

# Nd:YAG Laser Treatment of Early Stage Carcinoma of the Penis Preserves Form and Function of Penis

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**INTRODUCTION:** We analysed the results of penis-preserving (conservative) treatment of early stage cancer of the penis with neodymium: yttrium-aluminium-garnet (Nd:YAG) laser with long-term follow-up in a developing country.

**METHODS:** This was a retrospective study of 32 patients with cancer penis from 1993 to 2005 who were treated by Nd:YAG laser local excision and *in situ* coagulation of the tumour bed.

**RESULTS:** Out of 32 patients who were treated with Nd:YAG laser, 25 had pT<sub>1</sub> and seven had pT<sub>2</sub> stage cancer penis. The median follow-up was 70 months (range, 6–120 months). Two had stopped attending the follow-up clinic after 6–12 months. Three patients had concurrent and six had delayed inguinal block dissection. There was no mortality but two (6.25%) patients developed recurrence in 48–60 months post laser excision. Penis was preserved in all 32 patients. All patients were satisfied with the cosmetic result. Eight patients practiced celibacy, in 23 sexual functions were normal and in one this information was not available. Micturition was in standing posture in all 32 patients.

**CONCLUSION:** The result of this study shows that Nd:YAG laser treatment of early stage cancer penis has good local control with preservation of the penis. [*Asian J Surg* 2007;30(2):126–30]

**Key Words:** carcinoma, conservative treatment, Nd:YAG laser coagulation, penis

## Introduction

Carcinoma of the penis is a rare disease (1–2/100,000 men)<sup>1</sup> in the Western world but relatively common in developing countries,<sup>2</sup> occurring in men in the age group of 40–70 years. Treatment of early stage penile carcinoma is wide excision or partial penectomy with or without inguinal lymph node dissection.<sup>3,4</sup> Early disease (stage I–II) is curable in most patients.<sup>5</sup> A properly planned and executed partial penectomy or wide excision is recurrence-free, though there is marked emotional disturbance due to loss of male sexuality.<sup>1</sup> Laser ablation of the superficial primary tumour has a prominent role as a penis-conserving approach.<sup>6</sup> There are random reports of penis-preserving

treatment with neodymium: yttrium-aluminium-garnet (Nd:YAG) laser/carbon dioxide laser,<sup>7–24</sup> though prospective studies or guidelines to laser treatment are not mentioned.

We carried out local excision with a minimum of 3–5 mm margin clearance and laser coagulation of the tumour bed with Nd:YAG laser in a 54-year-old patient with pT<sub>2</sub>N<sub>0</sub>M<sub>0</sub> stage cancer penis, who refused standard partial penectomy in 1993. Since then, 31 more patients have been treated with Nd:YAG laser. There was no randomization and application of laser depended on its availability and the patient's preference. We reviewed the treatment of carcinoma penis by laser ablation and conventional method and analysed the results retrospectively in this study.

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## Patients and methods

Between the year January 1993 and June 2005, all 106 patients with squamous cell carcinoma of the penis were seen in the Department of Surgical Oncology at Institute of Medical Sciences, Banaras Hindu University, Varanasi, a tertiary care hospital in the northern part of India. In all the patients, this was the first occasion in which the penis was affected. None of the patients had a history of circumcision. All patients had a complete history and physical examination when first seen. Full incision biopsy histology was evaluated and histology done elsewhere was reviewed by in-house pathologist to confirm the diagnosis. Race, ethnicity, clinical stage, pathological and operative data were recorded. All patients had an ultrasound of the penile lesion and groin along with cystourethroscopy in a selected few.

Patients with lesions on the prepuce or glans (<2 cm in size) and refusing standard treatment were offered conservative laser excision. Informed consent was obtained. In the rest, a standard surgical partial or total amputation of the penis was done as appropriate. The patients were restaged, retrospectively, according to the VI<sup>th</sup> edition of the American Joint Committee on Cancer (AJCC) pathological tumour-node-metastasis (pTNM) staging system.

### *Laser excision of penile cancer*

Nd:YAG 100 watt equipment was used (Model Medilas-2, MBB, Germany 1990). A contact sapphire probe was used for contact laser excision and bare fibre for noncontact *in situ* coagulation of the tumour bed till all the suspicious area was covered. All laser operations were done under local anaesthesia administered by 0.5% lignocaine infiltration.

The protocol for treatment was Nd:YAG laser sapphire tip contact mode, circumcision with local excision of the tumour from the penis cutting tangentially through glans/corpora with a minimum of 3–5 mm margin and further complete coagulation of the tumour bed with noncontact mode laser irradiation to achieve uniform coagulation of tissue for 3–4 mm. In general, the tissue defect was left open for spontaneous healing by re-epithelialization from the normal margins, which was usually completed in 7–9 weeks. If the excision involved or was close to the distal urethra, the patient received an indwelling catheter for 1 week postoperatively.

