

Intralesional Vitamin D3 for Anogenital Warts in Human Immunodeficiency Virus Infected Individual

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Abstract: Anogenital warts (AGW) is the most common sexually transmitted infection in the world caused by the Human Papillomavirus (HPV), especially types 6 and 11. Immunotherapy is one of the therapeutic modalities that can be used to treat AGW. The mechanism of Vitamin D3 on AGW is the expression of antimicrobial peptides (AMP) that directly inactivate pathogens and also enhance innate immune responses. One case of AGW type condyloma acuminata was reported in a 29-year-old male. A case of condyloma acuminata-type AGW in a 29-year-old HIV stage 1 male patient was reported. His CD4 level was 500 cells/uL, and treated with anti-retroviral (ARV). Physical examination of the perianal area revealed a skin-colored tumor with a verrucous surface. Acetowhite test and HPV type 11 polymerase chain reaction (PCR) results were positive. The patient received intralesional injection of vitamin D3 60,000 IU per lesion every two weeks four times. The lesions appeared to have shrunk by more than 50% after the fourth injection. This case report shows the potential of intralesional vitamin D3 for the treatment of AGWs in an HIV patient. However, further research is required to confirm both the efficacy and safety of intralesional vitamin D3.

Keywords: anogenital warts, condyloma acuminata, human immunodeficiency virus, HIV, human papillomavirus, HPV, sexually transmitted infection, STI, vitamin D3

Introduction

Anogenital warts (AGW) are a benign proliferative lesion caused by the infection of human papillomavirus (HPV) types 6 and 11. It predominantly affects epithelial tissue of the anogenital or perianal area.^{1,2} AGW are highly contagious and the most common viral infections through sexual contact.^{3,4} The transmission of HPV occurs via direct skin contact during sexual intercourse on a micro abrasion lesion from an infected individual.^{1,2}

AGW are the most common manifestation of HPV infection in the young population.^{1,3} It has been reported that there were 160–289 cases of AGW per 100,000 adult population per year,⁵ whilst the prevalence of AGW was 0.13%–0.20%.³ Men who have sex with men (MSM), especially who are infected with human immunodeficiency virus (HIV), have a greater possibility to be infected by HPV.⁶ AGW can greatly influence productivity, medical health expenses, and generate psychosocial issues.^{3,5} In immunocompromised individuals with HIV infection, the risk of persistent HPV infection increased due to the disruption of HPV eradication by HIV. Thus, AGW lesions tend to easily grow and are more challenging to treat in HIV individuals.⁷

Numerous options to treat AGW are available, however, they merely reduce or eliminate the skin lesions without eradicating the HPV infection. Available treatments for AGW are generally symptomatic by extraction or destruction of the warts⁸ via surgical and non-surgical therapies.^{1,4} However, it is not suitable for individuals with multiple warts or for large-distant warts.^{1,4} This is due to the side effects, such as pain, dyspigmentation, skin irritation,¹ secondary infections,⁹

or scar lesion,^{1,4} caused by those therapies. The effectiveness of AGW therapies varies with the more frequent recurrences occurring following less aggressive treatment.⁴

Immunotherapy approach could be an ideal alternative therapy for AGW as it provides local and systemic impact,⁴ minimal side effects, with successful rates of 45%–60%.^{1,10} The administration of intralesional vitamin D3 has been reported by Tawfik et al as an alternative treatment for AGW. In their study, 20 individuals with AGW showed improvement after receiving intralesional vitamin D3.¹¹

Herein, we report a case of AGW located on the perianal region in HIV individuals treated with intralesional vitamin D3.

Case Report

A 29 year old male presented to Dermatology and Venereology Outpatient at Dr. Hasan Sadikin General Hospital (RSHS) Bandung with the chief complaint of verrucous skin-colored papules on the perianal region that sometimes felt itchy. Skin lesions were first developed six months prior to the consultation as a peanut-sized verrucous skin-colored papule on perianal area. The number and size of the lesions then increased, with the largest size similar to 100-rupiah coin three months prior to consultation. Patient was experiencing pruritus and occasionally bleeding during defecation. History of purulent discharge, pain during urination, ulcers on genital area, or erythematous skin lesion on palmoplantar area were denied. However, patient is suffering from stage 1 HIV since November 2021 and has been treated with anti-retro viral (ARV) drugs combined with tenofovir-lamivudine-dolutegravir (TLD) regiment.

Patient preferred to have intercourse with men. At the age of 18, patient had coitarche with a same-sex partner and engaged in unprotected intercourse as a “bottom” through anogenital and oro-genital manner. There was history of promiscuity with partners and casual same-sex friends and unprotected anogenital and oro-genital intercourse as a “bottom”. Patient occasionally scratched the skin lesions unknowingly and failed to wash his hands afterwards. Patient has a history of alcohol consumption since he was 24 years old, yet he claimed never to drink to the point of intoxication.

