

## Combination of Surgery and Nd:YAG Laser Therapy for Recalcitrant Viral Warts: A Successful Therapeutic Approach for Immunosuppressed Patients

Andrea BACZAKO<sup>1</sup>, Veronika KRAUTHEIM<sup>2</sup>, Tilo BIEDERMANN<sup>1</sup> and Thomas VOLZ<sup>1</sup>

<sup>1</sup>Department of Dermatology and Allergology, and <sup>2</sup>Department of Anaesthesiology, Klinikum rechts der Isar, Technical University of Munich, Biedersteinerstraße 29, DE-80802 Munich, Germany. E-mail: andrea.baczako@mri.tum.de

Accepted Nov 20, 2018; E-published Nov 21, 2018

Verrucae vulgares are benign epidermal tumours induced by cutaneous infection with different subtypes of human papilloma virus (HPV). Spontaneous regression can occur, but treatment is usually challenging and protracted. Immunocompromised patients have a higher risk of malignant HPV-induced skin tumours and recalcitrant viral warts, which are more difficult to treat than in immunocompetent individuals. In immunocompromised patients, complications appear more frequently and severely, therefore the therapeutic regime must be chosen carefully considering possible impaired wound healing or toxicity of therapeutic agents. Therapeutic approaches can be surgical, chemical or immunomodulatory or by laser, but only limited data exist on effective treatment in immunocompromised patients.

### CASE REPORT

We report here a 68-year-old woman who had had a large number of verrucae vulgares on both hands and feet for 5 years, which were refractory to multiple attempts at topical treatment with 5-fluorouracil, salicylic acid, cryotherapy, laser treatment or surgery alone. In addition to disfiguring skin findings, the patient experienced intense pain, limited mobility of both hands and psychological strain. The warts had proliferated due to an underlying B-cell lymphoma, repeatedly treated with chemotherapy. Despite a detectable leucopaenia (2.18 g/l, reference 4.0–9.0 g/l), the patient was otherwise in good health with no other susceptibility to infection. Multiple aggregated grey nodules with hyperkeratotic disrupted surface were found on the metacarpophalangeal and interphalangeal joints, dorsa and palms of both hands and toes on both feet (Fig. 1).

The extent of the lesions first required surgical reduction of all tumour masses on both hands and feet. Removal of the warts was carried out by shaving the base of the tumours until punctate bleeding from vessels of the dermal papillae could be seen. Thus, mainly intraepidermal resection was observed to prevent scarring wherever possible. In the same session we also performed laser treatment with a Nd:YAG laser (1,064 nm wavelength, 130 J/cm<sup>2</sup> fluence, 20 ms pulse duration). Both procedures were performed under general anaesthesia. Postoperative analgesia was achieved by an axillary brachial plexus block and oral analgesics. Infection parameters were monitored continuously under antibiotic prophylaxis. There were no postoperative complications, and the patient was permanently free of pain. All warts showed typical histological features, apart from 1, which presented with cell dysplasia and a change in the nuclear-cytoplasmatic ratio, thus displaying histological criteria of an initial squamous cell carcinoma. Genotyping revealed the presence of both low- and high-risk HPV types 1, 6, 11, 16, 18 and 31 (HPV Broad Spectrum antibody, Zytomed Systems GmbH, Berlin, Germany). All warts on the hands and feet were removed successfully, and wound healing was equally completed on all sites within 4 weeks after combined surgical and



**Fig. 1.** Multiple verrucae vulgares on the right hand of a 68-year-old immunocompromised patient.

laser-therapeutic approach (Fig. 2). As expected, several small warts returned on both hands due to the patient's permanently reduced immune status, spreading by autoinoculation. However, these were responsive to treatment with 5-fluorouracil and salicylic acid. Overall, the patient showed drastic improvement in mobility in all affected fingers and toes, reported a greatly improved life quality and is now able to perform everyday activities to the full extent.



