

Management of Pearly Penile Papules: A Review of the Literature

Anthony D. Honigman¹ , Danielle P. Dubin² , Justin Chu²,
and Matthew J. Lin² 

Journal of Cutaneous Medicine and Surgery
00(0) 1–7
© The Author(s) 2019
Article reuse guidelines:
sagepub.com/journals-permissions
DOI: 10.1177/1203475419887730
journals.sagepub.com/home/cms



Abstract

Pearly penile papules (PPPs) are benign, dome-shaped lesions found around the corona of the penis. Despite being asymptomatic and benign in nature, the appearance of PPPs may cause a great deal of psychological distress to both the patient and their sexual partner. While patient reassurance may be the first-line treatment, several other treatment modalities including cryotherapy, electrodesiccation and curettage, and laser therapy have all been used to treat PPPs in order to achieve a cosmetic outcome that satisfies the patient. Based on the evaluation of the existing literature, ablative laser therapies offer satisfactory cosmetic outcomes with good long-term results.

Keywords

pearly penile papules, cryotherapy, electrodesiccation and curettage, laser therapy

Introduction

Pearly penile papules (PPPs) are benign, painless, dome-shaped lesions that appear in rows on the corona of the glans penis in late adolescence or early adulthood. These growths are asymptomatic and do not cause any functional impairment. However, PPPs can often be a source of psychological distress to both the patient and his sexual partner, as they are often mistaken for sexually transmitted infections.¹ Some concerned patients actively seek treatment to remove these lesions. Cryotherapy, electrodesiccation and curettage (ED&C), and laser therapy are all viable therapeutic options for the treatment of PPPs. Each modality is associated with varying degrees of efficacy and risk.

Epidemiology

The exact prevalence of PPPs is unknown, but recent estimates suggest that the disease affects 14% to 48% of men worldwide.² The age of onset is similarly varied, with PPPs reported in males as young as 11 and as old as 52; however, the existing literature suggests that these lesions are more common in pubertal boys and young men and some may regress with age.²

Pearly penile papules are also seen more commonly in uncircumcised and black males.³ These papules do not serve any known purpose. It has been suggested that PPPs are evolutionary artifacts and are, therefore, normal anatomical variants.⁴

Histology

Pearly penile papules are structurally related to angiofibromas as their histology resembles adenoma sebaceum, subungual and periungual fibroma, fibrous papules of the nose, acquired acral angiofibroma, and oral fibroma.⁵ The epidermis of PPPs demonstrates orthokeratosis, hypergranulosis, and increased size and number of epidermal melanocytes with mute rete edges. Collagen fibers located immediately beneath the epidermis are mostly oriented perpendicular to the skin surface. The remaining fibrillary collagen assumes a whorled pattern with an increased number of plump, spindle-shaped stellate fibroblasts (Figure 1).

Clinical Signs and Symptoms

Pearly penile papules present as pearly-white, pink, or yellow dome-shaped or filiform papules that are 1 to 2 mm in diameter and 1 to 4 mm in height. The papules typically form rows on the dorsum of the corona of the glans penis, but in some instances these rows may encircle the glans

¹St. Vincent's Hospital Melbourne, Australia

²Department of Dermatology, Icahn School of Medicine at Mount Sinai, New York, NY, USA

Corresponding Author:

Matthew J. Lin, Department of Dermatology, Icahn School of Medicine at Mount Sinai, 234 East 85th Street, 5th Floor, New York, NY 10028, USA.
Email: matthew.lin@mountsinai.org



Figure 1. Microscopic examination shows the epidermis is hyperkeratotic. A fibrovascular stroma with thin-walled blood vessels and fibroblasts resides in the dermis.

penis entirely (Figure 2).⁶ Dermoscopic examination reveals a grape-like or cobblestone pattern and each individual white-pink lesion possesses a central vessel structure surrounded by crescent-shaped rims (Figure 3). These characteristics directly correlate with the PPPs' pathological findings of a hyperplastic papillary dermis, dilatation of vascular spaces, and mild acanthosis with orthokeratosis.⁷

Treatments

Documented PPP treatment modalities include cryotherapy, ED&C, CO₂ laser (fully ablative and fractioned),



Figure 2. Clinical examination shows pearly penile papules surrounding the corona of glans penis.

Er:YAG laser (fully ablative and fractioned), Ho:YAG (fully ablative), and pulsed dye laser (PDL). These methods can be painful and usually require multiple sessions to yield the most satisfactory results. Risks associated with treatment include infection, scarring, recurrence, pigmented changes, and postoperative bleeding due to the high vascularity of penile tissue.