On a physical examination, vital signs and general status were within normal limits. No skin abnormalities were found in dermatological examination. Venereological examination on the perianal region revealed multiple lesions of mucosal-colored tumors with a verrucous surface on anal and perianal area. Some lesions were mobile without tenderness on palpitation (Figure 1). Dermoscopy examination of mucosal-colored tumors with a verrucous surface showed finger-like projection (Figure 2). On laboratory examination, 500 cells/uL of CD4 cells and 23.1 ng/mL of vitamin D3 level were found. Type 6, 11, 16, or 18 HPV were negative on genotyping examination. Histological

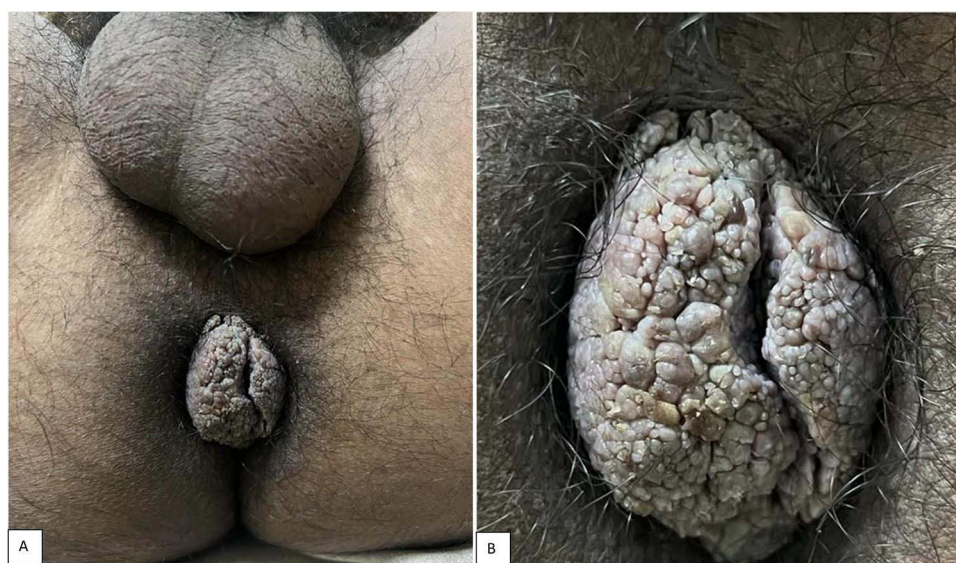


Figure 1 Multiple lesions of mucosal-colored tumors with a verrucous surface on anal and perianal area (**A** and **B**).



Figure 2 Dermoscopy examination of mucosal-colored tumors with a verrucous surface showed finger-like projection.

examination revealed hyperplastic keratinized stratified squamous epithelium, hyperkeratosis, parakeratosis, papillomatosis, and koilocytic cells were found (Figure 3). On the subepithelial layer, fibrocollagenous with infiltration of inflammatory lymphocytes, dilatation of blood vessels, and erythrocyte extravasation were found. No evidence of malignancy. Patient was then diagnosed with condyloma acuminata type of AGW according to the clinical features and histological result.

A couple of cryotherapy sessions had been performed to treat the lesion. However, only minimal effect was achieved with side effects that were difficult to tolerate. Eventually, patient received intralesional vitamin D3 injection (60,000 international unit [IU] per lesion) every two weeks for a total of four sessions. Patient experienced pain in the injection site for a moment but was not limiting his activity. After a period of time, skin lesions started to shrink in size after second injection of vitamin D3. The size of the lesion further shrunk after the 4th injection (Figure 4).

