

CLINICAL REPORT

Holmium Laser Treatment of Genital Warts: an Observational Study of 1500 Cases

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The treatment and relapse rate of genital warts are significant problems. The aim of this observational study was to assess the efficacy of holmium laser treatment of genital warts. A total of 1500 outpatients with genital human papillomavirus-induced lesions presenting from August 2002 to June 2005 were treated with holmium laser. The effects and side-effects of treatment were observed and analysed. Of this large cohort, lesions were excised at the first visit in 1488 cases. Twelve cases were treated a second or third time in the event that the lesions were too large to be removed at the first visit. The incidence of side-effects and complications after treatment with holmium laser was found to be low. Almost all warts can be excised at first treatment by holmium laser therapy with little bleeding during the treatment. Key words: warts; holmium laser; treatment.

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Genital human papillomavirus (HPV) infection or genital warts is one of the most commonly reported sexually transmitted infections (STI) worldwide. The incidence of genital warts is increasing and affects about 1% of the sexually active population (1). Warts are the visible manifestation of infection with one of more than 100 types of recognized HPVs. Ninety percent of cases of genital warts are caused by HPV type 6 or type 11, which in rare cases are associated with invasive squamous cell carcinoma of the external genitalia (2). The choice of treatment for warts depends on the number, size, site and morphology of the lesions, as well as patient preferences, cost, convenience, adverse effects and clinical experience. Traditional therapies include podophyllin, podophyllotoxin, trichloroacetic acid, surgical excision, cryosurgery and electrosurgery (3). However, these methods are often complicated by a high recurrence rate. For this reason, many alternative methods have been developed for a higher effective power, less recurrence, fewer complications, and shorter treatment duration. One of these advanced

technologies is the holmium:YAG laser, which has been used widely in urological diseases, especially in treating urolithiasis (4) and benign prostatic hyperplasia (5). The wavelength of holmium laser is 2140 nm, which is in the infrared electromagnetic spectrum. The energy of the laser at this wavelength can be absorbed strongly by water. Through a predominantly photo-thermal mechanism, even the largest warts can be removed effectively by holmium laser. However, there are few published reports on the use of holmium laser in the treatment of genital warts. This report describes the treatment of 1500 patients infected with HPV by holmium:YAG laser in our clinic from August 2002 to June 2005.

PATIENTS AND METHODS

Patients

The study was approved by the ethics review board of Anhui Medical University. All subjects were patients presenting at our department for STI and giving their written informed consent to join this observational study. The diagnosis of warts was based on clinical presentation, acetic acid test, and/or biopsy when necessary.

Treatment

Female patients were placed in a dorsolithotomy position, and male patients were placed in a standing position if warts were localized genitally or in a dorsolithotomy position if warts were localized around the anus. Disinfection with 0.1% benzalkonium chloride was performed routinely. Local infiltration with 2% lidocaine or nerve block was used to decrease pain. The parameters for treatment with holmium laser were as follows: maximum energy 0.8–1.0 J, pulse frequency 8–12 Hz, average power 6–12 W, treated with holmium laser at the surface of warts or melted warts by inserted the laser fibre into the warts. After warts were melted, necrotic tissue was removed. After the operation was completed, residual debris was wiped away with a piece of moist gauze. It was not necessary to use high-efficiency plume evacuation systems and high-filtration laser masks during the operation.

Small treatment areas were covered with erythromycin or mupirocin ointment. If the treatment area was large or wet, or if the warts were localized around the anus, cold wet compresses with 2%–4% boric acid liquid or 1:5000–1:8000 potassium permanganate were used daily. If the warts were very large (≥ 50 mm in diameter) or the numbers high (≥ 20 warts in total), the clearance operation was performed in several stages during a single hospitalization.

Efficiency assessment

All patients were recalled in order to check the status of recovery or relapse at 2, 4 and 5 weeks following every treatment. Recovery or relapse was recorded. At the same time, potential adverse effects, such as pain, bleeding during treatment, ulcer, oedema and scarring after treatment, were recorded. Patients who had not relapsed by the fifth week were followed up by telephone every 4 weeks thereafter until the sixth month after the last treatment. The cured cases were those whose lesions did not relapse following 6 months after the last treatment.

Statistical analysis

All calculations were conducted using SPSS software (version 10.0 for Windows). Contingency tables were used to determine statistical significance ($p < 0.05$, two-sided) when necessary.

RESULTS

From August 2002 to June 2005, 1706 patients with genital warts sought treatment in our department. All patients were treated with holmium laser and 1500 (87.9%) patients completed the follow-up. This large cohort of patients comprised 830 males and 670 females aged 16–78 years (mean age 24.3 years). More than two-thirds of the lesions in males were localized on the coronary sulcus, preputium or penis. Thirty-seven cases of lesions were localized at the root of the penis, skin of scrotum and urethrae externum. In females, the warts were located mainly on the labium majus/minus pudenda, vestibulum, ostium vaginae, mons pubis or clitoris. Ninety-eight cases grew on the wall of the vaginae, urethrae externum, or cervix uteri. Four main morphological types of lesions were distinguished: (i) extended cauliflower-like; (ii) smooth papular; (iii) flat warts; and (iv) keratotic (6) (Table I).

Two thirds of cases had 1–10 lesions. Two individuals had approximately 100 warts. Table I shows the 4 main morphological types distributed in all patients. The size of lesions varied from that of a pinhead to an adult fist. Twenty-eight percent of patients were cured after a single holmium laser treatment. Six patients were cured after 8 treatments. On average, every patient was treated 2.68 ± 0.04 (mean \pm SE) times. In some patients, warts were localized in specific places, such as the cervix uteri, urethra, anus, or annulus haemorrhoidalis. Table II shows the distribution of lesions located in specific sites and the mean times of treatment with holmium laser.

