Hyfrecation for Recalcitrant Nongenital Warts

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ABSTRACT

Background: Verruca vulgaris is a common skin condition in general practice, which often resolves without treatment. For lesions needing treatment, they often persist despite repeated treatment and become recalcitrant warts. Hyfrecation is a form of electrosurgery which has been used in treating common and recalcitrant warts. Objectives: This article describes the history and mechanisms of hyfrecation and also reviews available evidence on the effectiveness of hyfrecation for recalcitrant nongenital warts. Discussion: Hyfrecation provides controlled tissue destruction with carbonized desiccated wounds which are ideal for eradicating recalcitrant warts. A systematic literature search revealed very minimal, if any, good-quality clinical studies that compare the efficacy of hyfrecation against other treatments (i.e., liquid nitrogen) in treating recalcitrant nongenital warts. Other studies reported the benefits of hyfrecation for genital warts. The author illustrates with a case scenario, the benefits of hyfrecation in treating nongenital warts, and thereby, advocates its wider use in general practice.

Keywords: Hyfrecation, nongenital warts, recalcitrant warts, treatment

Introduction

Common warts, or verruca vulgaris, is a commonly encountered condition in general practice and it affects up to 7-10% of the general population. The human papilloma virus (HPV) subtypes commonly implicated are 1, 2, 4, 27, and 57 for lesions on hands and feet, and subtypes 3 and 10 are more associated with lesion on the face. For lesions presenting for the first time, especially in children, expectant approach is often appropriate as two-third of such lesions will resolve spontaneously within 12-18 months. And for lesions that need treatment, various chemical and physical options are available with varying levels of evidence, all aim to disrupt the integrity of the HPV-infected keratinocytes, so that the dendritic and Langerhans cells in the skin can recognize the exposed HPV virions and mount an effective cellular immunological response to clear the verruca vulgaris lesions. The commonest first-line treatment will be chemical treatment with salicylic acid (USPSTF level of evidence I-A) and cryotherapy with liquid nitrogen (USPSTP evidence I-B). However, not all lesions would resolve. In fact, in the author's experience, up to 60% of lesions still remain after three or more attempts. Surprisingly, there is no consensus regarding the definition of recalcitrance for verruca vulgaris, and the author would habitually label verruca vulgaris lesions as recalcitrant if they fail to resolve after the 5th treatment. Ideally, it would be best practice to refer recalcitrant nongenital warts to dermatologists both for confirmation of diagnosis and further specialist management. In actual practice, the waiting time for such referral will be at least 12-18 months under the present health care system in Canada. Given the hiatus, general practitioners are confronted with the dilemma of choosing between administering further salicylic acid/liquid nitrogen which may work at all, and simply adopting a conservative approach which may entail further symptoms in the patients.

Hyfrecation and its theory

Based on the discovery of high-frequency electrical circuitry by d’Arsonval in 1891, William T. Bovie developed the concept of hyfrecation in 1928, a form of electrosurgical procedure where low power high-frequency alternating current (500 kHz to 4 MHz) is delivered to the body via pointed unipolar electrode. In any living cell, there are numerous cations and anions which will attempt to align themselves according to the polarity of an applied current. However, when the polarity changes so rapidly in face of the high-frequency alternating current, the ions can only vibrate instead of flowing, generating heat abruptly within a short period of time. The climbing heat leads to protein coagulation (> 45°C), cell death (> 60°C), intracellular vaporization, and explosion (> 100°C) and finally

Access this article online
Quick Response Code:
Website: www.jfmpc.com
DOI: 10.4103/2249-4863.117403

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Carbonization (400°C to 600°C). Depending on the degree of contact between the electrode and the body surface, it results either in electrodessication or electrofulguration. Direct contact enables free current flowing through the body tissue at a lesser resistance, causing coagulation and desiccation without carbonization (electrodessication). When the electrode is positioned above the target tissue with an intentional air gap (usually 1-3 mm), electric current has to discharge through a higher resistance with a spark, leading to rapid heating and carbonization of the tissue (electrofulguration) [Figure 1]. When combined with curettage, electrodessication is a recognized treatment for treating basal cell carcinomas and low-risks squamous cell carcinomas.