Cryotherapy

Cryotherapy with liquid nitrogen causes tissue necrosis of the epidermis while preserving the warmer vascularized dermis. The risks of cryotherapy include edema, blister formation, erythema, scarring, and dyspigmentation at the application site. Cryotherapy in this area can also be painful.

Studies assessing cryotherapy as a treatment for PPPs are scarce and its clinical use is limited due to the associated risks.⁸ The evidence in support of cryotherapy is limited to small case studies (Table 1). One case study reported on a dark-skinned patient whose PPPs were treated with two 10-second cycles of liquid nitrogen (without anesthesia) with an open technique using a Cry-Ac hand-held device (Brymill Cryogenic Systems, Ellington, CT, United States). The investigators did not specify "freeze-thaw" time or whether a single or double "freeze-thaw" cycle was utilized during the treatment session. One month later, the treated lesions had resolved without scarring or postinflammatory pigmentary changes. There was no evidence of recurrence noted after 2 years.⁹ In another study of 4 patients, 2 treatments of cryotherapy (using two 15-20 second "freeze-thaw" cycles) without anesthesia, successfully cleared 80% to 90% of lesions without complications.¹⁰

In contrast, another case report found cryotherapy to be ineffective in treating PPPs on the penile shaft. The patient



Figure 3. Dermoscopic examination shows rows of whitish-pink tiny papules in rows with central dotted vessels.

Table 1. Comparison of Modalities for Treatment of Pearly Penile Papules.

Study, year	Country	Follow-up	Treatment	Patients	Outcome indicators	Summary
Porter et al (2000) ⁹	United Kingdom	1 month	Cryotherapy	1	Patient satisfaction	Patient was treated with liquid nitrogen from a Cryo-Ac gun, tip spray C, for two 10-s cycles without anesthesia. Two years after treatment, the patient was satisfied and there was no dysfunction, scarring, or pigmentary changes
Ocampo-Candiani et al (1996) ¹⁰	Mexico	Not stated	Cryotherapy	4	Visual examination	Patients were treated with a Cryo-Ac gun, tip spray C, for two 15-20 s freeze-thaw cycles. A second round of treatment was performed 1-2 months later. A total of 80%-90% of lesions were removed in 2 sessions
O'Neil et al (1995) ¹¹	United States	6 weeks	Cryotherapy	1	Patient satisfaction	Patient was treated with liquid nitrogen for lesions on the shaft of the penis. Three weeks later, a second treatment with liquid nitrogen was performed. At the 6-week follow-up visit, the papules were still present on the shaft of the penis
Grada et al (2018) ¹²	United States	10 days	ED&C/electrocoagulation	2	Visual examination and photographs	Patients were treated with electrocoagulation and 30% trichloroacetic acid chemical peel. After 10 days, the treated areas were completely healed and papule free
Gan et al (2015) ¹	United States	1-2 weeks	Fractional CO ₂ laser	2	Visual examination and photographs	Fitzpatrick V patient received 3 treatments at energy fluence of 100-125 mJ and a frequency of 125 Hz. Fitzpatrick I patient received 2 treatments at energy fluence of 100-125 mJ and a frequency of 125 Hz. At follow-up, lesions in both patients had cleared completely
Deda et al (2018) ¹³	Poland	7-10 days	Fractional CO ₂ laser	10	Visual examination and photographs	A total of 2-3 treatment sessions of fractional CO ₂ laser were performed for at least 4 weeks apart. Follow-up was 7-10 days after final treatment. Improvement was achieved in all patients
Rokhsar et al (2008) ¹⁴	United States	1 year	Er:YAG	1	Visual examination and photographs	Er:YAG laser treatment was performed every 2 weeks for a total of 5 treatments. Patient reported some erythema immediately postprocedure, but denied any pain. Complete remission was observed at follow-up
McKinlay et al (1999) ¹⁵	United States	2 months	Continuous wave CO ₂ laser	1	Visual examination and photographs	The SPHE CO ₂ laser (Ultrapulse, Coherent Laser Group, Palo Alto, CA, United States) was used with nominal pulse durations of 0.5-1.0 ms, with settings of 175 mJ, 8 Hz, a 1 mm spot size (~22 J/cm ²). All sites healed without evidence of scarring 2 months postoperatively