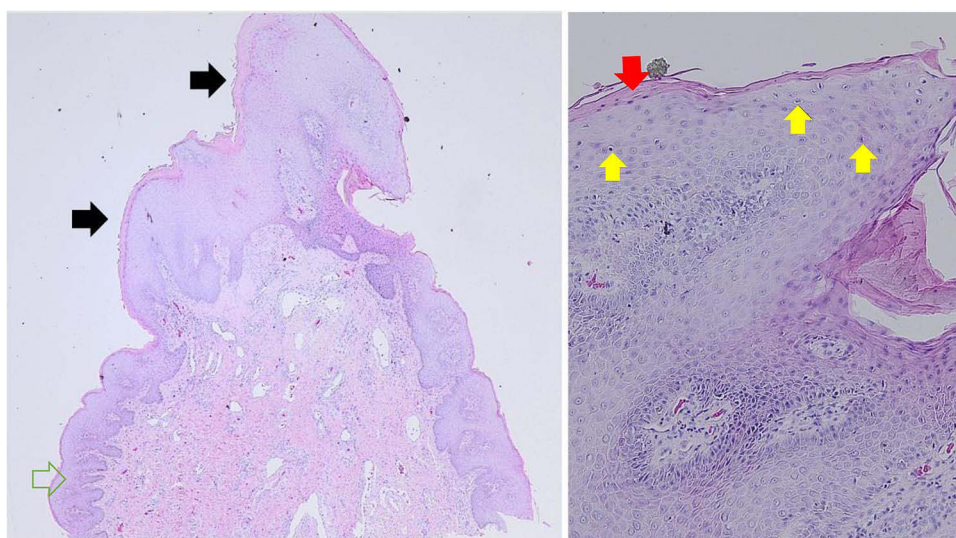


Figure 3 Histopathological examination showed hyperkeratosis (black arrow), parakeratosis (red arrow), and koilocytes in the epidermis (yellow arrow).

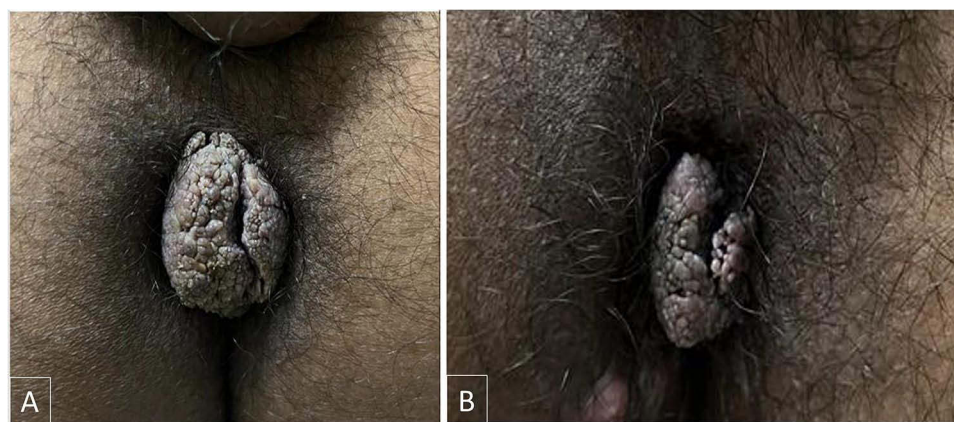


Figure 4 Comparison of condyloma acuminata on the first day of consultation (A) and after fourth injection of vitamin D3 (B).

Discussion

Condyloma acuminata, a type of anogenital warts (AGWs), is the third most common sexually transmitted infection (STI) found in 2007–2011 from twelve hospitals in Indonesia.¹² Young populations are susceptible to AGW with the highest incidence affecting 20 to 24 year old women and 25 to 29 year old men.³ A systematic review and meta-analysis by Banura et al reported a pooled prevalence of anogenital warts (AGWs) of 7.5% (95% CI: 5.6–9.4) among HIV-positive individuals in Sub-Saharan Africa, compared to 1.9% (95% CI: 1.2–2.6) in HIV-negative individuals, based on data collected from 1991 to 2012.¹³ Moreover, seroprevalence of HPV among MSM and bisexual men is 2–6 times higher compared to heterosexual men.¹⁴ HIV-positive individuals carry a higher burden of HPV infection and AGW.¹⁵ In this case report, a 29-years-old male with HIV infection that had AGW ad regio perianal was described.

Individuals who have an early sexual contact, multiple sexual partners, a history of other STIs, HIV infection, immunocompromised conditions, and non-use of condoms during sexual intercourse have a higher chance of HPV infection.¹⁶ Risk factors, such as multiple sexual partners, having a new sexual partner within the last 12 months, smoking, and immunosuppressive conditions also increase the possibility of AGW.¹⁷ Among MSM population, 65% of HIV-free population and 95% of HIV-infected individuals are diagnosed with AGW.¹⁸ AGW located on perianal area is common in MSM population with history of receptive anal intercourse without a condom.⁵ In this case report, the patient had several risk factors for AGW, including multiple sexual partners, a new sexual partner within the last 12 months, a history of receptive and unprotective anal intercourse, smoking, and immunosuppression condition due to HIV infection.