**Fig. 2.** Right hand of the same patient 3 months after surgery and laser therapy.

## DISCUSSION

The incidence and extent of viral warts in immunocompromised patients increases depending on the level of immunosuppression. An association of HPV-induced viral warts and the development of non-melanoma skin cancer was reported in organ-transplant recipients, in whom high-risk types HPV 16, 18, 31, 35 and 51 were identified (1, 2). These findings are congruent with the HPV types in our patient's warts. Considering the patient's immune status, the HPV profile and the histological findings, the importance of a thorough removal of the warts was evident. Since all preceding treatments had failed, a more aggressive therapeutic strategy was necessary. Our combined procedure targeted multiple therapeutic approaches. Surgery immediately relieved the patient from the painful and activity-limiting warts, enabled accessibility to subsequent treatment, and reduced the risk of autoinoculation and further spread of HPV. Ablative and non-ablative laser therapy has been shown to be effective and convenient for treating viral warts, although little data exists, especially for immunocompromised patients. Carbon dioxide laser treatment of recalcitrant viral warts showed comparable results in immunosuppressed patients and immunocompetent individuals (3). Given the extent of our patient's viral warts, we considered this method overly lengthy compared with surgery. The mechanism of non-ablative laser modalities is not yet fully understood. It is suggested that warts are destroyed through selective absorption of laser energy by dilated capillaries and feeding vessels of the warts. Thermal damage and consecutive induction of a local immune response may result in destruction of the HPV-affected tissue. Which of the mechanisms are predominant and to what extent they are relevant in immunocompetent or immunosuppressed individuals is unknown at this point. Nd:YAG laser was proven more effective than pulsed-dye laser though more painful and afflicted by more side-effects, such as inflammation, infection and scarring (4). Combined therapeutic approaches have been published previously, such as application of salicylic acid and pulsed-dye laser treatment (5) or paring and intense pulsed light (IPL) (6). These studies, however, do not describe the full extent of the clinical findings and do not address the issue of immunosuppression. Multiple sessions were necessary, which were described as painful. Therefore, comparability to our approach is hardly given. Given the multitude and extent of our patient's warts, as well as the long history, our combined therapy aimed at a maximum efficacy in a single session with supervised pain and wound management. Under these circumstances, we consider our therapeutic approach superior to other combined methods. We decided to perform Nd:YAG laser treatment as surgery had already been performed under general anaesthesia, and postoperative analgesia included an axillary brachial plexus block. Regional anaesthesia is rated superior to opioid-based postopera-

tive analgesia alongside additional advantages, such as anti-inflammatory effects and rapid functional recovery immediately after surgery and considering the long-term movement and that no significantly higher risk of severe infectious complications under immunosuppression is observed (7). In immunosuppressed patients especially, the risk of postoperative complications, mainly infections, and possible lengthy recovery time after such extensive procedures, must be weighed against the benefit of a quick and efficient removal and long-term absence of the large number of warts. In this case, our radical combined therapeutic approach was successful and encouraging to the patient. Our primary therapeutic objective was permanent removal of all verrucae, leading to reduction in the risk of autoinoculation and malignant transformation and the relief of pain and improvement in mobility. Although recurrence of viral warts is common in immunosuppressed patients, we expect a lower recurrence rate following the combined surgical and laser-therapeutic approach described here than after surgery or laser treatment alone. In the case of occasionally recurring warts, treatment will be less radical and quality of life will not be impaired to the extent seen in our patient.

Although many therapeutic options are available for treating HPV-induced warts, none of them is entirely effective. In particular, immunocompromised patients lack a safe and sufficient therapy that addresses the challenges that accompany the decreased immune status. The combined approach of surgical removal of the viral warts and immediate Nd:YAG laser therapy proved highly successful in our patient and offers an effective, fast and safe therapeutic option for recalcitrant viral warts in immunocompromised patients.

*The authors have no conflicts of interest to declare.*

## REFERENCES

- Schmook T, Nindl I, Ulrich C, Meyer T, Sterry W, Stockfleth E. Viral warts in organ transplant recipients: new aspects in therapy. *Br J Dermatol* 2003; 149: 20–24.
- Meyer T, Arndt R, Nindl I, Ulrich C, Christophers E, Stockfleth E. Association of human papillomavirus infections with cutaneous tumors in immunosuppressed patients. *Transpl Int* 2003; 16: 146–153.
- Läuchli S, Kempf W, Dragieva G, Burg G, Hafner J. CO<sub>2</sub> laser treatment of warts in immunosuppressed patients. *Dermatology* 2003; 206: 148–152.
- El-Mohamady A, Mearag I, El-Khalawany M, Elshahed A, Shokeir H, Mahmoud A. Pulsed dye laser versus Nd:YAG laser in the treatment of plantar warts: a comparative study. *Lasers Med Sci* 2014; 29: 1111–1116.
- Akarsu S, Ilknur T, Demirtaşoglu M, Ozkan S. Verruca vulgaris: pulsed dye laser therapy compared with salicylic acid + pulsed dye laser therapy. *J Eur Acad Dermatol Venereol* 2006; 20: 936–940.
- Togsverd-Bo K, Gluud C, Winkel P, Larsen HK, Lomholt HB, Cramers M, et al. Paring and intense pulsed light versus paring alone for recalcitrant hand and foot warts: a randomized clinical trial with blinded outcome evaluation. *Lasers Surg Med* 2010; 42: 179–184.
- Kettner SC, Willschke H, Marhofer P. Does regional anaesthesia really improve outcome? *Br J Anaesth* 2011; 107: i90–95.