Table 1. Continued

Study, year	Country	Follow-up	Treatment	Patients	Outcome indicators	Summary
Lane et al (2002) ¹⁶	United States	1 month and 6 months	Continuous wave CO ₂ laser	1	Visual examination and photographs	Two passes were made with the CO ₂ laser. Papules were removed with no evidence of recurrence after 6 months
Magid et al (1989) ¹⁷	United States	Not stated	CO ₂ laser	2	Visual examination and photographs	Both patients were successfully treated with 1 session of the CO ₂ laser. Settings were 0.1 s, 5 W, and pulse power density of 640-160 W/cm ²
Krakowski et al (2015) ¹⁸	United States	3 months and 6 months	Macrofractionated CO ₂ laser	1	Visual examination and photographs	At 3 months, more than 90% of the lesions had cleared. At 6 months, patient confirmed over telephone a lack of recurrence
Baumgartner et al (2010) ¹⁹	Slovakia	1 year	Er:YAG	45	Visual examination and photographs	Patients were treated with 2940 nm Er:YAG laser (Skinlight, FOTONA, Slovenia). Er:YAG laser ablation energy 400-500 mJ, spot diameter 1.5-3 mm, repetition rate 8-10 Hz, and energy density 5.8-28.9 J/cm ² . Patients received up to 6 treatments depending on clinical response. One year after treatment, there was no evidence of recurrence
Lee et al (2016) ²⁰	United States	8 months, 13 months, and 16 months	Ho:YAG	3	Visual examination and photographs	Treatment was performed with a 1000 mcg laser fiber at 0.5 J/pulse and a pulse frequency which varied between 5 and 10 Hz. 16 months after treatment, all patients were satisfied with the results and there were no reports of reoccurrence, hypopigmentation, or scarring
Sapra et al (2013) ²¹	United States	Not stated	Pulsed dye Laser	4	Visual examination, photographs, and patient satisfaction	PDL (Mini V Pulse-Dye [595 nm] laser; Cynosure) was used. Patients received 1-3 treatments with fluence ranging from 6 to 10 J/cm ² . All patients had either complete clearance or significant reduction to the patient's satisfaction

ED&C, electrodesiccation and curettage; PDL, pulsed dye laser.

was treated with liquid nitrogen at week 0 and week 3; however, by week 6, the papules had failed to resolve.¹¹ This study did not specify “freeze-thaw” time or whether a single or double “freeze-thaw” cycle was utilized during the treatment session. This report appears to be the only available study in the literature that describes the unsuccessful use of a treatment modality for the management of PPPs.

Electrodessication and Curettage

Electrodessication and curettage is a destructive technique that involves the use of an electrosurgical device to cauterize the cells of the target lesions. After cauterization, the tissue is removed with a blunt curette. Electrodessication and curettage is a quick, readily available, and economical in-office method to remove PPPs. However, ED&C is a uniquely operator-dependent modality, and overzealous technique is associated with an increased risk of scarring and disfigurement.^{9,11}

Two cases of PPPs in Fitzpatrick skin type III were completely cleared using electrocoagulation and 30% trichloroacetic acid chemical peel.¹² The treated areas healed completely within 10 days and no adverse outcomes were reported. Utilization of a curette or anesthetic during this study was not specifically documented, and there was no evidence of follow-up after the initial 10-day visit. As such, the findings of the study are limited.

CO₂ Laser

The 10 600 nm CO₂ laser targets water as its chromophore. This energy is delivered to a target area of tissue and raises local temperatures. The heat evaporates the tissue or ablates the epidermal and dermal layers of the skin.

Fully and fractionally ablative CO₂ laser can be performed when treating PPPs (Table 1).^{1,13–18} Fractional ablative CO₂ lasers, when compared with nonfractionated ablative lasers, are associated with a decreased risk of complications like infection, erosions, ulceration, scarring, and postinflammatory dyspigmentation. Fractional therapy also has the added benefit of shortened healing time, which translates into less downtime for the patient post-treatment.^{1,13,14,18}

Two studies reported the successful treatment of PPPs with a single fully ablative continuous wave CO₂ laser treatment.^{15,16} One study used a continuous wave CO₂ laser (Ultrapulse, Coherent Laser Group, Palo Alto, CA, United States) after the area was anesthetized with 2% lidocaine. Two months postoperatively, the treated sites were healed without clinical evidence of scarring.¹⁵ The other study used a 125 mm hand piece in a defocused mode for ablation after the area was anesthetized locally using 1% lignocaine. At the 6-month mark, all the lesions were cleared.¹⁶

