful healing rapidly and provides good control. Cryosurgery is a therapeutic method of treatment in which inflammation and destruction tissue cells is created by high cold freezing. This review article aimed to throw insight into the efficacy of cryosurgery in the treatment of oral and maxillofacial lesions.

Conclusion:

With the recent development of better equipment and use of liquid nitrogen, this mode of therapy appears to have promising role in the management of locally aggressive and recurrent lesions in the maxillofacial region. Thus, its ease of application and the absence of postoperative infection, contraction, scarring with little or no recurrence makes cryosurgery a highly useful method in treating various conditions of oral cavity. Cryosurgery procedure can be done in out patient clinic, very much cost feasible and comparatively in treating various oral lesions. It is an less invasive form of therapy when compared to the conventional surgery. Cryoprobe can be used as an adjuvant material with other surgical methods in treating various types of oral lesions. In conclusion there would be a considerable increase in the use of cryotherapy in oral surgery, along with a much better understanding of the basic principles and techniques related to this form of treatment.

Keywords: Cryosurgery, freeze-thaw, leukoplakia, mucus cysts, premalignant lesions, oral lesions...

1. Introduction:

From the days of Hippocrates, sub-zero temperatures concept were there for treating swelling, sprains, prevention of pain during operation, for some of the medical disorders etc. In the 17th century, Robert Boyle found that cells could be killed by freezing.[1] In the last century, Baron Lorrey observed its utility in anesthesia and sedation for amputation.[2,3] In 1977, John Hunter noted that there was local tissue necrosis and vascular stasis after application of freezing mixture that resulted in good healing of tissues.[4]

Cryosurgery is the method of controlled cooling causing deliberate destruction of tissues. James Arnott in 1851 was first to report on the therapeutic use low temperature in malignant disease by means of salt or ice mixture applied to breast neoplasm. The unique properties of cryosurgery were recognized before the turn of this century and since then use of cold and removal of tissue by freezing has been utilized in various field of medicine with an aim of destroying and removing unwanted tissues. Its success has paralleled the development of cryosurgical apparatus and its future progress may also reflect the kind of new technologies.

In field of oral surgery at early 1960s cryosurgery began to be seriously considered. Amaral et al. [5] reported the efficacy of liquid nitrogen on treating palatal inflammatory papillary hyperplasia. Mac Donald et al. in 1981 suggested that cryosurgery can be used for the treatment of leukoplakia, lichen planus angiomas, hyperplasias of palate. [6] Barnard et al in 1981 reported that cryotherapy helps in the management of chronic postoperative pain and has the ability to produce extended reversible nerve block. He emphasized that cryoanalgesia offers advantages over other methods of long-term nerve block or neurectomy and may result in prolonged relief in some patients.[7] Goss et al in 1988 suggested that for the intractable neuralgia cryotherapy can be used.[8]

There are various factors that determine mechanism of damage caused to the tissues by freezing, they are the physical nature of tissues, the apparatus used, rate of cooling, degree of cooling, distance from which the cryoprobe used, nature and depth of the lesion etc. Cold sensitivity varies. Melanocytes are the most susceptible cells, followed by basal cells, keratinocytes, bacteria, connective tissue, axon myelin sheath and virus.[9]

The direct effects are Ice crystal formation or cellular disruption, cellular dehydration and electrolyte disruption, thermal shock, inhibition of enzymes, the effects of thawing. The indirect effects are vascular effects and immunological effects. Ideal properties of instruments are that the cold source (which is really a means of extracting heat – a heat sink) must be small and sufficiently maneuverable to reach the various parts of the mouth. It must be controllable, nearby tissues should not be damaged, temperature must be maintained till the end of the procedure, controllable rate of thawing, thermocouples are needed to be fixed in order read the temperature by the surgeon in between the procedure. cryogens like nitrous oxide (-81°C), liquid nitrogen (-191°C), and carbon-di-oxide (-79°C).[10]

The apparatus for cryosurgery may be classified into the following:

1. Open systems: In which direct application of the freeze dried mixture is used. Preferred when control in the depth of destruction is of secondary importance.
2. Closed systems: provides very good control, works under the principles of thermoelectric and Evaporative.

