

# Comparing functional outcomes of glansectomy with or without glans reconstruction

Mihály Murányi,<sup>1\*</sup> András Domoszlai,<sup>1</sup> Attila Csaba Nagy,<sup>2</sup> Tibor Flaskó,<sup>1</sup> <sup>1</sup>Department of Urology, University of Debrecen, Debrecen, 4032, Hungary

<sup>2</sup>Department of Health Informatics, University of Debrecen, Debrecen, 4032, Hungary

MURÁNYI M, DOMOSZLAI A, NAGY AC, FLASKÓ T. Comparing functional outcomes of glansectomy with or without glans reconstruction. *Can J Urol* 2025;32(2):119–127.

**Introduction:** We aimed to compare the oncological and functional outcomes of glansectomy and split-thickness skin graft reconstruction (GR) with those of glansectomy alone (GA) and penile amputation (PA).

**Materials and Methods:** This retrospective study included patients with penile carcinoma or penile intraepithelial neoplasia diagnosed between 2017 and 2022. Surgical outcomes, complications, and oncological outcomes were assessed through a chart review, and functional outcomes were assessed using a questionnaire administered to patients who underwent GR (group A), GA (group B), or PA (group C).

## Introduction

The aims of surgical treatment for primary penile carcinoma are to preserve as much penile function as possible and completely remove the tumor. In contrast to traditional penile amputation, partial or total glansectomy is an ideal organ-sparing treatment option for tumors confined to the glans. Performing glans reconstruction with split-thickness skin grafting (STSG) offers even better aesthetic (Figure 1D) and functional results.<sup>1</sup> Glansectomy and

\*Corresponding Author: Mihály Murányi. Email: muranyi.mihaly@med.unideb.hu **Results:** Six, eight, and seven patients were enrolled in groups A, B, and C, respectively. Their complication rates were 0%, 25%, and 29%, respectively; margin positivity rates were 17%, 13%, and 0%, respectively; and local recurrence rates were 0%, 0%, and 14%, respectively. Logistic regression analysis showed that being in group A rather than C was a significant predictor of favorable erectile function (p = 0.007) and cosmetic outcomes (p = 0.030). However, being in group A rather than B was not a significant predictor of favorable erectile function (p = 0.127) or cosmetic outcomes (p = 0.638).

*Conclusion:* Excellent functional results were observed after GR; however, the benefits were significant only when compared with those of amputation.

**Key Words:** penile cancer, organ-sparing treatments, split-thickness skin graft, glansectomy, glans reconstruction

STSG reconstruction have presently become the most common and popular types of organ-sparing surgery.<sup>2,3</sup> There is a large body of evidence regarding its favorable oncological and functional outcomes.<sup>4-6</sup> However, there is a lack of randomized controlled trials and observational comparative studies regarding glansectomy and STSG reconstruction and other treatment options for organ-confined penile cancer. In particular, studies involving direct comparisons of glansectomy with or without STSG reconstruction are lacking.<sup>7,8</sup> However, this is an important issue because glansectomy with STSG reconstruction is much more complex and time-consuming and requires specific expertise in STSG.

We analyzed the data of patients who underwent partial or total glansectomy and reconstruction with STSG (GR), partial or total glansectomy alone (GA), or penile amputation (PA) for penile carcinoma or

Received date 24 January 2025 Accepted for publication 16 April 2025 Published online 30 April 2025



**FIGURE 1.** Total glansectomy and split-thickness skin graft (STSG) reconstruction technique. A, After removal of the glans, the penile skin margin is sutured in a circular pattern to the corporal bodies 3–4 cm from the tip of the penile stump to create the neosulcus. The urethral stump is fixed to the tip of the penile stump. Four of the threads used to attach the urethral stump and neosulcus are left long. B, A rectangular STSG with a size determined by the distance between the neosulcus and the tip of the penile stump (3–4 cm) and the circumference of the neosulcus (10–11 cm) is marked and harvested from the thigh. C, The STSG is fixed with absorbable sutures to the neoglans area bordered by the meatus and neosulcus. At the completion of surgery, the bandage is fixed to the neoglans using the four pairs of long threads. The bandage and catheter are removed 5 days after surgery. D, Appearance of the neoglans 2 months after surgery

penile intraepithelial neoplasia. This study aimed to compare the oncological and functional outcomes of GR with those of GA and PA. We hypothesized that all three types of surgery could be performed safely from an oncological perspective. We expected good functional results with GA; however, we expected even better results with GR.