The transmission of HPV might occur by sexual and non-sexual routes.¹⁹ HPV can survive within epithelial cells in its dormant form for a long period. This could be leading to asymptomatic latent infections in 70% of infected individuals,²⁰ allowing the transmission of HPV even without the evidence of AGW lesions.⁵ Study showed that there were 630 million people infected by HPV, however, the manifestation of AGW was found in only 30 million cases.²¹ Incubation period of anogenital HPV infection varies from three to eight months (average of two to three months),^{19,22} and the period is shorter in women patients (median 2.9 months) than in men (median 11.0 months).^{5,19} If left untreated, AGW lesions may resolve spontaneously, still persist, or increase in size or number. Study by Camargo et al in 2014 showed 31% of 159 Brazilian male individuals who were infected by HIV were also diagnosed with AGW.²³ Lesions of AGW in HIV-infected individuals tend to enlarge or increase in number, have poor response to and have a higher recurrence rate after therapy.⁸ Higher CD4 counts might improve the ability of immune system to eradicate AGW.⁷ Elimination of HPV infection in HIV-infected individuals usually occurs after patient receives ARV therapy for more than 5 years.²⁴ The transmission of HPV in this case report is likely through sexual routes, particularly receptive of anal intercourse, and also through non-sexual transmission by scratching the lesion. Minimal spontaneous AGW resolution in this patient might be caused by immunosuppression state of HIV infection and short duration of ARV therapy that is less than five years.

Most AGW cases can be diagnosed through history taking and physical examination. There are several types of AGW, such as condyloma acuminata, popular warts, keratotic warts, and flat-topped papules. Clinical features of condyloma acuminata resemble cauliflower appearance. Papular warts presented with 1–4 mm dome-shaped papules, while keratotic warts have a thick layer that resemble verruca vulgaris or keratosis seborrheic appearance. Flat-topped papules appeared as macules or papules¹⁹ with size ranging from 1–5 mm.^{5,19} Plaque might be visible when multiple lesions are fused, especially in untreated or immunocompromised individuals.⁵ AGW that grow on skin surfaces usually show more pigmented lesion compared to the one that grow on mucosal surfaces.^{5,19} Whilst AGW is frequently asymptomatic, an itchy or pain sensation might occur when irritation, bleeding, or secondary infection happens.¹⁹ Traumatic place during sexual intercourse, such as male preputium and posterior vaginal introitus, are the most common place for AGW. However, involvement of perianal area might occur in both genders without history of anal intercourse.^{5,8} Mucosal-colored cauliflower tumour with verrucous surface that was found in this patient's anal area is consistent with the clinical appearance of condyloma acuminata.

Biopsy is required to confirm the diagnosis of AGW, especially in immunocompromised individuals, challenging cases, AGW that is unresponsive to conventional treatment, or patients that worsen during treatment.¹⁹ Histopathological features of AGW are hyperkeratosis, parakeratosis, hypergranulosis, basal cell hyperplasia, and papillomatosis. Koilocytes, which represent the cytopathic effect of HPV, are flattened epithelial cells with a clear perinuclear area. It has large, hyperchromatic, and sometimes contain multiple nucleus. Koilocytes might be found in stratum granulosum of infected patient.²² Histopathological features taken from this patient showed similar findings of condyloma acuminata.

Human papillomavirus is part of *Papillomaviridae* family with double-stranded DNA. There are 150 types of HPV based on nucleotide sequences, particularly the L1 protein-coding gene.²⁵ HPV types responsible for AGW and benign lesions are divided into low-risk HPV and types responsible for malignant lesion are high-risk HPV. Genotyping PCR that is used to determine the type of HPV has sensitivities of 73.6% and specificities of 98%.²⁶ Study by Gao et al²⁵ in 2010 described that the most common HPV types causing AGW in China were type 6 (19.6%), type 16 (13.0%), type 52 (8.5%), and type 11 (7.6%). In this case report, the results from genotyping PCR were negative for types 6, 11, 16, and 18.

AGW has a tendency to persist with spontaneous regression in 30% of cases within one year¹⁹ and 90% of cases within 3 years.²⁷ It also has a high recurrence rate, especially within the first three months after treatment,⁸ and might lead to malignancy.^{1,3,19,27} Resistance to treatment might occur in HPV lesions that have already grown in size or number. Therefore, it is recommended to treat the lesion despite it being able to resolve spontaneously.²⁸ Currently available therapies for AGW aim to inhibit the growth of the lesion without eliminating the infection. Thus, it is not an ideal treatment as it is less effective at preventing relapse.^{4,8,22} Surgical procedures, such as electrocautery, excision, cryotherapy, and laser therapy, as well as non-surgical procedures, such as podophyllin, podophyllotoxin, trichloroacetic acid, and immunotherapy are the available treatment for AGW.⁹ However, these are less suitable for multiple warts or lesions in distant locations because it might cause depigmentation, irritation, pain,¹ secondary infections,⁹ or scarring.^{1,4} Therefore, treatment option is determined by the location, size, and number of the lesions, patient preferences and comfort, treatment costs, possible side effects, available instruments, and the physician's experience.^{1,8}

Host's immune response plays an important role in controlling HPV infection.^{1,22} Immunotherapy is a biological treatment that utilized specific substance to stimulate or suppress the immune system to aid host battling cancer, infection, or other disease.²⁹ Immunotherapy generates a strong systemic immune response against HPV infection via pro-inflammatory signals,^{9,28} leading to the remission of treated lesions and lesions far from the treated area.^{1,4} Additionally, injection trauma from the administration of immunotherapy might enhances local immune response.³⁰ Administration of immunotherapy as a treatment of AGW has a lower recurrence rate and generally does not leave a scar.^{4,31} Accordingly, immunotherapy is recommended for recalcitrant or recurrent HPV infections, lesions that grow in difficult-to-reach areas, or extensive cases.²⁹ In this case report, the patient had a large AGW lesion and the conventional therapies that were given previously caused significant side effects, including pain and secondary infections.