2. Discussion:

For oral lesions like leukoplakia, vascular malformations and lichen planus, cryosurgery found to be very good therapy. The technique of freezing has been used to treat hemangiomas by Chapin M.E. et al in 1976 [11], Hartman p.k. et al [12] in 1984 and [13] Haim Tal et al in 1992. Applications of selected freezing have been employed to treat leukoplakia and hyperkeratosis by Emmings et al in 1967, Sako et al in 1969, Gongloff r.k. et al [14,15] in 1980 and Ishida C.E. et al in 1998. With the advancement in cryosurgical technique and equipment, it was utilized in pyogenic granuloma, angioma, fibroma, keratoacanthoma. Lichen planus was treated with cryotherapy with good results by Sankodi et al in 1979, Bekke J.P.H. et al in 1979, Loitz G.A. et al in 1986 and Ishida.C.E. et al in 1998. Trigeminal neuralgia (Barnard J.D.W. et al, 1979) and salivary gland neoplasms (Emmings et al, 1967) were also treated using cryosurgery.

The treatment of ranula involves excision of gland or a much simpler marsupialisation. However, surgery in the floor of the mouth is associated with a risk of injury to Wharton's duct and to lingual nerve, profuse bleeding due to rich blood supply and high risk of infection due to loose areolar tissue in various spaces in this region. All the cases of ranula in this study showed complete ablation. Mild transient paresthesia was reported in one of the cases. Thus cryosurgical procedure is a good preference in the treatment of ranulas. These results are in conformity with the reports of Marvin E. Chapin et al [16] in 1976, who have successfully treated ranulas with cryotherapy.

According to Ashok Bansal et al Cryosurgery is very much useful against vascular malformations and provides very minimal scarring. The conditions like nevi are also treated successfully. It was found to be very useful in treating the strawberry nevi as well as capillary nevi [17]. In those lesions combined cryosurgical approach with excision sometimes proved to be useful.

Lloyd et al. [18] suggested the use of cryoanalgesia in the management of chronic facial pain. A reliable, prolonged, reversible nerve block is achieved that does not aggravate symptoms. Following cryosurgery the postoperative pain is found to be very minimal. Sensation in the distribution of peripheral nerves have most often returned to normalcy that incidentally incorporated in the cryolesion. Bradley et al. in his study reported that the sensation to the inferior alveolar nerve have returned following cryosurgery.

AN Goss et al used cryoneurotomy to the TMJ capsule and great auricular nerve. The patients had severe pain with analgesic abuse and other psychosocial problems. Those patients following cryoneurotomy had very good relief of pain. In cases of oral carcinoma, cryosurgery proved to be very good means of localized tissue destruction. Its use has been mainly confined to recurrent or persistent growths following surgery or radiotherapy. According to Holden et al, cryosurgery is the treatment of choice in recurrent nasopharyngeal carcinoma. [19] It should not be the primary treatment of oral cancer except in very early lesions of anterior part of palate and in patients who are considered unfit for other forms of treatment. [20]

Lichen planus is basically a skin disease. Multiple etiological factors have been suggested including infection, trauma, stress, immunologic factors, hypertension and contact allergy to certain metals. It is present in oral cavity in various forms subreticular, papular, bullous, erosive and plaque like. Many treatment modalities have been proposed for this disease which includes topical steroids, laser therapy, antifungal mouth washes, surgical excision and cryosurgery.

The advantages of cryosurgery are very low complication rate, accepted very well by elderly people. Reasonably predictable volume of tissue destruction. Particularly suited to extensive

superficial lesions. Without causing further scarring the treatment can be repeated as many times as possible. This is particularly important in facial skin and the treatment of wide areas of premalignant change. May be used as an adjunct to surgery or for radiotherapy in palliative tumor control.

The complications of cryosurgery are pain after surgery, Vesicle formation, Exposure of bone if probe applied to areas with thin mucoperiosteal surfaces such as mucosa over lingual aspect of mandible. Although healing may be delayed in such cases, the devitalized exposed bone remains unaffected and pain free, until sequestration or resorption have occurred, and the area is covered by mucosa again. If freezing is done for longer than 20–30 seconds scarring of facial skin takes place. Reduction in pigmentation occurs due to healing. After a few months the detection of the lesion will become difficult.