# Materials and Methods

This was a retrospective study of consecutive patients with primary penile carcinoma or penile intraepithelial neoplasia who underwent surgery of the penis at our center between 1 January 2017, and 31 December 2022. The inclusion criteria were biopsy-proven penile carcinoma or penile intraepithelial neoplasia on the glans. Patients who underwent total or radical penectomy with perineal urethrostomy and those who underwent radical circumcision of a tumor confined to the foreskin were excluded. Patients were divided into three groups. Group A included patients who underwent GR using Bracka's technique (shown in Figure 1A–C).<sup>9</sup> Group B included patients who underwent partial or total glansectomy without STSG reconstruction (GA; shown in Figure 2A). Group C included patients with penile cancer who underwent PA. Patients were followed-up after surgery in accordance with the current European Association of Urology guidelines for penile cancer.<sup>8</sup>

Ethical approval for this study was obtained from the Regional and Institutional Ethics Committee, University of Debrecen, Clinical Center. The approval number is 5734–2021. The study was conducted according to the Declaration of



**FIGURE 2.** Simple glansectomy surgical technique A, After removing the glans and fixing the urethral stump to the tip of the penile stump, the edge of the penile skin is fixed to the urethral stump. The excess edge of the penile skin is cut off such that the suture on the dorsal side of the penis lies tight against the penis. B, Appearance of the penis 7 months after surgery

Helsinki. Written informed consent was obtained for anonymized patient information to be published in this article. Age, Charlson Comorbidity Index (CCI) score, American Society of Anesthesiologists (ASA) physical status score, body mass index (BMI), length of surgery, length of hospital stay, positive surgical margin (PSM), local recurrence (LR), diseasespecific survival (DSS), and overall survival (OS) were analyzed retrospectively. Data were obtained by analyzing the medical records of the enrolled patients. The "Tumor, Node, Metastasis" (TNM) clinical and pathological classification system published by the Union for International Cancer Control and the American Joint Committee on Cancer in 2017 was used.<sup>10</sup> Postoperative complications were recorded and evaluated using the Clavien-Dindo classification.

Penile function was evaluated using a questionnaire administered during a personal interview, that included a question about the ability to urinate while standing (yes/no), a question about the ability to participate in sexual intercourse (yes/no), and a fivescale question regarding overall satisfaction with the appearance of the penis (1: very unsatisfied; 2: unsatisfied; 3: uncertain; 4: satisfied; 5: very satisfied). Surgery was considered satisfactory in terms of cosmetic results if the patients answered "satisfied" or "very satisfied" to the aforementioned question. Erectile function was assessed using the International Index of Erectile Function (IIEF-5) questionnaire. Patients originally included in groups A and B who underwent salvage penile amputation after primary surgery because of a PSM were assigned to group C for oncological and functional evaluations.

### Statistical analysis

The Shapiro–Wilk test was performed to evaluate the normality of continuous variables. Categorical variables are described as proportions, and continuous variables are described as medians and interquartile ranges (IQRs).

The Wilcoxon rank-sum test was performed to compare the medians of the continuous variables. Fisher's exact test was performed to explore associations between categorical variables. Multiple binary logistic regression models were created to explore possible factors that influence binary outcomes. All statistical analyses were performed using Intercooled Stata version 17.0 (Stata Statistical Software Release 17; StataCorp LLC, College Station, TX, USA). Results were considered significant when p < 0.05.

## Results

This study included 21 consecutive patients. Group A comprised six patients; two underwent partial glansectomy with STSG reconstruction, and four underwent total glansectomy with STSG reconstruction. Group B included eight patients; five underwent partial glansectomy, and three underwent total glansectomy. Seven patients were enrolled in group C.

