Management of Penile Cancer Using Penile Preserving Techniques

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Penile cancer

- Surgical amputation is the oldest of all modalities.
- Local control rates greater than 90% of the primary tumor
- Oncological “gold standard” for all stages
Penile amputation

- associated with urinary and sexual dysfunction
- dramatic psychological morbidity
- development of several surgical organ preserving techniques
Penile Preserving Treatment

- definitive treatment of penile carcinoma is stage-dependent
- Penile preserving option reserved for low-grade and low stage tumors
- aim to remove as little of the functional anatomy as possible, without compromising local oncological radicality
- retrospective studies suggest a statistically higher local recurrence rate following penis-preserving treatments
- Most recurrences are surgically salvageable and overall mortality is comparable to primary amputation
Penile Preserving Treatment

- 80% of penile carcinomas occur distally, involving the glans and/or prepuce
- favourable histology (stages Tis, Ta, T1; grades 1 and 2) are at low risk for local progression and/or distant metastatic spread
- best candidates for penile preserving treatment options
- maintain penile sensation and to maximize penile shaft length where possible.
- Not compromise long-term oncological outcomes.
- Histological diagnosis with local staging must be obtained in all cases, especially if non-surgical treatment modalities are considered (EAU).
- Essential to remove all malignant tissue with negative surgical margins.
- Patients must be counselled about all relevant treatment modalities.
T- staging (2009)

- **TX**  Primary tumour cannot be assessed
- **T0**  No evidence of primary tumour
- **Tis**  Carcinoma \textit{in situ}
- **Ta**  Non-invasive carcinoma
- **T1**  Tumour invades subepithelial connective tissue
  - **T1a**  Tumour invades subepithelial connective tissue without lymphovascular invasion and is not poorly differentiated or undifferentiated (T1G1-2)
  - **T1b**  Tumour invades subepithelial connective tissue with lymphovascular invasion or is poorly differentiated or undifferentiated (T1G3-4)
- **T2**  Tumour invades corpus spongiosum and/or corpora cavernosa
- **T3**  Tumour invades urethra
- **T4**  Tumour invades other adjacent structures
Tropical treatment

- Imiquimod or 5-FU is an effective for penile CIS.
- Relatively low toxicity and adverse events but the efficacy is limited. Complete responses have been reported in up to 57% of cases of CIS.
- Close and long-term surveillance is required.
- If topical treatment fails it should not be repeated.

Laser

- carbon dioxide
- neodymium yttrium aluminium garnet (Nd:YAG)
- potassium titanyl phosphate (KTP) lasers
- Argon
CO2 laser

- 0.1mm penetration power
- Retrospective study by Bandieramonte in 2008
- Patients included had CIS or T1 penile cancers. (N=224)
- 10-yr recurrence rate was 17.5% (N=39)
- 10-yr amputation rate of 5.5% (N=9)
- In the remaining cases, organ form and curvature were preserved, with satisfactory cosmetic and functional results.

Laser Nd:YAG

- Pentration power is 6mm
- Included penile cancer CIS and T1
- Recurrence-free survival rates were reported as 100%, 95% and 89% at one, two and five years (Meijer at el)
- Inguinal nodal recurrence were reported in 21%. (Frimberger at el)
- Overall survival ranged from 100% at 4 years and 95% to 85% at seven years.
- The rate of secondary partial penectomy after initial Nd:YAG laser treatment was reported to have been 4% and 45%

Mohs micrographic surgery (MMS)

- most commonly used for skin tumors
- excising accessible tumors under microscopic control. The tumor is excised in layers
- the undersurface of each layer is examined microscopically by systematic frozen sections in multiple sessions.
- Excision is continued until the undersurface of the excised tissue is negative, at which point another section of tissue is removed to ensure a clear resection margin.
- increased precision and control of the negative surgical margin, while maximizing safe organ preservation.
- the success rate good at Tis and T1
Mohs micrographic surgery (MMS)

- allows reassurance of local complete excision and preservation of local penile anatomy and function.
- reserved to patients with penile carcinoma in situ or with small, distal, superficially invasive tumors.
- Only reported by Mohs (1992) and Shidel (2007)
- In Mohs series, 79% (23/29) were cured at 5 years.
- In the Shidel series, 68% (17/25) were recurrence-free after a median of 37 months.
- Further reports with this technique are necessary to allow comparison and reproducibility of outcomes in order to encourage its more widespread use.

