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Case Report

Cutaneous warts removal in a male teenager with combination therapy of Er:YAG and Nd:YAG Laser

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Abstract Cutaneous warts also known as verruca vulgaris are common benign epithelial proliferation caused by human papilloma virus (HPV). For the eradication of warts, several therapeutic techniques have been suggested. However, complete eradication of cutaneous wart is not always achieved with standard therapy. Although there is still a scarcity of data, the use of Light Amplification by Stimulated Emission of Radiation (LASER) may be a useful treatment option to manage cutaneous warts. We present a case of a 19-year-old male teenager with asymptomatic brownish to greyish verrucous papules and plaques over the upper and lower extremities for almost 2 years. Diagnosis of cutaneous warts was established with clinical findings and dermoscopy of the lesions which revealed pinpoint dots of papillary capillaries. The patient was treated with combination of Er:YAG (erbium-doped yttrium aluminium garnet) and Nd:YAG (neodymium-doped yttrium aluminium garnet) LASER under local anesthesia. All cutaneous warts were completely removed with no noted serious adverse events. The Er:YAG laser is perfectly suited for rapid and precise warts removal without thermal harm to surrounding tissue. Combining with the Nd:YAG laser, which affects the nearby blood vessels and removes the remaining wart tissue, has produced favorable outcome. Combining Er:YAG with Nd:YAG in a LASER is a promising and effective way to eliminate cutaneous warts.

Key words
Ablative laser; Common warts; Non-ablative laser; Verruca vulgaris.

Introduction

The term "cutaneous wart" or "verruca vulgaris" refers to a benign epithelial skin growth that is frequently brought on by HPV (Human Papillomavirus) infection.[1] About 15 different subtypes of HPV have been linked to cutaneous warts. Approximately 200 different genotypes of HPV. The most prevalent HPV genotypes that cause cutaneous warts are HPV1/2/3/4/10/27/57, with genotypes 1, 2, 4 and 27 being particularly common.[2]

The prevalence of cutaneous warts ranges from 7 to 12% on average. Cutaneous warts are mostly asymptomatic, but on rare occasions, people have reported physical discomfort, aesthetic problem, or even psychological effect due to cutaneous warts.[2] Human papilomavirus may grow everywhere. Common warts, vaginal warts, flat warts, palmoplantar warts, localized epithelial hyperplasia, and epidermodysplasia verruciformis are some of the most noticeable signs of HPV infection. Warts can spread by direct or indirect inoculation. When the epithelial barrier is disrupted, warts are more likely to form. Systemic wart dissemination is rare. The virus can also be seen in the

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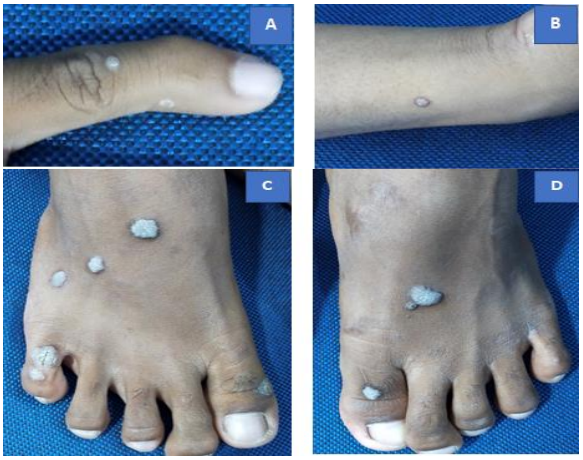

Figure 1 Clinical findings: few greyish verrucous papules on the left fifth finger (A); left wrist (B) and multiple greyish to brownish verrucous round-shaped papules and plaques sized 3 x 3 mm to15 x 15 mm on the dorsum aspect of both feet (C and D).

epithelium's basal layer, however it is known to multiply in the upper epithelial layer.[3,4]

Verruca vulgaris can appear at any age. Its prevalence rises among school-age children and peaks at 12 to 16 years of age.[4,5] As no single treatment can completely cure verruca vulgaris, their management may be challenging.[6] There are numerous reported wart treatments, but none are 100% successful. Conventional wart removal modalities, such as topical salicylic acid, topical imiquimod, bleomycin injections, cryotherapy, surgical excision, and electrocautery, have proved to be somewhat effective, but they may also produce only partial or superficial results, which might increase the recurrence rate.[3,4] A promising alternative to traditional treatment is provided by energy-based devices, such as monochromatic laser therapy.[7]