Wallerian degeneration followed by regeneration due to profound application of freeze drying mixture. This can also be the cause for reduction in the sensation following cryosurgery. The delayed complications are appearance of hyperplasia, fever, post-surgical infection and pyogenic granuloma. There are also some permanent complications such as hypopigmentation, atrophy, alopecia and ectropion, when performed near the eyes.[21-23] There are some contraindications such as cold intolerance, Raynaud's and collagen diseases, patients with immunosuppressive therapy, patients with platelet alterations or with multiple myeloma.[24]

3. Conclusion:

With the recent development of better equipment and use of liquid nitrogen, this mode of therapy appears to have promising role in the management of locally aggressive and recurrent lesions in the maxillofacial region. Thus, its ease of application and the absence of postoperative infection, contraction, scarring with little or no recurrence makes cryosurgery a highly useful method in treating various conditions of oral cavity. Cryosurgery procedure can be done in out patient clinic, very much cost feasible and comparatively in treating various oral lesions. It is an less invasive form of therapy when compared to the conventional surgery. Cryoprobes can be used as an adjuvant material with other surgical methods in treating various types of oral lesions. In conclusion there would be a considerable increase in the use of cryotherapy in oral surgery, along with a much better understanding of the basic principles and techniques related to this form of treatment.

4. References:

1. Rowell AG. Cryosurgery. Aust Dent J 1976;21:1-2.
2. Jackson A, Colver G, Dawber R. Cutaneous cryosurgery. Principles and clinical practice. London: Martin Dunitz; 1992. p. 1-5.
3. Shepherd J, Dawber RP. The historical and scientific basis of cryosurgery. Clin Exp Dermatol 1982;7:321-8.
4. Barnard D, Lloyd J, Evans J. Cryoanalgesia in the management of chronic facial pain. J Maxillofac Surg 1981;9:101-2.
5. Amaral WJ, Frost JR, Howard WR, Cheatham JL. Cryosurgery in treatment of inflammatory papillary hyperplasia. Oral Surg Oral Med Oral Pathol 1968;25:648-54
6. MacDonald RD, Pospisil OA. Comparison of experimental carcinogenesis in normal hamster cheek pouch and pouch treated previously by cryosurgery. Br J Oral Surg 1981;19:24-8.

7. Barnard D, Lloyd J, Evans J. Cryoanalgesia in the management of chronic facial pain. *J Maxillofac Surg* 1981;9:101-2.
8. Goss AN. Cryoneurotomy for intractable TMJ pain. *Br J Oral and Maxillofac Surg* 1988;26:26-31.
9. Jackson A, Colver G, Dawber R. Cutaneous cryosurgery. Principles and clinical practice. London: Martin Dunitz; 1992. p. 7-15.
10. Prasad M, Kale TP, Halli R, Kotrashetty SM, Baliga SD. Liquid nitrogen cryotherapy in the management of oral lesions: A retrospective clinical study. *J Maxillofac Oral Surg* 2009;8:40-2.
11. Chapin ME. Cryosurgery with nitrous oxide: Report of cases. *J. Oral Surg.* 1976; 34: 717-21
12. HartmanPK, Verne D and Davis RG. Cryosurgical removal of a large hemangioma. *Oral Surg., Oral Med., Oral Path.*1984; 58(3):280-82
13. Haim Tal. Cryosurgical treatment of hemangiomas of lip. *Oral Surg., Oral Med., Oral Path.* 1992; 73:650-54
14. Gongloff RK, Samit AM, Greene Jr G W, Innc o G F G a g e A A . Cryosurgical management of benign and dysplastic intraoral lesions. *J. Oral Surg.* 1980; 38: 671-76
15. Ishida CE, Ramos-e-Silva M. Cryosurgery in oral lesions. *Int. J. Dermatol.*1998; 37(4): 283-85
16. Vercellino V, Magnani G, Goia F, Gandolfo S. Our clinical experience with the cryosurgery of oral lesions of odontostomatologic interest. 1980; 29(4): 252-258
17. Goldwyn RM, Rosoff CB. Cryosurgery for large haemangiomas in adults. *Plast Reconstr Surg* 1969;43:605-11.
18. Lloyd JW, Barnard JD, Glynn CJ. Cryoanalgesia: A new approach to the pain relief. *Lancet* 1976;2:932-4.
19. Holden HB. Cryosurgery in ENT practice. *J Laryngol Otol* 1972; 86:821-7.
20. Gage AA. Cryosurgery for oral and pharyngeal carcinoma. *Am J Surg* 1969;118:669-72.
21. Torre D, Lubritz RR, Kuflik EG. Practical cutaneous cryosurgery. Connecticut: Appleton and Lange; 1988. p. 51-60.
22. Dawber R, Colver G, Jackson A. Cutaneous cryosurgery. Principles and clinical practice. London: Martin Dunitz; 1992. p. 139-53.
23. Faber WR. Side effects and complications in cryosurgery. *Dermatol Monatsschr* 1993;179:247-51.
24. Kuflik EG, Gage AA. Cryosurgical treatment of skin cancer. New York: Igaku-Shoin; 1990. p. 15-33.