Immunotherapy is one option to treat AGW that might stimulate or suppress the immune system against infections, diseases, and malignancies.²⁹ Available immunotherapy agents are trichopytin, imiquimod, mumps-measles-rubella (MMR), Candida antigen, cimetidine, zinc sulfate, Bacillus Calmette-Guerin (BCG), and topical allergens.³⁰ Several

case reports documented the benefit of vitamin D, as well as intralesional antigens and vaccines, such as bleomycin, purified protein derivative (PPD), MMR, Candida antigen, and Mycobacterium vaccines, as a treatment of AGW.^{11,31–33} Vitamin D3 is an immunomodulator with numerous benefits for the immune system.^{34–36} Its mechanism of action relates to the expression of antimicrobial peptides (AMP)^{37–39} which directly inactivate pathogens and enhance the innate immune response.^{40–45} AMP might eliminate and interrupt the early phase of the HPV infection. Study by Buck et al⁴⁶ showed AMP could protect host before HPV invaded host's cells. Vitamin D acts through its receptor on keratinocytes, melanocytes, fibroblasts, and skin's immune cells.³⁵

Aktaş et al¹⁷ injected 60,000 IU of intralesional vitamin D3 per lesion on maximum 5 lesion per session in 20 patients with warts. Patients were given second injection within two-week interval and it showed successful treatment without recurrence in 80% of patients. Kavya et al⁴¹ reported successful recovery rate of 78.5% in 42 patients that received 120,000 IU intralesional vitamin D3 every two weeks up to four injections. Moreover, recurrency rate out of 42 patients was only 2.38%.⁴³ In addition, Kumar et al³⁸ reported intralesional injections of 300,000 IU vitamin D3 up to four of the largest lesions every three weeks lead to a recovery to 71.5% out of 88 patients. Raghukumar et al⁴² also reported that 90% of patients who received intralesional vitamin D3 injections had a complete response to resistant warts.

The utilization of intralesional vitamin D3 to treat AGW is still limited and it has only been reported in two case reports. Case report by Jha⁴³ described a successful treatment of AGW in male patient using a total of 120,000 IU vitamin D3 intralesionally. Each lesion from two different warts had been injected with 60,000 IU vitamin D3 three times within two week period and showed no recurrences within six months after treatment. Treatment responses were categorized as complete resolution (100% wart clearance), moderate (50–100% wart size reduction), and mild responses (<50% reduction).⁴² Other case report from Tawfik et al¹¹ reported out of 18 patients; 2 patients had complete resolution, 6 patients had moderate responses, and 1 patient had mild responses to intralesional 60,000 IU vitamin D3 in four locations every two weeks, for up to four injections. In this case report, the patient showed moderate response after five intralesional injections of 60,000 IU vitamin D3 within a two-week interval.

Recent studies suggest that intralesional vitamin D3 rapidly improves viral load of HIV patients.⁴⁶ Coelho et al investigated the effect of 50,000 IU vitamin D twice weekly for five weeks, followed by 8,000 IU twice weekly for a total of 24 weeks. They found an increment of 3.3 cell/mm³ CD4 count that positively correlated with an increment of 1 ng/mL in calcidiol levels.⁴⁷ Thus, vitamin D3 supplementation might be safe for HIV patients. However, the measurement of CD4 in this case report was not performed after the administration of vitamin D3.

The side effects that had been observed in study by Tawfik et al¹¹ was pain during injection, which was also reported by Kavya et al⁴¹ in 80% of pediatric patients. No life-threatening complications were reported. Injection site swelling was observed in 78.57% of patients with spontaneous recovery within four weeks, and depigmentation was reported in one patient. Raghukumar et al⁴² noted that the pain at injection site was the main side effect of intralesional vitamin D3 injections. In this case, the patient also experienced pain sensation during injection with no other side effects.

