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Ravi Arjunan

Professor, Department of surgical oncology, Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, India

Durgesh kumar

Senior resident, Department of surgical oncology, Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, India

Neharika

Senior resident, Department of general surgery, St John's medical college, Bangalore, Karnataka, India

Girish MS

Senior resident, Department of surgical oncology, Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, India

Rekha V Kumar

Professor, Department of surgical pathology, Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, India

Correspondence

Ravi Arjunan

Professor, department of surgical oncology, Kidwai Memorial Institute of Oncology, Bangalore, Karnataka, India

Role of carbon dioxide laser in early stage carcinoma penis: An organ preservation approach

Ravi Arjunan, Durgesh kumar, Neharika, Girish MS and Rekha V Kumar

Abstract

Introduction: Penile cancer is more common in Indian subcontinent compared to western world. Majority of patients present with advance stage. For them partial or total penectomy is the only option but for the early stage diseases organ preservation should be the goal. Organ preservation is associated with better functional and cosmetic outcomes with good quality of life.

Aims: In this study we analysed the results of CO₂ laser in the management of early stage penile cancer with a goal of organ preservation and both short and long term outcomes of laser.

Material and Methods: It was a retrospective observational study of 17 patients of stage T1 carcinoma penis who underwent CO₂ laser excision between 2012 to 2015. We evaluated the role of laser excision in early penile cancer as a penile preservation modality. Proximal and base margins analysed retrospectively.

Results: The median follow-up was 15 months (range, 3–31 months). There was no cancer specific mortality but two (11%) patients developed recurrence in 17-20 months post treatment. One patient underwent partial penectomy and other patient had repeat laser excision. Penis was preserved in all cases. All patients were satisfied with the cosmetic and functional outcome.

Conclusion: CO₂ laser is associated with good outcome and organ preservation rate and could be used as important tool in managing early penile cancers.

Keywords: partial penectomy, carcinoma in situ, circumcision

1. Introduction

Carcinoma penis is not a common malignancy and it constitutes 1.7% of all male cancer. Its incidence in western world is less than 1 % of all cancers in men with average age adjusted incidence rate of 0.81 /100,000. Among the developing countries India shows one of the highest incidence rate of 3.3/100,000 men ^[1]. In urban population of India, the age adjusted incidence of penile cancer ranges from 0.7-2.3 cases per 100,000 men whereas in rural population this rate is 3 cases per 100,000 men, which accounts for 6% of all malignancies ^[2]. Various risk factors have been defined for carcinoma penis which includes smoking, race and ethnicity, socioeconomic condition and culture. It is a disease of elderly male and most commonly after 50 years ^[1].

Early stage penile cancers are treated with curative intent and various treatment options available are partial penectomy, Mohs micrographic surgery, and laser ablation. Since we are in era of organ preservation, laser has a definite role in penile preservation ^[3] with improved well being. There are various retrospective studies of penis-preserving treatment with neodymium: yttrium-aluminium-garnet (Nd: YAG) laser/carbon dioxide laser are available in the literature but no definite guidelines to laser treatment are mentioned ^[4]. Since we are in organ preservation era we tried to find out whether laser surgery could be an effective management tool for early carcinoma of penis with better functional outcome or not.

2. Material and Methods

It was a retrospective study done in department of surgical oncology at Kidwai memorial institute of oncology, a tertiary care centre from south India. Data was collected from 2012 to 2015 from the hospital data base. Total 138 cases of carcinoma penis were registered during this duration. 79/138 patients had tumor involving the glans penis. Tumors of prepuce were treated with circumcision only.

After proper counselling for re – surgery in from of repeat laser excision and partial penectomy with or with without inguinal block dissection 17 patients with early penile cancer were fit for laser excision. These patients were included in the study to evaluate the efficacy of laser excision in the management of early penile. Patients with clinical stage T₂ or more and patients not giving consent for surgery were excluded from the study.

Laser excision

CO₂ laser of 25 watt equipment was used (SNJ-1000N_Ultra-Pulse CO₂ Laser Made in Korea). A 50mm Hand piece Beam with Spot Size 0.5 mm used for laser excision and excessive bleeding was controlled with bipolar electrocautery. All laser operations were done under local anesthesia.

The protocol for treatment with CO₂ laser was local excision of the tumor with a minimum of 5 mm margin and further complete coagulation of the tumor bed with laser or bipolar electrocautery. [figure1] The wound was left open for spontaneous healing by re-epithelialization from the normal margins, which was usually completed in 5-6 weeks [figure 2]. If the margin was close to the distal urethra, the patient received an indwelling catheter for 2 week postoperatively. The groin dissection was independent of the type of local treatment for carcinoma penis.

In the post operative period, the operative site was examined on day 1, day 3[figure 3], day 14 [figure 4] and then twice weekly until complete healing was achieved. After 5-6 weeks, the wound was examined for healing and evidence of residual disease. A 3-monthly examination was carried out to look for local recurrence, inguinal recurrence, urination, erectile and sexual functions.