Clinical evidence regarding use of hyfrecation in treating nongenital warts

A literature search was performed on all published medical reports from PubMed, Medline, Embase, CINAHL, Cochrane Library, AMED, and EBM Reviews (from 1947 to December, 2010) using the OVID portal of Queen’s University, Kingston, Ontario. Abstracts were initially obtained using keywords of “verruca vulgaris or common wart or recalcitrant wart” and “electrosurgery or electrodessication or hyfrecation” and “treatment or trial”. Manual searches of references and review articles supplemented the computerized search, and only full-length published trials were considered. There is no limitation by language, age, or sex. Where applicable, randomized controlled trials were evaluated according to the Cochrane risks of bias tool. We found 138 entries on initial search and after removal of duplicates plus irrelevant entries, only 13 articles were included in our analysis [Appendix 1]. Out of the 13 publications, there is only one randomized controlled study by Sudhakar et al., that compared electrosurgery against 40% salicylic acid.
acid for treatment of non-genital common warts. In this study, 60 patients with nongenital warts were randomized to either electrosurgery (author did not specify the protocol nor equipment use) or 40% salicylic acid treatment over a period of 12 months. Clearance rate with electrosurgery is 90% versus 16.7% with salicylic acid, and overall tolerance of treatment is considered very satisfactory. Nine other publications are opinion/review articles that mentioned electrodesiccation/electrosurgery as one of the destructive methods of treatment for common warts, without any form of systematic review of evidence. The other three publications are case reports, two of which perhaps mark the earliest description of using electrofulguration and electrocautery for treating common wart.

Pros and cons of hyfrecation in treating common warts
The advantages of hyfrecation include controlled destruction of HPV-infected keratinocytes and virions, and creation of a dry desiccated wound (as compared with a wet wound with or without blistering when using liquid nitrogen treatment) with lesser risks of secondary infections. It often provides clearance for recurrent or recalcitrant lesions as a single treatment when the more expensive alternative, CO₂ laser, is unavailable. Disadvantages of hyfrecation include the need of local anesthetics (which removes the sensation of pain but not the heat), the unpleasant smell of burnt flesh, possible interference with electromagnetic implants (like pace-makers, magnetic cerebrospinal fluid shunt), poor healing complicated by diabetes and peripheral vascular diseases, possible cicatrisation and keloid formation. It is also less favored in pediatric patients or lesions on the face. Last but not the least, damage to underlying deep tissues is possible with overtreatment, leading to possible mutilation. In particular, the risks of HPV virions airborne dissemination from the smoke plumes of electrodesiccation can be a genuine concern. Garden et al. detected papilloma DNA in the vapor arising from verruca lesions in both cows and humans treated by CO₂ laser, a method very similar to hyfrecation in its destructive mechanisms. In a similar way, Sawchuk et al. demonstrated the presence of HPV DNA in the electrocoagulation vapour in four out of seven human subjects treated for plantar wart. However, the authors suggest the use of surgical face mask will be sufficient to protect operators from inhalation risks of such vaporized HPV virions. It is also imperative to know that the tip of the hyfrecator probe is not heated up during hyfrecation and is not self-sterilizing; hence, the tip should be disposed after treatment and never be reused for another patient.

Case study
A 37-year-old male insurance broker has three lesions of verruca vulgaris on the medial aspect of his right foot for over a decade. He had tried various strength of local salicylic acid application bought over the counter, and no less than 12 liquid nitrogen treatments without any noticeable improvement. Due to his job nature, he has to wear leather shoes to match his suite and tie and at times, he experienced pain over the lesions after a long day. He came to the author’s clinic asking for possible cure, also admitting that the last dermatologist he consulted did suggest a topical 5-fluorouracil cream or intralesional bleomycin injection, and he was reluctant to try either as his initial Internet search informed him that both chemicals belong to anticancer drugs. On examination, there are three wart lesions on the medial aspect of the first metatarsophalangeal joint of the right foot, measuring 2 to 4 mm in diameters. The author explained the logistics of hyfrecation and its possible risks, and patient agreed to have a trial. Local anesthesia was achieved with 2% lignocaine injected at the base of the lesions, and hyfrecation was performed.
with standard square waves at setting of 30 (Hyfrecator 2000, ConMed USA) until the lesions were desiccated with a thickness of 1 mm. Patient was reviewed at 3 weeks with uncomplicated healing [Figure 3], and at 8 weeks, the scabs have fallen off with no scarring and total resolution of verruca [Figure 4].

**Conclusion**

Nongenital warts are common encounters in general practice and they can persist after repeated treatments. Hyfrecation is a form of electrosurgery which when used by trained hands with caution, can result in clearance of recalcitrant warts with a single treatment. The author hereby advocate its wider use in general practice for nongenital warts which have failed repeated topical treatment or cryotherapy, as a cost-effective alternative to other more expensive modalities like CO₂ laser.

**Acknowledgment**

The author thanks Arthur Leung, who drew Figure 1.

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How to cite this article: Leung L. Hyfrecation for recalcitrant nongenital warts. J Fam Med Primary Care 2013;2:141-4.

Source of Support: Nil. Conflict of Interest: None declared.