Table I. Proportion of cured patients with different morphological types of genital warts treated by holmium laser

Type of warts	Percentage of cured patients after different numbers of treatments							
	1	2	3	4	5	6	7	8
Cauliflower-like ($n = 1023$)	27.0	14.4	29.0	20.1	5.0	2.2	1.7	0.6
Smooth papular ($n = 246$)	23.2	17.5	28.0	20.7	8.1	1.6	0.8	0.0
Flat warts ($n = 134$)	38.8	27.6	15.7	11.2	6.0	0.7	0.0	0.0
Keratotic ($n = 97$)	43.3	32.0	13.4	9.3	2.1	0.0	0.0	0.0

Table II. Percentage of cured patients with genital warts located in specific sites and treatments

Localization of warts	Percent of cured patients after different numbers of treatments						
	1	2	3	4	5	6	7
Cervix uteri ($n = 132$)	55.3	19.7	15.9	6.8	2.3	0	0
Urethra ($n = 69$)	15.9	24.6	30.4	17.4	7.3	4.3	0
Anus ($n = 285$)	23.5	36.1	22.1	13.0	2.8	1.8	0.7

Of the 1500 cases, 123 had very large warts. Warts in 112/123 patients were cleared at the first visit. The remaining 11 patients were treated with repetitive operations. The largest warts encountered were excised with holmium laser at the fourth visit. The wound surface took from 3 to 28 days (11.4 days on average) to heal after the operations. The majority of the wound surface was dry 3–10 days after treatment. Exudation and oedema were rarely observed.

Of the 1500 patients who completed the 6-month follow-up, the mean follow-up time was 7.50 ± 0.42 months. The longest follow-up time was 21 months in one case who was treated 8 times with holmium laser. For different morphological types of warts the recurrence times were different and the treatment times also differed accordingly. The cauliflower-like lesions were more likely to relapse (Table I). In addition, the recurrence rates of warts in different locations were also different. Warts around the anus had the highest recurrence rate compared with those in other locations (Table II).

Holmium laser treatment could also result in mild side-effects and complications, such as pain, epithelial erosion and ulceration, especially when warts were located on the anus or urethra. Pain could be alleviated by pre-treatment with anaesthesia. Severe pain was encountered in a very few patients with enormous warts, especially warts located around the anus. In general, holmium laser surgery was bloodless, even though occasional bleeding points occurred at the injection site of anaesthesia or during the cleaning of enormous warts. Defocusing the laser beam a second time could coagulate all these bleeding points. No scarring was observed after treatment even with warts on the anus or intra-urethra.

DISCUSSION

Despite the high prevalence of genital HPV infection, both patients and physicians are dissatisfied with the effects of treatment. At present, the major goal of treatment for this kind of STI is to physically remove the symptomatic warts and reduce the high recurrence rate. In China, cryotherapy, CO₂ laser, electrodissection, microwave and 5-fluorouracil are popularly used in treatment of genital warts. However, along with a high recurrence rate, these methods often cause pain, scarring, oedema and/or complications. Holmium laser has been used widely in the treatment of prostate hyperplasia and calculus of the urethra for more than a decade (4, 5). However, very few papers have been published about holmium laser treatment of warts. Our experience shows excellent efficiency of holmium laser in treatment of warts, with 99.2% of patients showing complete clearance of warts after a single treatment. For patients with a high number of warts or very large warts, the lesions could be cleared through repetitive laser operations at intervals of 1 or 2 days. The largest warts we encountered were the size of a small football, located around the anus, and were removed by 4 repeated holmium laser treatments.

Warts on the cervix uteri or in the urethra are difficult to treat with traditional methods such as cryosurgery (7). Holmium laser may be a good choice for warts localized in these sites. For example, when warts are localized to the haemorrhoidalis, they bleed easily and are not suitable for treatment with CO₂ laser. Oedema often occurs if warts in the urethra are treated with cryotherapy. In addition, CO₂ laser could cause stenosis if warts are located around the anus or in the urethra (8–11). In our experience, unlike the CO₂ laser that can vaporize warts, holmium laser melts warts using high temperatures. So, it is not necessary to use high-efficiency ventilator and high-filtration masks during the operation. However, it is essential to guard against methane gas explosions during laser treatment with wet gauze.

Holmium laser treatment can also cause side-effects and complications, such as pain, epithelial erosion and ulceration, especially when warts are located in the anus or urethra. However, the incidence is very low. Pain could be alleviated through pre-treatment with local anaesthesia. Severe pain was encountered in a few patients with enormous warts, especially warts located around the anus. Almost every patient in this study could endure the pain caused by holmium laser. In general, holmium laser surgery is bloodless, although occasional bleeding points may occur at the injection sites of anaesthesia or during the cleaning of enormous warts. Defocusing the laser beam a second time can coagulate these bleeding points. No scarring was observed after treatment, even for warts on the anus or intra-urethra.

Follow-up time was defined by clinic visits within 5 weeks, and by telephone if warts did not relapse, because some patients refused to come back if no relapse occurred. As it is difficult for patients to observe warts recurring in some locations (e.g. cervix, anal), relapse in these areas was not addressed in our study.

In conclusion, the holmium laser technique is a safe and effective alternative method for the surgical treatment of genital HPV infection. Although the removal of warts can be effected by a variety of energy sources, only the holmium laser has the ideal combination of cutting and coagulation properties. Holmium laser treatment is bloodless, induces less oedema and scarring, and has a high efficiency compared with traditional treatment methods for warts.

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