The 2,940 nm Erbium YAG laser emits infrared light which can ablate skin tissue with the depth of 5–20 µm on each laser pass, thanks to its 250 µs pulse duration and 5 J/cm^2 short pulse.[8] It has the capacity to eliminate warts by directly ablating the epidermal layer until normal tissue is visible.[8,9] The primary heat-producing mechanism of 1064 nm Nd:YAG is the infrared

Figure 2 Dermoscopy of verruca vulgaris shows well-defined margins, brown background, skin colored papillae with red dot globules and hemorrhage.

spectrum. The DNA of wart lesions that have undergone heat treatment is entirely destroyed. The Nd:YAG lasers can also be used for photothermal tissue coagulation and destruction. The 1064 nm Nd:YAG laser, which also targets hemoglobin, can target the wart-containing capillaries.[10]

Case report

A 19-year-old Fitz Patrick phototype V male presents with a 2-year history of multiple asymptomatic greyish to brownish verrucous papules which gradually enlarged into plaques on the upper and lower extremities. Patient was self-medicated with over-the-counter topical medication which contain salicylic acid 2%, lactic acid 0.5% and polidocanol 0.2%, once daily with no noted improvement. Examination of the organ system was unremarkable. Patient had a history of hypertrophic scarring. Family history was non-contributory. Physical examination showed few greyish verrucous papules on the left fifth finger and left wrist; multiple greyish to brownish verrucous round-shaped papules and plaques sized 3x3 mm to 15x15 mm on the dorsum aspect of both feet **(Figure 1)**. Dermoscopy of verruca vulgaris shows well-defined margins, brown background,

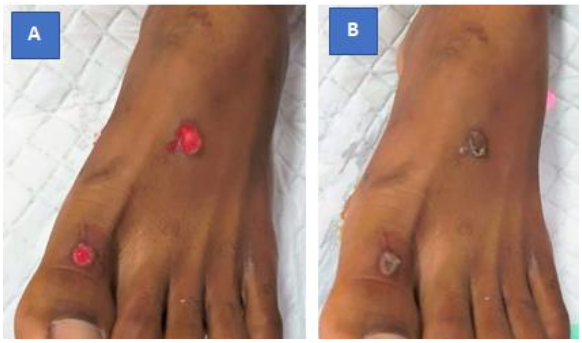

Figure 3 (A) Post – cutaneous removal of warts with 1st step ablative Er:YAG laser and skin scraping; (B) 2nd step of Nd:YAG warts removal.

skin-colored papillae with red dot globules and hemorrhage **(Figure 2)**.

A hybrid Er:YAG/Nd:YAG laser was used to treat cutaneous warts. Under 2% lidocaine local anesthetic, a 2-step laser operation was carried out. With the R11 handpiece, a 2 mm spot size, a 300-microsecond pulse length, 10 J/cm^2, and 10 Hz were the parameters used in the first step of the procedure to remove the warts. The lesion of irradiated warts was then scraped with a curette **(Figure 3A)**. Thereafter, these following parameters were used for Nd:YAG coagulation in the second step: with the R33 handpiece 4 mm spot size, 15 ms pulse duration, 220 J/cm^2, and 1 Hz.

Complete healing of the wound occurred after 2 months. However, patient was not compliance with the post procedure wound treatment. During wound healing period, wound scabs on both feet were peeled off due to trauma which led to hyperpigmentation and hypertrophic scars formation. There was no recurrence of common warts noted after 5 months **(Figure 4)**.

Figure 4 Five months after 1 treatment, 100% improvement achieved without recurrence but with hypertrophic scars on the feet.

Discussion

Human papillomavirus (HPV) infections are the most prevalent skin diseases in human because they can have a wide range of clinical signs and are ubiquitous. The most typical kind of cutaneous warts are common warts. Although they can affect any part of the body, hands are the most commonly affected area.[11]

The majority of extra genital warts are benign, and clinical diagnosis is frequently sufficient; however, sometimes further techniques are needed. Dermoscopy is a very effective way to see warts, despite its lack of sensitivity and specificity. Dermoscopy is also highly helpful for differential diagnosis and follow-up.[11] According to a prospective descriptive study by Agarwal M, *et al.* (2021), the presence of papillae surrounding haloes (61.67%), vascularity (58.33%), interrupted skin lines (51.67%), and a brown backdrop (48.3%) were the most often detected dermoscopic features in cutaneous warts.[12] Those findings are consistent with dermoscopic findings in our patient.[11] These features are the pathognomonic sign of cutaneous warts' dermoscopic characteristics.[2,11]

The following were listed as the ideal goals of treatment for warts in the guidelines for the management of cutaneous warts: (i) Wart removal that prevents recurrence. (ii) Minimal scarring. (iii) Treatment-induced immunity ought to be permanent.[4] Warts typically self-

limit. According to large studies, 42% of patients experienced a complete spontaneous remission after two months, 53% after six months, and 65% after two years. Common warts in adulthood can be far more difficult to eliminate, and persistence of the warts is not unusual.[4,5]