The treatment of the groin was independent of the type of local treatment for carcinoma penis. A simultaneous



**Figure 1.** Perioperative photograph of a patient following conservative treatment of penile cancer with neodymium:yttrium-aluminium-garnet laser showing the granulating wound.

inguinal block dissection was done for fine needle aspiration cytology positive inguinal nodes. A delayed full inguinal block dissection was carried out if there was evidence of lymph node metastasis within 6–8 weeks or later in the follow-up.

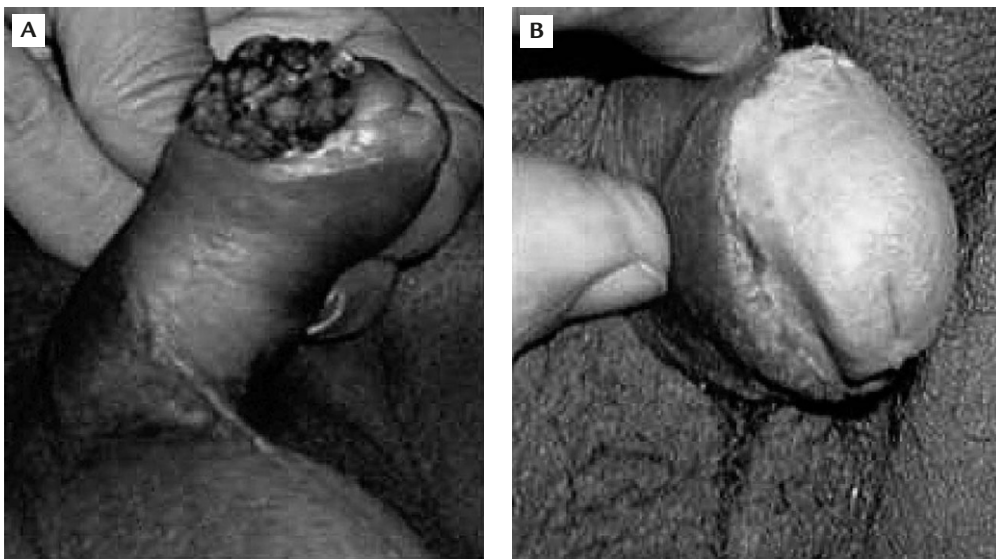
In the post laser period, the laser treated area was examined on day 1, day 4 and then twice weekly until complete healing was achieved (Figures 1 and 2). After 6–8 weeks, the treated area was re-examined for healing and evidence of residual disease in the form of ulcer or nodular formations. A review at 3-monthly intervals was carried out to examine wound healing, local recurrence and urination. Enquiry was made regarding erectile and sexual functions.

The follow-up examination data were updated from the outpatient records. At the subsequent outpatient visits, recurrence and survival information were updated. The follow-up varied from 6 to 120 months, averaging 70 months. Figure 3 shows the disease-free survival calculated with Kaplan–Meier curves.

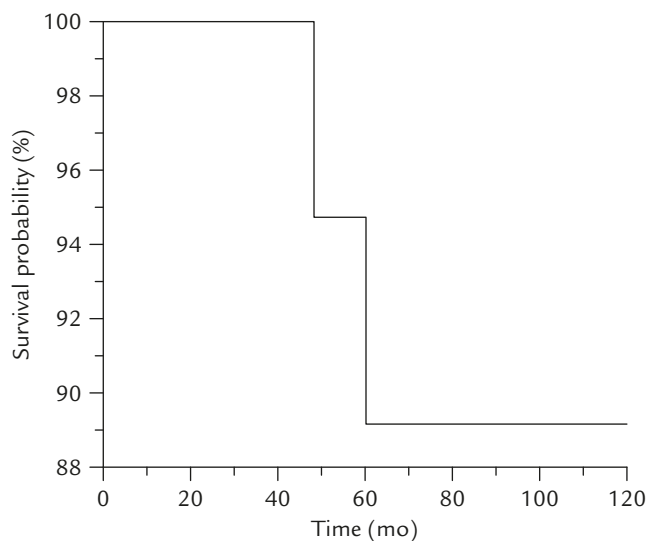
## Results

The frequency distribution of races and ethnicity indicated that 100% of patients were Hindu. The socioeconomic class listed was upper in five (15.6%), middle in 10 (31.3%) and lower in 17 (53.1%) patients. Age of the patients was 32–67 years with a median of 47 years.

The histology was squamous cell carcinoma in all 32 laser treated patients. The pTNM of the patients was



**Figure 2.** (A) Preoperative and (B) postoperative photograph of a patient following conservative treatment of penile cancer with neodymium: yttrium-aluminium-garnet laser.