Treatment with fractional CO₂ lasers has also been reported to successfully treat PPPs.¹³ One case reported

complete remission of PPPs following 2 to 3 treatments of fractional CO₂ in patients with Fitzpatrick I and V skin types. Each treatment consisted of an energy fluence of 100 to 125 mJ/cm² and frequency of 125 Hz at 2 months (Ultrapulse, Lumenis Inc., Santa Clara, CA, United States).¹ Another study reported more than 90% resolution of PPPs after a single fractional CO₂ treatment (Active Fx, Ultrapulse Encore, Lumenis, Yokneam, Israel).¹⁸ A more recent study used a fractionated CO₂ laser (Synderon Candela Wayland, MA, United States) to perform a point-by-point ablation on 10 patients with PPPs. The settings used in that study were an energy density of 10 mJ/cm², output power of 60 W, and laser pulse mode. Clear clinical improvement was achieved with only mild erythema and swelling observed for a maximum of 48 hours after treatment.¹³

Ablative Er:YAG Laser

The 2940 nm Er:YAG laser is another ablative laser modality used in the treatment of PPPs (Table 1). The laser is strongly absorbed by water within the tissue and effectively remodels collagen. One case series of 45 patients described the use of the fully ablative Er:YAG laser (Skinlight, FOTONA, Slovenia) to treat PPPs. A topical anesthesia with 2.5% lidocaine and 2.5% prilocaine cream was applied 1 hour prior to the procedure. Patients received an average of 2 treatment sessions, though up to 6 treatments were administered if the lesions persisted. All 45 patients reported an overall positive response and complete clearance in all cases was noted at the 1-year follow-up visit. Adverse effects included mild capillary bleeding and discomfort in an unspecified number of patients. No severe complications were reported.¹⁹

Fractional resurfacing with the 1550 nm erbium laser has also been reported to completely clear PPPs in 1 patient who underwent 5 treatment sessions of fractional photothermolysis (Fraxel SR750 laser, Reliant Technologies Inc., China). At a 1-year follow-up, complete lesion resolution was achieved and there was no reoccurrence. Adverse effects of the laser treatment included mild erythema; however, in comparison to ablative approaches, the fractional laser was relatively painless.¹⁴

Holmium:YAG

The 2100 nm Holmium (Ho):YAG laser has also been used to treat PPPs. It is functionally similar and has comparable operational characteristics to the Er:YAG, but boasts a deeper laser penetration of 200 to 400 μ m. Its 2100 nm wavelength is also highly absorbed by water. The major advantage of the Ho:YAG laser is its contact hand piece that provides greater precision and hemostasis compared to the Er:YAG laser. One case report described 3 Caucasian males with extensive PPPs treated with the Ho:YAG laser.

Patients underwent monitored anesthesia care using the short acting intravenous sedative, propofol. Subcutaneous lidocaine 1% was administered circumferentially around the coronal sulcus.²⁰ All patients were satisfied and there was no evidence of recurrent lesions, hypopigmentation, or scarring 16 months after treatment. Ho:YAG laser therapy appears to be a simple, effective, and cosmetically acceptable cure for PPP. However, one must exercise caution when using this laser in darker skin patients, as there is an increased risk of scarring and hyperpigmentation in these individuals.²⁰

Pulsed Dye Laser

One of the hallmarks of PPPs is a dense collagen layer under the epidermis that is characterized by a prominent vascular layer network. This vascularity is an ideal target for the 595 nm PDL and a case report in the literature has demonstrated its safety and moderate efficacy for the treatment of PPPs.^{3,8} Four patients were treated with 1 to 3 PDL treatments (Mini V Pulse-Dye laser; Cynosure). All subjects had either complete lesion clearance or a reduction that was satisfying to the patient. One patient reported mild discomfort that abated within 1 week after treatment.²¹ Other adverse effects of PDL include scarring, infection, and pain; however, these outcomes are rare.

Conclusions

Pearly penile papules are one of the most common nonpathological lesions seen in the dermatologist's office.¹³ Despite their benign nature, they are often mistaken for sexually transmitted infections. As such, these papules can lead to significant patient embarrassment and anxiety. Patient reassurance is the first-line management of PPPs; however, counseling and a discussion of appropriate therapeutic options as well as their risk-to-benefit ratio is warranted if an individual is considerably distressed. Much of the literature evaluating the treatment of PPPs is limited to case series, with the majority reporting on the efficacy of CO₂ or ablative Er:YAG lasers. Treatment modalities like cryotherapy and ED&C have variable cosmetic outcomes and carry a risk of scarring, disfigurement, and pigmentary changes. Despite the lack of randomized controlled trials or comparative studies in the literature, ablative laser therapies appear to offer satisfactory cosmetic outcomes with good long-term results for patients with PPPs.