	Group A	Group B	Group C
Patients, N	6	8	7
Median age, years (range) [p-value]	65 (23-77)	71 (59–79) [0.595]	66 (42–77) [0.868]
Median CCI score (range) [ <i>p</i> -value]	2 (0-3)	4.5 (1-5) [0.036]	2 (0-5) [0.508]
Median ASA score (range) [ <i>p</i> -value]	2 (1–3)	3 (2–4) [0.157]	2(2-3) [0.783]
Median BMI, $kg/m^2$ (range) [ <i>p</i> -value]	25.4 (24.0-26.5)	25.1 (23.0–50.9) [0.926]	29.8 (21.3-35.8) [0.171]
Penile biopsy results, n (%)			
SCC	1 (17)	6 (75)	7 (100)
Verrucous carcinoma	1 (17)	1 (13)	
PeIN	4 (66)	1 (13)	
cT stage, n (%)			
Is	4 (66)	1 (13)	
a	1 (17)	1 (13)	
1	1 (17)	6 (75)	
2			2 (29)
3			5 (71)
cN stage, n (%)			
0	6 (100)	7 (87)	3 (43)
1			4 (57)
2			
3		1 (13)	
cM stage, n (%)			
0	6 (100)	8 (100)	7 (100)
Grade, n (%)			
not specified	4 (66)	1 (12.5)	
1	2 (33)	2 (25)	3 (43)
2		4 (50)	3 (43)
3		1 (12.5)	1 (14)

TABLE 1. Demographic and clinical characteristics of the patients and results of the histopathological examination of the initial penile biopsy specimen (ASA, American Society of Anesthesiologists; BMI, body mass index; CCI, Charlson comorbidity index; PeIN, penile intraepithelial neoplasia; SCC, squamous cell carcinoma)

The descriptive characteristics of the patients, results of the histopathological examination of the initial penile biopsy specimen, and clinical TNM stages are summarized in Table 1.

### Surgical outcomes

Operations described in this article were routinely performed under general or spinal anaesthesia. In two cases, local anaesthesia was used due to the patient's general condition and co-morbidities, after consultation with the anaesthetist and with the patient's informed consent. Type of aensthesia, operative times, and lengths of stay are shown in Table 2. No postoperative complications occurred in group A. The grafts adhered in all cases, and no shrinkage was observed. In group B, complications occurred in two (25%) patients. Of them, one complication was grade I, and one was grade III/a according to the Clavien–Dindo classification. Wound disruption requiring local skin care and wound edge bleeding were treated by resuturing the wound under local anesthesia. In group C, grade I complications occurred in two (29%) patients. The wound infection was treated with local skin care, and moderate wound edge bleeding required a compression bandage. Meatal stenosis was not observed in any of the groups.

## Histopathological results

The tumor type, pTNM stage, tumor grade, and tumor diameter of all patients according to the final histopathological examination are shown in Table 2. All three groups included one patient with stage

	Group A	Group B	Group C
Anesthesia, n (%)	-	-	-
local		2 (25)	
spinal	4 (67)	4 (50)	6 (86)
general	2 (33)	2 (25)	1 (14)
Operating time—min, median (IQR) [ <i>p</i> -value]	136 (132–142)	51.5 (37.5–90) [0.011]	80 (65–148) [0.169]
Lengths of stay—day, median (IQR) [p-value]	7 (7–7)	1.5 (1–5) [0.004]	4 (1–11) [0.304]
Tumor diameter, median (IOR) [ <i>p</i> -value]	25 (20-30)	24 (8-40) [0.975]	35 (24–45) [0.351]
Tumor type, n (%)	· · · ·		
SCC	3 (50)	5 (63)	6 (86)
Verrucous carcinoma	1 (17)	2 (25)	
PeIN	1 (17)		
pT0	1 (17)	1 (13)	1 (14)
pT stage, n (%)			
0	1 (17)	1 (13)	1 (14)
Is	1 (17)		
1a	3 (50)	3 (37)	
1b		3 (37)	2 (29)
2		1 (13)	2 (29)
3	1 (17)		2 (29)
pN stage, n (%)			
X	6 (100)	6 (74)	3 (43)
0		1 (13)	2 (29)
1		1 (13)	1 (14)
2			1 (14)
Grade, n (%)			
not specified	2 (33)	1 (13)	1 (13)
1	3 (50)		3 (43)
2	1 (17)	6 (74)	2 (29)
3	. ,	1 (13)	1 (14)