**Figure 3.** Disease-free survival curve of 32 patients who underwent conservative treatment of penile cancer with neodymium: yttrium-aluminium-garnet laser, with a follow-up of 6–120 months.

pT<sub>1</sub> stage in 25 and pT<sub>2</sub> in seven patients. Twenty-one patients had grade 1, eight had grade 2 and three had grade 3 cancer penis (Table). All 25 patients with pT<sub>1</sub> stage tumour had their tumour excised along with circumcision with 3–5 mm margin. In the seven patients with pT<sub>2</sub> stage carcinoma, the lesion was also locally excised with 1/2–1 cm healthy margin all around which included parts of the glans and corpora cavernosa. The base of the excised area was further irradiated to produce *in situ* coagulation with non-contact mode of laser. There was no blood loss. Patients stayed in the hospital for 1–5 days. None of the patients

**Table.** Distribution of pathological tumour stage, grade and inguinal block dissection of the 32 patients treated with neodymium: yttrium-aluminium-garnet laser

pT stage	Grade			Inguinal block dissection	
	1	2	3	Concurrent	Delayed
pT <sub>1</sub> (25)	17	7	1	0	2
pT <sub>2</sub> (7)	4	1	2	3	4
Total (32)	21	8	3	3	6

pT = pathological tumour stage (tumour-node-metastasis).

required parenteral analgesics. There was no wound infection and antibiotics were administered in none. All 32 laser treated patients with stage pT<sub>1</sub> and pT<sub>2</sub> disease had their penis saved.

Patients conservatively treated with Nd:YAG laser were satisfied with the cosmetic appearance of the penis (Figure 2). Micturition was in standing posture in all of these 32 patients. Eight patients observed celibacy, in 23 sexual function was satisfactory and in one patient the information could not be obtained.

There was no mortality in the laser treated group. Three patients stopped attending the follow-up clinic after 6 months to 1 year. One of these (pT<sub>2</sub>, N<sub>2</sub>, G<sub>3</sub>) returned after 4 years with widespread metastatic disease. This patient had first refused any treatment but later agreed to undergo conservative laser excision of his penile cancer, though he still refused an inguinal block dissection. One patient

(pT<sub>2</sub>, N<sub>1</sub>, G<sub>2</sub>) developed local recurrence after 60 months that was salvaged by partial amputation of the penis.

## Discussion

Treatment of T<sub>1</sub> and T<sub>2</sub> stage carcinoma penis is with wide excision or partial penectomy with or without inguinal lymph node dissection.<sup>3,4</sup> A properly carried out partial penectomy is curative. Early stage carcinoma may also be treated by organ preserving methods—radiotherapy for selected noninvasive small lesions,<sup>5,25</sup> though radionecrosis or stenosis of urethra makes the penis nonfunctional. However, at times, chordae and stricture urethra might also occur after laser excision. Other organ preserving methods are photodynamic therapy and Mohs' micrographic surgery.<sup>26-28</sup>

Nd:YAG laser ablation of penile cancer is achieved without loss of form or function of the penis with satisfactory long-term results. Windahl et al<sup>7</sup> noted unaltered erectile function in 72%, decreased erection in 22% and improved erection in 6% of the 40 patients sexually active before the treatment, of whom 75% resumed their normal sex life and 50% were satisfied with their sex life. In 78%, the self-perceived cosmetic results were satisfactory.

The long-term results of laser treatment are comparable to partial penectomy. Moreover, local recurrence following laser ablation is salvaged by partial penectomy.<sup>12</sup> The 5-year survival benefit of conventional partial or total penectomy in 150 patients was 83.3% for T<sub>1</sub>, 60.4% for T<sub>2</sub> and 39.4% for T<sub>3</sub> cancers.<sup>29</sup> None of the 32 patients treated conservatively by laser have died of cancer. Two patients were lost to follow-up. One developed local recurrence and one widespread metastatic disease at 60 and 48 months, respectively, after laser treatment.

Laser treatment of T<sub>1</sub> and T<sub>2</sub> stage carcinoma penis has several advantages. During or post laser, there is no blood loss, pain relief is achieved with oral analgesics, there is no wound infection, and antibiotic administration is not required. On long-term follow-up, cosmetic appearance of the penis is unchanged or little altered and erectile function is retained. The patient is able to urinate in the normal standing posture. Local treatment failure can be treated with repeat laser application or partial/total penectomy. The management of regional lymph nodes is on their own merit, not affected by laser application. At this stage, a prospective study of laser treatment for carcinoma of the penis is required with a view to develop firm guidelines for the application of laser to cancer of the penis.