AGW is a disease localized to the epidermis site and does not interfere with systemic condition.²⁷ In this case report, PCR examination of the warts was negative for HPV types 6, 11, 16, and 18, which indicates a favorable prognosis for the patient's longevity. Patient expressed anxiety for sexual intercourse due to his concerns regarding transmission to his partners and also discomfort from difficulty cleaning after defecation, indicating a somewhat uncertain functional prognosis. AGW has a tendency to persist⁴ with a high recurrence rate,^{1,3,8} especially in individuals with HIV.⁸ HPV eradication in HIV-infected individuals typically occurs after the administration of ART for more than five years.²⁴ This patient has been treated with ART for 11 months, indicating a doubtful prognosis for complete resolution. Life expectancy in HIV-infected individuals with a CD4 count above 500 cells/uL is comparable to that of the general population. Opportunistic infections are the leading cause of death in HIV-infected individuals, but their incidence can be reduced with the administration of ART.³⁷ This patient is in stage I HIV with CD4 count of 500 cells/uL without any evidence of opportunistic infections, suggesting a poor long-term prognosis. In Indonesia, social stigma and discrimination still hinder the prevention for HIV infection and treatment efforts, affecting the quality of life for individuals with HIV.³⁸ This patient is still not ready to disclose his HIV condition to his family.

The limitation of this case report is that the efficacy of 60,000 IU of vitamin D3 intralesional injection for AGWs in HIV-positive patient has only been tested on one patient. Further research using a large scale of subject is recommended to investigate the effectiveness and safety of vitamin D3 as treatment for AGWs in HIV positive patients.

Conclusion

Condyloma acuminata (CA), a type of anogenital warts (AGW), is a common sexually transmitted infection (STI) that continues to be a significant public health concern, particularly in populations such as men who have sex with men (MSM) and individuals with human immunodeficiency virus (HIV). AGW lesions easily grow in HIV individuals. Conventional treatment of AGW is not effective to eradicate the infection and only inhibit the growth of the lesions. Even though AGW might resolve spontaneously, it is recommended to promptly treat the lesion to avoid treatment resistance. Vitamin D3 is an immunomodulator with numerous benefits for the immune system. It might directly inactivate pathogens and enhances the innate immune response. The administration of vitamin D3 is a treatment option for AGW with minimal side effects. Whilst vitamin D3 might be safe to treat AGW in HIV patients, further study is required to confirm both the efficacy and safety of intralesional vitamin D3, particularly in HIV-infected populations.

Ethical Approval

This study was conducted in compliance with the Declaration of Helsinki, Good Clinical Practices, local regulatory requirements, and was approved by the Medical Ethics Committee of Hasan Sadikin General Hospital Bandung (approval number DP.04.03/D.XIV.6.5/497/2025).

Consent Statement

The authors certify that they have obtained all appropriate patient consent forms. The patients signed a consent form to publish the case details and images.

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Disclosure

The authors report no conflicts of interest in this work.

References

1. Delmonte S, Benardon S, Cariti C, Ribero S, Ramoni S, Cusini M. Anogenital warts treatment options: a practical approach. *G Ital di dermatologia e Venereol organo Uff Soc Ital di dermatologia e Sifilogr*. 2020;155(3):261–268.
2. Ye Y, Sun X-Z, Feng J-S. Woman with rectal condyloma acuminatum: a case report. *Int J Clin Exp Med*. 2015;8(4):6365–6368.
3. Patel H, Wagner M, Singhal P, Kothari S. Systematic review of the incidence and prevalence of genital warts. *BMC Infect Dis*. 2013;13(1):39. doi:10.1186/1471-2334-13-39
4. Akhavan S, Mousavi A, Modaresgilani M, Alibakhshi A. Genital warts. *J Obstet Gynecol Cancer Res*. 2017;2(1):143–149.
5. Gilson R, Nugent D, Werner RN, Ballesteros J, Ross J. IUSTI-Europe guideline for the management of anogenital warts. *J Eur Acad Dermatol Venereol*. 2020;34(8):1644–1653. doi:10.1111/jdv.16522
6. Workowski KA, Bolan GA. Sexually transmitted diseases treatment guidelines, 2015. *MMWR*. 2015;64(RR-03):1–137.
7. Pudney J, Wangu Z, Panther L, Fugelso D, Marathe J, Dkk SM. Condylomata acuminata (anogenital warts) contain accumulations of HIV-1 target cells that may provide portals for hiv transmission. *J Infect Dis*. 2019;219(2):275–283. doi:10.1093/infdis/jiy505
8. Kors HHA, Nashaat H-AH, Halim HM, Atwa MA, Mahmoud Marie RE-S. Interleukin-18 serum level before and after intralesional immunotherapy with tuberculin purified protein derivative in patients with cutaneous and genital warts. *J Cosmet Dermatol*. 2022;21(12):7035–7042. doi:10.1111/jocd.15358
9. Sharma N, Sharma S, Singhal C. A comparative study of liquid nitrogen cryotherapy as monotherapy versus in combination with podophyllin in the treatment of condyloma acuminata. *J Clin Diagn Res*. 2017;11(3):WC01–5. doi:10.7860/JCDR/2017/23797.9339
10. Winer RL, Koutskys LA. Genital human papillomavirus infection. In: Holmes KK, Sparling PF, Stamm WE, Piot P, Wasserheit JN, Corey L, editors. *Sexually Transmitted Diseases*. Edisi ke-4 ed. New York: McGraw Hill; 2008:489–501.
11. Tawfik Y, Hosny A, El-Gazzar A, Bakr R. Efficacy and safety of treating anogenital warts with intralesional vitamin D3 injection: a report on 20 egyptian patients. *Al-Azhar Assiut Med J*. 2020;18(2):140. doi:10.4103/AZMJ.AZMJ_161_19