TABLE 2. Anesthesia, operating time, lenths of hospital stay and results of the final histopathological examination (IQR, interquartile range; PeIN, penile intraepithelial neoplasia; SCC, squamous cell carcinoma)

pT0 based on the final histopathological examination. The histopathological examination of the initial penile biopsy specimens from patients with stage pT0 in groups A and B revealed penile intraepithelial neoplasia with a PSM. The initial penile biopsy of the patient with stage pT0 in group C revealed G2 squamous cell carcinoma (SCC) with PSM.

The final histopathological examination confirmed a PSM in two patients; one (17%) patient was in group A with G1 verrucous SCC, and one (13%) patient was in group B with G2 SCC. The patient with PSM in group A underwent salvage PA 1 month after glansectomy, and histopathological examination of the salvaged PA specimen confirmed a minimal amount of margin-negative pT3 verrucous SCC. The patient was tumor-free for 5 years after the surgery. PA was recommended for the patient with a PSM in group B; however, he did not consent to salvage surgery because of the high risk associated with the use of anesthesia (CCI score, 5; ASA score, 4). The patient survived 33 months after the surgery without tumor recurrence.

Six patients (two in group B and four in group C) underwent bilateral modified inguinal lymphadenectomy. Three of these patients underwent radical inguinal lymphadenectomy because of lymph node positivity determined by the intraoperative frozen section analysis. One patient underwent pelvic lymphadenectomy because of stage pN2 disease. Patients with lymph node metastasis received chemotherapy. One patient with a cN3 tumor was treated as neoadjuvant and two patients with pN1 and pN2 tumor as adjuvant 4 cycles of TIP (paclitaxel, ifosfamide, cisplatin).

### **Oncological** outcomes

During the analysis of oncological outcomes, patients with PSMs who underwent penile amputation in group A were transferred to group C. During a median follow-up period of 44 months (IQR, 22-57 months), LR was not observed in any patients in group A (0/5 patients), and the DSS and OS rates were 100% (5/5 patients). LR was not observed in any patients in group B (0/8 patients) during a median follow-up of 21 months (IQR, 13–39 months; p =0.142). The DSS and OS rates were 100% (8/8 patients) and 75% (6/8 patients), respectively. One patient died 27 months after surgery, and one died 33 months after surgery. During a median follow-up of 25 months (IQR, 11–57 months; p = 0.366), LR was observed in one of eight (13%) patients in group C. The time to recurrence for this patient was 6 months after PA. Subsequent imaging studies revealed inguinal lymph node, lung, and adrenal metastases, which were treated with four cycles of paclitaxel, ifosfamide, and cisplatin. Despite chemotherapy, the patient died 13 months after the initial PA. As a result of this disease-specific death, the DSS rate was 88% (7/8 patients) in group C. One nontumor-specific death was observed 57 months after surgery; therefore, the OS rate was 75% (6/8 patients) in group C.

### Functional outcomes

Owing to the retrospective nature of the study, patients who died during follow-up could not be assessed using the questionnaire. Consequently, a functional outcome assessment was performed for five, six, and six patients in groups A, B, and C, respectively. According to the questionnaire, five of five (100%), five of six (83%), and four of six (67%) patients in groups A, B, and C, respectively, were able to urinate while standing. Furthermore, five of five (100%), three of six (50%), and one of six (17%) patients in groups A, B, and C, respectively, were able to participate in sexual intercourse. The cosmetic outcomes in four of five (80%), four of six (67%), and two of six (33%) patients in groups A, B, and C, respectively, were satisfactory. The median IIEF-5 scores (IQR) in groups A, B, and C were 21 (19-25), 7.5 (5–17), and 5 (5–9), respectively. The results of the logistic regression analysis of the cosmetic outcomes and IIEF-5 questionnaire results are shown in Table 3.

