

Short Communication

CRYOSURGERY

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Cryosurgery is a branch of therapeutics which makes use of local freezing for the controlled destruction or removal of living tissues. Four thousand years ago ancient Egyptians noted that the application of cold minimized pain and inflammation of trauma. The first true cryosurgery was performed in the late nineteenth century by a dermatologist, Campbell White, who used solid carbon dioxide¹. Modern apparatus was developed by a neurosurgeon, Irving Cooper, in 1962². A number of cryogens are available e.g. ethyl chloride, Freon, carbondioxide, nitrous oxide and liquid nitrogen etc. Liquid nitrogen with a boiling point of -196 °C, is the most widely used. Cryogens can be delivered to the tissues in various ways e.g. cryoprobes and open spray nozzles of variable sizes with which a very fine control can be achieved³.

Mechanisms for the cellular injury include intracellular and extracellular ice formation, osmolar changes, vascular stasis, thermal shock, denaturation of lipoprotein complexes and cold-induced immune recognition of remaining viral or tumor cells^{3,4}. These changes are dependent on several factors e.g. rate of

temperature fall and rate of rewarming, solute concentration, length of time cells are exposed to a below freezing temperature in the zero to -50°C range, and the coldest temperature reached in the target tissue.

Different cells and tissues demonstrate a range of sensitivity to freezing. Rapidly growing cells, nerve cells and melanocytes are the most sensitive. Fibroblasts and stromal structures are less sensitive which may be an important factor for the lack of scarring following superficial procedures. Adequate freezing in both horizontal and vertical dimensions is required for effective treatment. Depth of freeze can be gauged by an experienced operator, based on the surface area of ice formation. However, for malignant lesions, thermocouples are used to directly measure the depth and duration of the desired isotherm (temperature level) and ensure adequate treatment. Post-operative follow up ensures complete tumor extirpation since marginal clearance cannot be assessed otherwise. Benign superficial lesions should be retreated rather than to over freeze, increasing the risk of scarring and hypopigmentation⁵.

Cryosurgery has vast applications in dermatology, gastroenterology, eye, neurosurgery, ENT and oncology. In dermatology, numerous lesions, benign, pre-malignant and malignant can be effectively treated by cryosurgery. These include angiomas, condyloma acuminata, warts (common and plantar), dermatofibromas, freckles (ephelides), lentigines, granuloma annulare, hypertrophic scars, keloids, molluscum contagiosum, mucocele, prurigo nodularis, sebaceous hyperplasia, seborrhoeic

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keratoses, skin tags (achrochordons), xanthelasma, pyogenic granuloma and lymphangioma circumscriptum^{3,4}. Premalignant conditions e.g. actinic keratoses and Bowen's disease, as well as malignant conditions e.g. basal cell carcinoma and squamous cell carcinoma, all respond to cryotherapy^{3,4,5}. Cryosurgery, which is "blood-free" has unique advantages, especially in the treatment of warts, molluscum contagiosum and Kaposi's sarcoma in HIV positive patients⁶.

Ophthalmological indications for, cryosurgery includes cataract, retinopathy of prematurity, diabetic retinopathy and sebaceous carcinoma of the lid⁷. In ENT, it is successfully applied for habitual tonsillitis, tonsillar haemangioma, papilloma and malignant lymphoma. It is also useful to treat varicose veins⁶. In other fields of medicine, cryosurgery has been successfully employed for brain tumors, lung cancer, hepatic malignancy and metastatic tumors in liver, polyposis of rectum and colon, colo-rectal carcinoma and benign and malignant prostatic hypertrophy^{8,9}.

Cryosurgery has a few adverse effects which are generally not severe e.g. edema, vesicles, bullae, weeping, eschar formation, infection, abnormal scarring, pigment alteration, nerve damage, alopecia and insufflation of soft tissue^{3,4}. Periorbital edema may be lessened by the use of systemic steroids or potent topical steroids applied twice daily.

Contraindications of cryosurgery include agammaglobulinaemia, cold intolerance, cold urticaria, cryoglobulinaemia, cryofibrinogenaemia, Raynaud's disease,

collagen vascular diseases, multiple myeloma, concurrent treatment with immunosuppressives, renal dialysis and absence of an accurate diagnosis^{3,4}.

In short, cryosurgery has the advantages of rapid treatment of multiple lesions, ease of use, low cost and acceptable results.

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