12. Achdiat PA, Septharina R, Rowawi R, et al. A review and case study of genital and extragenital human papillomavirus type 6 and 11 infections in men who have sex with men accompanied by human immunodeficiency virus infection. *HIV AIDS*. 2024;16:175–182. doi:10.2147/HIV.S451989
13. Banura C, Mirembe FM, Orem J, Mbonye AK, Kasasa S, Mbidde EK. Prevalence, incidence and risk factors for anogenital warts in Sub Saharan Africa: a systematic review and meta analysis. *Infect Agent Cancer*. 2013;8(1):27. doi:10.1186/1750-9378-8-27
14. Brown B, Kjaer S, Sigurdsson K, et al. Anogenital human papillomavirus infection: seroprevalence and risk factors in men from three Nordic countries. *J Infect Dis*. 2009;199(5):661–671. doi:10.1086/596742
15. Gilson R, Nugent D, Werner RN, Ballesteros J, Ross J. Anogenital warts (condyloma acuminata). *BMJ Clin Evid*. 2017;2017:1606.
16. Fathi R, Tsoukas MM. Genital warts and other HPV infections: established and novel therapies. *Clin Dermatol*. 2014;32(2):299–306. doi:10.1016/j.clindermatol.2013.08.014
17. Aktaş H, Ergin C, Demir B, Ekiz O. Intralesional vitamin D injection may be an effective treatment option for warts. *J Cutan Med Surg*. 2016;20(2):118–122. doi:10.1177/1203475415602841
18. Dareng EO, Adebamowo SN, Famooto A, et al. Prevalence and incidence of genital warts and cervical human papillomavirus infections in nigerian women. *BMC Infect Dis*. 2019;19(1):27. doi:10.1186/s12879-018-3582-y
19. Vela S, Videla S, Ornelas A, et al. Effectiveness of physically ablative and pharmacological treatments for anal condyloma in hiv-infected men. *PLoS One*. 2018;13(8):e0199033. doi:10.1371/journal.pone.0199033
20. Sterling JC. Human papillomavirus infections. In: Dalam KS, Amagai M, Bruckner AL, Enk AH, Margolis DJ, McMichael AJ, editors. *Fitzpatrick's Dermatology, Edisi: 9e*. New York, NY: McGraw-Hill Education; 2019:hlm.3095–106.
21. Yanofsky VR, Patel RV, Goldenberg G. Genital warts: a comprehensive review. *J Clin Aesthet Dermatol*. 2012;5(6):25–36.
22. Beutner KR, Reitano MV, Richwald GA, Wiley DJ, Warts TAMAEOEG. External genital warts: report of the American medical association consensus conference. ama expert panel on external genital warts. *Clin Infect Dis an off Publ Infect Dis Soc Am*. 1998;27(4):796–806. doi:10.1086/514964
23. Camargo CC, Tasca KI, Mendes MB, Miot HA, Souza LR. Prevalence of anogenital warts in men with HIV/AIDS and associated factors. *Open AIDS J*. 2014;8(1):25–30. doi:10.2174/1874613601408010025
24. Zheng Z-M, Baker CC. Papillomavirus genome structure, expression, and post-transcriptional regulation. *Front Biosci*. 2006;11(1):2286–2302. doi:10.2741/1971
25. Gao L, Zhou F, Li X, Yang Y, Ruan Y, Jin Q. Anal HPV infection in HIV-positive men who have sex with men from China. *PLoS One*. 2010;5(12):e15256. doi:10.1371/journal.pone.0015256
26. Tchernev G. Sexually transmitted papillomavirus infections: epidemiology pathogenesis, clinic, morphology, important differential diagnostic aspects, current diagnostic and treatment options. *An Bras Dermatol*. 2009;84(4):377–389. doi:10.1590/S0365-05962009000400009
27. Deshpande DJ, Nayak C, Mishra S, Dhurat R. Verrucous condyloma lata mimicking condyloma acuminata: an unusual presentation. *Indian J Sex Transm Dis AIDS*. 2009;30(2):100–102. doi:10.4103/0253-7184.62766
28. Henao-Martínez AF, Johnson SC. Diagnostic tests for syphilis: new tests and new algorithms. *Neurol Clin Pract*. 2014;4(2):114–122. doi:10.1212/01.CPJ.0000435752.17621.48
29. Thappa DM, Chiramel MJ. Evolving role of immunotherapy in the treatment of refractory warts. *Indian Dermatol Online J*. 2016;7(5):364–370. doi:10.4103/2229-5178.190487