### Discussion

The rationale for organ-sparing penile surgery is based on the evidence that a resection margin smaller than the historically used 2-cm limit is oncologically safe.<sup>11</sup> Agraval et al. found that none of the penile tumors extended beyond 15 mm, and none of the G1-2 tumors extended beyond 10 mm on the macroscopic tumor margin. Furthermore, 81% of tumors did not exceed the macroscopic tumor margin microscopically.<sup>12</sup> Narrower surgical margins increase the risk of LR but do not worsen DSS.13 Based on the study by Sri et al., a surgical margin of at least 1 mm is sufficient for organ-sparing penile surgery in the absence of lymphovascular invasion or cavernosal involvement and is associated with a low risk of PSMs.<sup>14</sup> By applying this new paradigm (the narrower surgical margin), it is possible to perform surgery that preserves the function and appearance of the penis.<sup>1</sup>

GR is an ideal organ-sparing treatment for patients with penile carcinoma. In contrast to nonsurgical organ-sparing treatments, such as radiotherapy, laser ablation, and topical treatment, tumor removal allows accurate histological examinations. This avoids the possibility of undertreatment, which is an issue with nonsurgical methods based on inaccurate penile biopsy results.<sup>18</sup> Graft adherence rates are high for the penile stump, shrinkage and meatal stenosis are rare, and postoperative functional outcomes are favorable.<sup>1</sup>

The results of GR surgeries for penile carcinoma performed at our clinic from 2017 to 2022 were compared with those of patients who underwent GA and PA during the same period. Our study was aimed to investigate whether GR is an oncologically safe intervention compared to GA and PA, especially with regard to margin positivity and local recurrence. Furthermore, we wanted to demonstrate whether GR provides an advantage in functional outcomes, in particular with regard to penile appearance and erectile function compared to GA and PA.

The three groups of patients were not significantly different in terms of age, ASA score, and BMI. The difference in CCI score was significant only between groups A and B. For this reason, there is a selection bias between groups A and B, which may explain the marked difference in erectile function between the two groups. That patients in group B had significantly more comorbidities than those in group A was an expected finding because the presence of multiple and more severe comorbidities was one of the main reasons why GA was performed instead of GR, which is more time-consuming and riskier for this group. TABLE 3. Multiple binary logistic regression of factors associated with cosmetic outcomes and IIEF-5 questionnaire results after surgery (ASA, American Society of Anesthesiologists; BMI, body mass index; CCI, Charlson comorbidity index; CI, confidence interval; GA, glansectomy alone; GR, glansectomy and split-thickness skin graft reconstruction; IIEF, International Index of Erectile Function; OR, odds ratio; PA, penile amputation. \*Values are rounded to two digits)

	Cosmetic outcomes		IIEF-5	
	OR [95%CI]	<i>p</i> value	OR [95%CI]	<i>p</i> value
GA/GR	5.26 [0.01-5308.03]	0.638	9929.9 [0.07–1,340,000,000]	0.127
PA/GR	0.01 [0.01*-0.65]	0.03	0.01* [0.01*-0.09]	0.007
Age (years)	1.3 [0.9–1.87]	0.161	1.78 [0.99–3.2]	0.056
Tumor size (mm)	0.8 [0.63–1.02]	0.068	0.76 [0.56–1.03]	0.081
CCI score	0.01 [0.01-3.45]	0.124	0.01* [0.01*-0.5]	0.035
ASA score	18.95 [0.47–767.23]	0.119	0.01* [0.01*-0.35]	0.021
BMI (kg/m <sup>2</sup> )	0.78 [0.54–1.11]	0.171	0.54 [0.31–0.93]	0.027

A selection bias for clinical stage is present between groups A, B, and C. Groups A and B had only patients with cTis, cTa, and cT1 tumors, while group C had only patients with cT2-3 tumors. This can explain the less favourable results for the four questions on functional outcomes for group C.

Group A had significantly longer operative times and hospital stays than group B, which could be explained by the time required to harvest the STSG and create the neoglans and by the fact that proper graft adhesion requires several days of penile immobilization in the hospital. Nonetheless, the number of postoperative complications was even lower in group A than in the other groups. However, only mild complications occurred in groups B and C.