There is insufficient data to name specific anti-HPV medications. It has maintained the complexity of wart management. The challenging nature of managing warts has been perpetuated. Cryotherapy, imiquimod, and cantharidin are examples of traditional verrucae treatments with relative clearance rate varied from 56 to 80%. The usage of several lasers for more advanced treatment modalities has been advised in order to generate effective and long-lasting benefits due to the inconveniences and difficulties of attaining successful clearance with these traditional treatment modalities. Laser therapy is more popular as a favorable option as a warts treatment modality.[7]

According to the selective photo-thermolysis principle of laser therapy, certain skin structures preferentially absorb particular wavelengths. After that, the laser energy is transformed into heat energy, which causes the target tissue to be destroyed. Hemoglobin, melanin, and water are all recognized targets in the skin. Comparing lasers to other treatments, the selectivity of lasers has the advantage of reducing surrounding tissue damage owing to collateral thermal damage.[13]

The most popular method of treating common warts is to harm or remove the affected epithelium. Moreover, it may result in antigen exposure and presentation, cell death, and immune response potential. The wart should become thinner and the generation of new viruses should be stopped by lowering epidermal proliferation, or more precisely DNA replication. Only a limited substance has the virucidal activity at the skin's surface; nevertheless, these medications may not have any effect on lower epidermal layers' virus-infected cells. Treatment outcome may be maximized by directly stimulating the immune system where the wart is located to increase the possibility of an immune response to reach the infected keratinocytes. However, the amount that the immune response contributes to wart clearance following destructive or other inflammatory treatments is not yet established.[4]

An ablative laser called an Er:YAG emits infrared light with a 2,940 nm wavelength. It targets water in the wart tissue. In contrast to the carbon dioxide (CO2) laser, the Er:YAG laser can ablate and cut soft tissue layer by layer with surgical accuracy, minimum bleeding, and minimal residual thermal damage. This is because of its modest penetration depth and the high power of the short light pulse. The Er:YAG laser has the benefit of being precise in its depth of ablation so as to not injure nearby tissues, quick in the case of numerous lesions, and bleeding-free.[7,14]

The Nd:YAG laser can also be used to successfully treat verruca vulgaris. When light energy is delivered deeper onto the hyperkeratotic epidermis, which is usually linked with warts, it targets red structures like hemoglobin in blood vessels and the capillaries that harbor the HPV. Furthermore, melanin's reduced ability to absorb light at 1064 nm lowers the chance of post-procedural hyperpigmentation.[5,10] In addition to its direct impact on keratinocyte destruction, the Nd:YAG laser is hypothesized to disrupt the delivery of essential materials to the wart. Nd:YAG laser therapy has the advantage of eradicating HPV DNA more effectively than traditional treatments like cryotherapy.[10]

It has been documented that the combination of Er:YAG and Nd:YAG is effective in treating

verruca vulgaris. After two years of treatment, this laser combination technique completely eliminated warts without recurrence. Also, the treatment is convenient for the patients because less sessions are needed.[3] Similar to warts treatment for the patient in this report, only single laser session was needed for warts removal. However, patient in this report had an increased risk of hyperpigmentation and hypertrophic scars due to poor wound treatment compliance.

In people with darker skin, hyperpigmentation following laser treatments is a common side effect (Fitzpatrick type III to VI). An uncommon yet serious consequence of cutaneous laser is hypertrophic scarring. Ablation zones that are too wide can leave scars after ablative laser treatments. When used with too much fluence, non-ablative lasers for vascular lesions, pigmented lesions, and laser hair removal can burn the surrounding tissue and leave scars. In addition to personal risk factors and subpar intraoperative procedures, postoperative wound care is a significant contributor to scar development.[15]

Conclusion

Cutaneous warts can be effectively treated on an outpatient basis with little risk of complications using the two-step laser combination of Er:YAG and Nd:YAG. Moreover, it has been demonstrated to completely eradicate warts and stop their recurrence. Long-term morbidity and the need for subsequent therapy can be reduced through patient compliance, early detection, and timely treatment of post-procedural problems.

Declaration of patient consent The authors certify that they have obtained all appropriate patient consent.

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Conflict of Interest Authors declared no conflict of interest.

Authors' contribution

SWY: Identification and management of the case, manuscript evaluation, critical review, final approval of the version to be published.

AS, RCU: Diagnosis and management of the case, manuscript writing and critical review, final approval of the version to be published.

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