30. Sefcik R, Burkhart C. Wart immunotherapies: a short review. *Open Dermatol J*. 2017;11(1):30–34. doi:10.2174/1874372201711010030
31. Saoji V, Lade NR, Gadegone R, Bhat A. Immunotherapy using purified protein derivative in the treatment of warts: an open uncontrolled trial. *Indian J Dermatol Venereol Leprol*. 2016;82(1):42–46. doi:10.4103/0378-6323.171650
32. Majid I, Imran S. Immunotherapy with intralesional candida albicans antigen in resistant or recurrent warts: a study. *Indian J Dermatol*. 2013;58(5):360–365. doi:10.4103/0019-5154.117301
33. Garg S, Baveja S. Intralesional immunotherapy for difficult to treat warts with mycobacterium w vaccine. *J Cutan Aesthet Surg*. 2014;7(4):203–208. doi:10.4103/0974-2077.150740
34. Chen S, Sims GP, Chen XX, Gu YY, Chen S, Lipsky PE. Modulatory effects of 1,25-dihydroxyvitamin D3 on human b cell differentiation. *J Immunol*. 2007;179(3):1634–1647. doi:10.4049/jimmunol.179.3.1634
35. Egawa K, Ono T. Topical vitamin D3 derivatives for recalcitrant warts in three immunocompromised patients. *Br J Dermatol*. 2004;150(2):374–376. doi:10.1111/j.1365-2133.2003.05766.x
36. Labandeira J, Vázquez-Blanco M, Paredes C, Suárez-peñaranda JM, Toribio J. Efficacy of topical calcipotriol in the treatment of a giant viral wart. *Pediatr Dermatol*. 2005;22(4):375–376. doi:10.1111/j.1525-1470.2005.22425.x
37. Liu PT, Stenger S, Li H, Wenzel L, Tan B, Krutzik S. Toll-like receptor triggering of a vitamin d-mediated human antimicrobial response. *Science*. 2006;311(5768):1770–1773. doi:10.1126/science.1123933
38. Kumar S, Awasthi S, Kumar A, Jain P. Role of intralesional vitamin D3 in cutaneous warts: an interventional study. *Int J Res Dermatology*. 2020;6.
39. Moscarelli L, Annunziata F, Mjeshtri A, Paudice N, Tsalouchos A, Zanazzi M. Successful treatment of refractory wart with a topical activated vitamin d in a renal transplant recipient. *Case Rep Transplant*. 2011;2011:368623. doi:10.1155/2011/368623
40. Rind T, Oiso N, Kawada A. Successful treatment of anogenital wart with a topical vitamin D3 derivative in an infant. *Case Rep Dermatol*. 2010;2(1):46–49. doi:10.1159/000312986
41. Kavya M, Shashikumar BM, Harish MR, Shweta BP. Safety and efficacy of intralesional vitamin D3 in cutaneous warts: an open uncontrolled trial. *J Cutan Aesthet Surg*. 2017;10(2):90–94. doi:10.4103/JCAS.JCAS_82_16
42. Raghukumar S, Ravikumar BC, Vinay KN, Suresh MR, Aggarwai A, Yashovardhana DP. Intralesional vitamin D 3 injection in the treatment of recalcitrant warts: a novel proposition. *J Cutan Med Surg*. 2017;21(4):320–324. doi:10.1177/1203475417704180
43. Jha N. Complete clearance of condyloma acuminata using injection vitamin D3. *Australas J Dermatol*. 2021;62(3):e417–e418. doi:10.1111/ajd.13586
44. Mortensen GL, Larsen HK. The quality of life of patients with genital warts: a qualitative study. *BMC Public Health*. 2010;10(1):113. doi:10.1186/1471-2458-10-113
45. Sterling JC, Handfield-Jones S, Hudson PM. Guidelines for the management of cutaneous warts. *Br J Dermatol*. 2001;144(1):4–11. doi:10.1046/j.1365-2133.2001.04066.x

46. Buck CB, Day PM, Thompson CD, et al. Human alpha-defensins block papillo- mavirus infection. *Proc Natl Acad Sci USA*. 2006;103(5):1516–1521. doi:10.1073/pnas.0508033103
47. Coelho L, Cardoso SW, Luz PM, Hoffman RM, Mendonça L, Veloso VG. Vitamin D3 supplementation in HIV infection: effectiveness and associations with antiretroviral therapy. *Nutr J*. 2015;14(1):81. doi:10.1186/s12937-015-0072-6

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