## References

1. Hadzi-Djokic J, Dzamic Z, Tulic C, et al. Surgical treatment and quality of life in patients with carcinoma of the penis. *Acta Chir Jugosl* 1999;46(Suppl 1):7-10.
2. Nagpal BL, Prabhakar BR, Kataria SP, et al. Male genital tract tumours in Punjab, India. *J Environ Pathol Toxicol Oncol* 1992; 11:331-4.
3. Skinner DG, Leadbetter WF, Kelley SB. The surgical management of squamous cell carcinoma of penis. *J Urol* 1972;107:273-7.
4. Persky L, Dekernion J. Carcinoma of the penis. *CA Cancer J Clin* 1986;36:258-73.
5. Mosconi AM, Roila F, Gatta G, Theodore C. *Crit Rev Oncol Hematol* 2005;53:165-77.
6. Kroon BK, Horenblas S, Nieweg OE. Contemporary management of penile squamous cell carcinoma. *J Surg Oncol* 2005;89: 43-50.
7. Windahl T, Skeppner E, Andersson SO, Fugl-Meyer KS. Sexual function and satisfaction in men after laser treatment for penile carcinoma. *J Urol* 2004;172:648-51.
8. Opjordsmoen S, Waehre H, Aass N, Fossa SD. Sexuality in patients treated for penile cancer: patients' experience and doctors' judgment. *Br J Urol* 1994;73:554-60.
9. Doehn C, Baumgartel M, Jocham D. Surgical therapy of penis carcinoma. *Urologe A* 2001;40:303-7.
10. Babjuk M, Novak J, Dvoracek J. Nd:YAG laser in the treatment of superficial lesions of the penis. *Rozhl Chir* 1998;77:497-9.
11. Blatstein LM, Finkelstein LH. Laser surgery for the treatment of squamous cell carcinoma of the penis. *J Am Osteopath Assoc* 1990; 90:338-44.
12. Boon TA. Sapphire probe laser surgery for localized carcinoma of the penis. *Eur J Surg Oncol* 1988;14:193-5.
13. Malloy TR, Wein AJ, Carpinello VL. Carcinoma of penis treated with neodymium YAG laser. *Urology* 1988;31:26-9.
14. Frimberger D, Schneede P, Hungerhuber E, et al. Autofluorescence and 5-aminolevulinic acid induced fluorescence diagnosis of penile carcinoma—new techniques to monitor Nd:YAG laser therapy. *Urol Res* 2002;30:295-300.
15. Kuzaka B, Szymanska K, Suleiman W. Nd:YAG laser cw in treatment of precancerous states of the penis. *Pol Tyg Lek* 1996; 51:98-9.
16. Weese D, Murphy J, Zimmern PE. Nd:YAG laser treatment of extra mammary Paget's disease of the penis and scrotum. *J Urol (Paris)* 1993;99:269-71.
17. Malek RS. Laser treatment of premalignant and malignant squamous cell lesions of the penis. *Lasers Surg Med* 1992;12: 246-53.
18. Olsen PR, Lund F. Laser treatment of penile cancer. *Ugeskr Laeger* 1989;151:568-70.
19. Kvarstein B, Fossa SD, Harvei S. Diagnosis and treatment of penile cancer. *Tidsskr Nor Laegeforen* 2002;122:1194-7.
20. Van Bezooijen BP, Horenblas S, Meinhardt W, Newling DW. Laser therapy for carcinoma *in situ* of the penis. *J Urol* 2001;166: 1670-1.

21. Tietjen DN, Malek RS. Laser therapy of squamous cell dysplasia and carcinoma of the penis. *Urology* 1998;52:559-65.
22. Clemente Ramos LM, Maganto Pavon E, Garcia Gonzalez R, et al. Verrucous carcinoma of the penis. A report of 6 new cases and review of the diagnostic and therapeutic aspects. *Actas Urol Esp* 1997;21:372-6.
23. Pizzocaro G, Piva L, Bandieramonte G, Tana S. Up-to-date management of carcinoma of the penis. *Eur Urol* 1997;32:5-15.
24. Windahl T, Hellsten S. Laser treatment of localized squamous cell carcinoma of the penis. *J Urol* 1995;154:1020-3.
25. Fraley EE, Zhang G, Sazama R, Lange PH. Cancer of the penis: prognosis and treatment plans. *Cancer* 1985;55:1618-24.
26. Singh I, Khaitan A. Current trends in the management of carcinoma penis—a review. *Int Urol Nephrol* 2003;35:215-25.
27. Misra S, Chaturvedi A, Misra NC. Penile carcinoma: a challenge for the developing world. *Lancet Oncol* 2004;5:240-7.
28. Mohs FE, Snow SN, Messing EM, et al. Microscopically controlled surgery in the treatment of carcinoma of the penis. *J Urol* 1985;133:961-6.
29. Kamat MR, Kulkarni JN, Tongaonkar HB. Carcinoma of the penis: the Indian experience. *J Surg Oncol* 1993;52:50-5.