In groups A and B, PSMs were observed in 17% and 13% of patients, respectively; however, in agreement with related literature findings,<sup>13</sup> this did not affect DSS. Although one patient did not undergo salvage surgery, LR and disease-specific death were not observed in groups A or B during the 43- and 21-month follow-up periods, respectively, and the OS rates of groups A and B were 100% and 75%, respectively. These results are comparable to those reported previously. A large multicenter study of a series of patients who underwent glansectomy showed a 12.6% PSM rate and 10.5% LR rate during a median follow-up period of 35 months.<sup>19</sup> A systematic review of glansectomy and reconstruction showed DSS rates of 89.0%–96.6% and OS rates of 78.6%–91.9%.<sup>4</sup>

According to the questionnaire, outstanding functional results were observed following GR. This finding is consistent with those of previous studies. Falcone et al. reported favorable erectile function after GR. The median score of the 15-question IIEF questionnaire was 52. Nevertheless, 88.2% of the patients were satisfied with the appearance of the penis after surgery.<sup>1</sup>

Logistic regression analysis showed that a significant predictor of favorable cosmetic outcomes was undergoing GR instead of PA; however, no such association was observed between GR and GA. One explanation for this may be that the penis was shortened to a similar extent during GR and GA. In contrast, the appearance of the penis after GA was not significantly different from that of an uncircumcised penis (Figure 2B). This may be a particularly important consideration in countries with a low proportion of circumcised men, such as Hungary. However, this result might be different in a country where the proportion of circumcised men is high. Therefore, the idealized image of the penis is correspondingly different.

The logistic regression analysis showed that the significant predictors of favorable postoperative erectile function were lower CCI scores, ASA scores, and BMI and undergoing GR instead of PA; however, undergoing GR instead of GA was not a significant predictor. This result suggests that postoperative erectile function is influenced by the radicality of the surgery rather than whether reconstruction has been performed.

The limitations of our study included the heterogeneity in the data, the small number of patients, and the retrospective nature of data collection. The low number of enrolled patients can be explained by the low incidence of penile cancer in Hungary, as in developed countries. According to the Hungarian National Cancer Registry, between 2010 and 2020, the number of new cases of penile cancer in Hungary, with a population of 9.7 million, was 68–116 per year.<sup>20</sup> So far, GR has only been performed at our center in Hungary, so we cannot supplement this study with data from other Hungarian hospitals. International multicenter comparative trials involving more patients are required to mitigate the impact of the above-mentioned limitations.

# Conclusion

Our study data suggest that glansectomy, with or without STSG reconstruction, is an oncologically safe, organ-sparing penile surgery. GR is a significantly more time-consuming surgery that requires a significantly longer hospital stay than GA; however, it does not increase the number of complications. Although the patients who underwent GR had better scores than those who underwent GA in terms of penile appearance and erectile function, no significant differences were observed. Regarding both these parameters, there was a significant difference between GR and PA in favor of the former.

# Acknowledgement

Not applicable.

# **Funding Statement**

The authors received no specific funding for this study.

# Author Contributions

The authors confirm contribution to the paper as follows: Conceptualization, Mihály Murányi; methodology, Mihály Murányi; software, Attila Csaba Nagy; validation, Mihály Murányi; formal analysis, Attila Csaba Nagy; investigation, Mihály Murányi; resources, András Domoszlai; data curation, András Domoszlai; writing—original draft preparation, Mihály Murányi; writing—review and editing, Tibor Flaskó; visualization, Mihály Murányi; supervision, Tibor Flaskó; project administration, Mihály Murányi. All authors reviewed the results and approved the final version of the manuscript.

# Availability of Data and Materials

Due to the nature of this research, participants of this study did not agree for their data to be shared publicly, so supporting data is not available.

# Ethics Approval

Ethical approval for this study was obtained from the Regional and Institutional Ethics Committee, University of Debrecen, Clinical Center. The approval number is 5734–2021. The study was conducted according to the Declaration of Helsinki. Written informed consent was obtained for anonymized patient information to be published in this article.

# Conflicts of Interest

The authors declare no conflicts of interest to report regarding the present study.