Glansectomy

- local excision of distal tumors on the glans and prepuce
- In all forms of penile-preserving surgery, a frozen biopsy of the surgical bed is mandatory to confirm tumor clearance (negative margins).
- combined with grafting procedures to create a neoglans
- partial glansectomy
- Total glansectomy
Partial glansectomy

- which removes the portion of the glans affected by the tumor
- leaving behind remaining glanular epithelium with malignant potential
- Surgically margin of 5 mm is considered oncologically safe
- Primary closure for small and simple defect
- Larger lesions necessitated partial glansectomy followed by glans reconstruction which was performed with the use of split-thickness or full-thickness grafting.
Partial glansectomy

- Ubrig described using outer preputial skin flap was used to cover the glans defect
- Pietrzak et al. have suggested the use of a full-thickness flap of penile skin or extragenital (lateral aspect of the thigh)


(a) Superficial glans carcinoma outlined  
(b) outer preputial flap 

(c) glans lesion has been excised and circumcision  
(d) surgical glans defect covered by preputial flap performed
Total glansectomy

- first described by Austoni in 1996
- total glansectomy was performed followed by either split-thickness skin graft reconstruction or reconstruction of cavernosal tips and grafting

Radiotherapy/ brachytherapy

- Good results in T1-2 lesions < 4 cm in diameter (EAU)
- Radiation dose was center based, about 60 Gy
- Reported best local control rates ranging from 70-90%
- The rates of local recurrence after radiotherapy are higher than after partial penectomy.
- With local failure after radiotherapy, salvage surgery can achieve local control
- Urethral stenosis (20-35%), glans necrosis (10-20%) and late fibrosis of the corpora cavernosa (41)
- With brachytherapy, meatal stenosis is a common complication occurring in > 40% of cases.
Complications and oncological outcomes of local treatments

<table>
<thead>
<tr>
<th>treatment</th>
<th>complications</th>
<th>local recurrence</th>
<th>nodal recurrence</th>
<th>cancer-specific deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nd:YAG laser</td>
<td>none reported</td>
<td>10-48%</td>
<td>21%</td>
<td>2-9%</td>
</tr>
<tr>
<td>CO₂-laser</td>
<td>bleeding, meatal stenosis (both &lt; 1%)</td>
<td>14-23%</td>
<td>2-4%</td>
<td>none reported</td>
</tr>
<tr>
<td>Lasers (unspecified)</td>
<td>bleeding (8%), local infection 2%</td>
<td>11-26%</td>
<td>2%</td>
<td>2-3%</td>
</tr>
<tr>
<td>Moh’s micrographic surgery</td>
<td>local infection 3%, meatal stenosis 6%</td>
<td>32%</td>
<td>8%</td>
<td>3-4%</td>
</tr>
<tr>
<td>Glans resurfacing</td>
<td>none reported</td>
<td>4-6%</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td>Glansectomy</td>
<td>none reported</td>
<td>8%</td>
<td>9%</td>
<td>none reported</td>
</tr>
<tr>
<td>Partial penectomy</td>
<td>not reported</td>
<td>4-13%</td>
<td>14-19%</td>
<td>11-27%</td>
</tr>
<tr>
<td>Brachytherapy</td>
<td>meastal stenosis &gt; 40%</td>
<td>10-30%</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td>Radiotherapy</td>
<td>urethral stenosis 20-35%, glans necrosis 10-20%</td>
<td>not reported</td>
<td>not reported</td>
<td>not reported</td>
</tr>
<tr>
<td>Primary tumour</td>
<td>Organ-preserving treatment is to be considered whenever possible</td>
<td>LE</td>
<td>GR</td>
<td></td>
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<td>---------------</td>
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<tr>
<td>Tis</td>
<td>Topical treatment with 5-fluorouracil or imiquimod for superficial lesions with or without photodynamic control. Laser ablation with CO₂ or Nd:YAG laser. Glans resurfacing.</td>
<td>3</td>
<td>C</td>
<td></td>
</tr>
<tr>
<td>Ta, T1a (G1, G2)</td>
<td>Wide local excision with circumcision CO₂ or Nd:YAG laser surgery with circumcision. Laser ablation with CO₂ or Nd:YAG laser. Glans resurfacing. Glansectomy with reconstructive surgery, with or without skin grafting. Radiotherapy by external beam or as brachytherapy for lesions &lt; 4 cm.</td>
<td>3</td>
<td>C</td>
<td></td>
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<tr>
<td>T1b (G3) and T2 confined to the glans</td>
<td>Wide local excision plus reconstructive surgery, with or without skin grafting. Laser ablation with circumcision. Glansectomy with circumcision, with reconstruction. Radiotherapy by external beam or brachytherapy for lesions &lt; 4 cm in diameter.</td>
<td>3</td>
<td>C</td>
<td></td>
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<tr>
<td>T2 with invasion of the corpora cavernosa</td>
<td>Partial amputation and reconstruction. Radiotherapy by external beam or brachytherapy for lesions &lt; 4 cm in diameter.</td>
<td>3</td>
<td>C</td>
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