Acknowledgments

The authors thank Stephanie Liu, MD, Division of Dermatopathology, Icahn School of Medicine at Mount Sinai; Sewon Hwang and Gyong Moon Kim, The Indian Journal of Dermatology, Venerology and Leprology. Department of Dermatology, St. Vincent's Hospital, College of Medicine, The Catholic University of Korea, Seoul,

Republic of Korea. "Pápulas perladas del pene" by Alberto21, licensed under CC BY-SA 4.0/Adaptation.

Declaration of Conflicting Interests


The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iDs

Anthony D. Honigman  <https://orcid.org/0000-0002-4872-6340>

Danielle P. Dubin  <https://orcid.org/0000-0002-2974-1609>

Matthew J. Lin  <https://orcid.org/0000-0003-2674-9987>

References

1. Gan SD, Graber EM. Treatment of pearly penile papules with fractionated CO₂ laser. *J Clin Aesthet Dermatol*. 2015;8(5):50-52.
2. Agha K, Alderson S, Samraj S, et al. Pearly penile papules regress in older patients and with circumcision. *Int J STD AIDS*. 2009;20(11):768-770.
3. Agrawal SK, Bhattacharya SN, Singh N. Pearly penile papules: a review. *Int J Dermatol*. 2004;43(3):199-201.
4. Oates JK. Pearly penile papules. *Genitourin Med*. 1997;73(2):137-138.
5. Ackerman AB, Kronberg R. Pearly penile papules: acral angiofibromas. *Arch Dermatol*. 1973;108(5):673-675.
6. Aldahan AS, Brah TK, Nouri K. Diagnosis and management of pearly penile papules. *Am J Mens Health*. 2018;12(3):624-627.
7. Ozeki M, Saito R, Tanaka M. Dermoscopic features of pearly penile papules. *Dermatology*. 2008;217(1):21-22.
8. Maranda EL, Akintilo L, Hundley K, et al. Laser therapy for the treatment of pearly penile papules. *Lasers Med Sci*. 2017;32(1):243-248.
9. Porter WM, Bunker CB. Treatment of pearl penile papules with cryotherapy. *Br J Dermatol*. 2000;142(4):847-848.
10. Ocampo-Candiani J, Cueva-Rodriguez JA. Cryosurgical treatment of pearly penile papules. *J Am Acad Dermatol*. 1996;35(3 Pt 1):486-487.
11. O'Neil CA, Hansen RC. Pearly penile papules on the shaft. *Arch Dermatol*. 1995;131(4):491-492.
12. Grada A, Obagi Z. Treatment of pearly penile papules with the use of electrocoagulation followed by 30% trichloroacetic acid localized chemical peel. *J Am Acad Dermatol*. 2018;79(3):AB302.
13. Deda A, Lipka-Trawińska A, Wilczyński S, Błońska-Fajfrowska B. CO₂ laser treatment for pearly penile papules - personal experience. *J Cosmet Laser Ther*. 2019;21(3):152-157.
14. Rokhsar CK, Ilyas H. Fractional resurfacing for the treatment of pearly penile papules. *Dermatol Surg*. 2008;34(10):1420-1422.

15. McKinlay JR, Graham BS, Ross EV. The clinical superiority of continuous exposure versus short-pulsed carbon dioxide laser exposures for the treatment of Pearly penile papules. *Dermatol Surg.* 1999;25(2):124-126.
16. Lane JE, Peterson CM, Ratz JL. Treatment of pearly penile papules with CO2 laser. *Dermatol Surg.* 2002;28(7):617-618.
17. Magid M, Garden JM. Pearly penile papules: treatment with the carbon dioxide laser. *J Dermatol Surg Oncol.* 1989;15(5):552-554.
18. Krakowski AC, Feldstein S, Shumaker PR. Successful treatment of pearly penile papules with carbon dioxide laser resurfacing after local anesthesia in an adolescent patient. *Pediatr Dermatol.* 2015;32(3):433-435.
19. Baumgartner J. Erbium: yttrium-aluminium-garnet (Er:YAG) laser treatment of penile pearly papules. *J Cosmet Laser Ther.* 2012;14(3):155-158.
20. Lee JA, Larson JS, Kava BR. Preliminary experience in the treatment of pearly penile papules with holmium: YAG laser. *SM Clin Case Rep.* 2016;4(6):1119.
21. Sapra P, Sapra S, Singh A. Pearly penile papules: effective therapy with pulsed dye laser. *JAMA Dermatol.* 2013;149(6):748-750.