### References

- Falcone M, Preto M, Blecher G et al. The outcomes of glansectomy and split thickness skin graft reconstruction for invasive penile cancer confined to glans. *Urology* 2022;165(5):250–255.
- Palminteri E, Berdondini E, Lazzeri M, Mirri F, Barbagli G. Resurfacing and reconstruction of the glans penis. *Eur Urol* 2007;52(3):893–900.
- 3. Pérez J, Chavarriaga J, Ortiz A et al. Oncological and functional outcomes after organ-sparing plastic reconstructive surgery for penile cancer. *Urology* 2020;142:161–165.
- 4. Pang KH, Muneer A, Alnajjar HM. Glansectomy and reconstruction for penile cancer: a systematic review. *Eur Urol Focus* 2022;8(5):1318–1322.
- Beech BB, Chapman DW, Rourke KF. Clinical outcomes of glansectomy with split-thickness skin graft reconstruction for localized penile cancer. *Can Urol Assoc J* 2019;14(10):E482–E486.
- Croghan SM, Compton N, Daniels AE, Fitzgibbon L, Daly PJ, Cullen IM. Phallus preservation in penile cancer surgery: patient-reported aesthetic & functional outcomes. *Urology* 2021;152:60–66.
- Parnham AS, Albersen M, Sahdev V et al. Glansectomy and split-thickness skin graft for penile cancer. *Eur Urol* 2018;73(2):284–289.
- EAU-ASCO penile cancer guidelines. presented at the EAU annual congress Milan, Italy. 2023. [Internet]. [cited 2024 Feb 15]. Available from: https://d56bochluxqnz.cloudfront.net/ documents/full-guideline/EAU-ASCO-Guidelines-on-Penil e-Cancer-2023\_2023-03-08-131333\_piyo.pdf.
- 9. Bracka A. Glans resection and plastic repair. *BJU Int* 2010;105(1):136–144.
- 10. Brierley JD, Gospodarowicz MK, Wittekind C. *TNM classification of malignant tumours*. 8th ed. Hoboken, NJ, USA: John Wiley & Sons, Inc; 2017.

- Minhas S, Kayes O, Hegarty P, Kumar P, Freeman A, Ralph D. What surgical resection margins are required to achieve oncological control in men with primary penile cancer? *BJU Int* 2005;96(7):1040–1043.
- 12. Agrawal A, Pal D, Ananthakrishnan N, Smile SR, Ratnakar C. The histological extent of the local spread of carcinoma of the penis and its therapeutic implications. *BJU Int* 2000;85(3):299–301.
- Djajadiningrat RS, Van Werkhoven E, Meinhardt W et al. Penile sparing surgery for penile cancer—does it affect survival? *J Urol* 2014;192(1):120–126.
- 14. Sri D, Sujenthiran A, Lam W et al. A study into the association between local recurrence rates and surgical resection margins in organ-sparing surgery for penile squamous cell cancer. *BJU Int* 2018;122(4):576–582.
- Diaz KA, Spiess PE, García-Perdomo HA. Patient-reported outcomes in penile cancer patients: quality of life, sexual and urinary function. What do we know? *Urology* 2022;169:1–5.
- Philippou P, Shabbir M, Malone P et al. Conservative surgery for squamous cell carcinoma of the penis: resection margins and long-term oncological control. J Urol 2012;188(3):803–808.
- 17. Croghan SM, Cullen IM, Raheem O. Functional outcomes and health-related quality of life following penile cancer surgery: a comprehensive review. *Sex Med Rev* 2023;11(4):441–459.
- Sujenthiran A, Hegarty PK, Watkin NA. Penile-sparing surgical approaches in the management of primary penile tumours. In: *Spiess PE. Penile cancer*. New York, USA: Springer Nature, 2016. p. 31–43.
- 19. Roussel E, Peeters E, Vanthoor J et al. Predictors of local recurrence and its impact on survival after glansectomy for penile cancer: time to challenge the dogma? *BJU Int* 2021;127(5):606–613.
- 20. National Institute of Oncology, Hungary—hungarian National Cancer Registry [Hungarian]. [Országos Onkológiai Intézet—nemzeti Rákregiszter.] [Internet]. [cited 2024 Feb 15]. Available from: https://onkol.hu/nemzeti-rakregiszter/.