Fig 1: Intra-operative



Fig 2: Post-operative



Fig 3: Post-op day 3



Fig 4: Post-op day 14

3. Results

Analysis of epidemiological data showed 11 out of 138 patients were Muslims having history of circumcision (7.9%). None of Hindu patients have previous history of circumcision. Out of 138 patients only 17 patients were

eligible for laser excision with average follow up period of 15 months, range (3-31months). Age of the patients was 41-83 years with a mean of 56.11 years. The histology was well differentiated squamous cell carcinoma in 67 patients out of which 17 underwent laser treatment. [Table 1].

Table 1: Clinico- pathological data of all patients.

Total number of patients	138
Age (mean/range)	56.11(41-83)
<50 years	15.21%
>50 years	84.79%
Religion	
Hindu	127
Muslim	11
History of circumcision	7.9%
Site	
Glans	57.24%
Prepuce	33%
Shaft	9%

Stage	
T1	79
T2	45
T3	14
Histopathology	
Well differentiated	67
Moderately differentiated	51
Poorly differentiated	20
Lymph node status	
Positive inguinal nodes	37
Negative inguinal nodes	101

All patients underwent circumcision followed by laser excision with ~ 5 mm margin [figure 1]. A separate deep margin sent for frozen section to confirm that the deep margin is free of tumor. Blood loss was very minimal. Patients stayed in the hospital for 1–3 days and managed with oral analgesics. Antibiotics were administered at the time of induction of anesthesia only and there was no wound infection. Catheterization was required for four patients on post operative day one but it was removed after 2-3 days. In one patient silicon catheter was placed for 2 weeks because of deep urethral margin resection. No urethral fistula was found on follow up. Range of margin of resection was 1.6-5mm with mean of 3.6mm.

Patients treated with CO2 laser had their penis saved and satisfied with the cosmetic and function of the penis which was decided by history of sexual activity and Micturition in standing position. Micturition in standing position was possible in all of these 17 patients. On follow up we found 2 recurrences within 17-20 months which was treated with repeat laser excision and one patient underwent partial penectomy for positive urethral margin leading to organ preservation rate of 94.11%. No nodal recurrence or distant metastasis was found on follow up.

4. Discussion

Penile cancer is relatively uncommon in western world but little higher incidence reported from India and other developing countries [5]. Surgery has curative role in management. Partial and total penectomy with or without inguinal block dissection are the traditional form of treatment of treatment. Poor quality of life due to psychological and sexual consequences of penectomy led to the development of various organ preservation approaches which includes local excision, circumcision, Mohs micrographic surgery, glans resurfacing, laser ablation, photodynamic therapy, topical therapy with 5-fluorouracil, imiquimod 5% cream, cryotherapy or radiotherapy [5]. According to European association of urology conservative treatment is effective in early penile cancer for stages Tis, Ta and T1 with good organ preservation rate and functional outcome [6].

Nd: YAG and CO2 laser are the most common laser techniques used for penile preservation surgery and it preserve the form and function of penis as well. A study from India reported 6.25 % local recurrence with excellent quality of life with Nd: YAG laser in early stage penile cancer as compared to amputative surgeries [7].

Largest cumulative data on early stage penile cancer treated with Nd: YAG laser showed local recurrence rate of 10 -48 %, inguinal nodal recurrence of 10-21%, with cancer specific mortality of 2-4% only after 5 years follow up [8]. Secondary partial penectomy rate was only 4 % which

showed despite of high local recurrence majority were managed with repeat laser excision [9, 10].

Quiet similar results were observed with CO2 laser with estimated local recurrence 10-16%, inguinal recurrence of 1 -4% with secondary penectomy rate of 10 % in ten year follow up period [11]. Despite of local recurrence cancer specific death was very low at 2% during mean follow up of 5 years with good quality of life [12]. Another study of carcinoma penis treated with CO2 laser showed local recurrence of 20-55% but patients requiring amputative surgery were only three which constitutes of 10 % of their study population. Majority of recurrence were treated with repeat conservative laser excision with organ preservation of 90% [13].

The result of laser treatment is comparable to amputative surgeries in terms of local or distant recurrence. Cancer specific survival was also similar with good quality of life [14]. In our study we found recurrence rate of 11 % with organ preservation of 95%.

5. Conclusion

Laser treatment of early stage penile cancer having better short term outcome in terms off blood loss, no need of intravenous analgesia, no wound infection, and no intravenous antibiotic administration. post-operative catheterization rarely required. Long term follow up showed good results in term of cosmesis, sexual function, and micturination in standing position.

Recurrence rate, disease free survival and cancer specific mortality is similar and type of laser has no significant impact on any of the disease related parameter and its use entirely depends upon availability of the instruments and experience.

6. Consent

Written informed consent was obtained from the patient for publication of this case series and any accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal.

7. Abbreviations

Nd: YAG -neodymium: yttrium-aluminium-garnet, CO2-carbon dioxide

8. Competing interests

The authors declare that they have no competing interests.

9. Authors' contributions

The department of surgical oncology was involved in the diagnosis, management and post-operative recovery of the patients. The Pathology department was responsible pathological report of the cases. All authors have contributed with the literature review and with the

preparation of this manuscript. All authors read and approved the final manuscript.

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