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## Does Routine Pathology Analysis of Adult Circumcision Tissue Identify Penile Cancer?

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### Abstract

**OBJECTIVE**—To assess the utility of foreskin pathology analysis, we evaluated the outcomes and the costs of this practice in patients for whom penile cancer was not suspected. Adult circumcision specimens are routinely sent for pathologic analysis even when penile cancer is not suspected, increasing costs with little benefit.

**MATERIALS AND METHODS**—All adult patients who underwent circumcision between January 2000 and August 2013 at a single institution were evaluated by retrospective chart review. Cases of suspected penile cancer ( $n = 6$ ) were excluded. We identified cases where foreskin specimens were sent for pathologic analysis and reviewed pathology reports. Our Department of Pathology estimated the cost for evaluation of specimens at \$311 per case.

**RESULTS**—A total of 147 circumcisions were performed in patients with no suspicious findings. Pathologic analysis was obtained in 69% (101 of 147) of the cases. Inflammation (58%) was the most common finding. One unsuspected instance of squamous cell carcinoma (Tis) was identified in a patient with human immunodeficiency virus (1 of 147 = 0.7%). The overall cost of pathologic analysis in this study was \$31,411.

**CONCLUSION**—In individuals without predisposing immunodeficiency and where cancer was not suspected, we found that pathologic analysis of circumcision specimens identified no additional malignancies. Our data suggest that in this normal risk population, pathologic analysis may not be required. Additionally, forgoing pathology on foreskin specimens in lower risk cases may reduce costs to the health care system.

Newborn circumcision is one of the most common surgical procedures.<sup>1</sup> Recent trends have suggested a decrease in newborn circumcisions but a concomitant increase in adult circumcisions.<sup>2</sup> On performing adult circumcisions, it has become a common practice for urologists to send the excised foreskin for pathologic and histologic analyses; however, the prevalence of this analysis is not known. There is a distinct lack of systematic analysis on whether routine pathologic examination of excised foreskin has any identifiable benefit.<sup>3</sup> In the current environment of cost containment, review of expensive standard practices is warranted to identify if there is an actual benefit for the cost.<sup>4</sup>

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In the case of circumcision, pathologic evaluation may identify penile cancer. Studies have suggested a relationship between chronic inflammation from phimosis and risk for penile cancers.<sup>5,6</sup> However, the penile cancer rate in routine circumcision has not been reported. Because the value of routine evaluation of circumcision pathology in cases where penile cancer is not suspected is not known, we investigated the pathologic evaluation of these surgical specimens.

To ascertain if this practice is of clinical value, we determined the rate of abnormal pathology in a consecutive series of cases at a single institution over 14 years. We hypothesized that in individuals at low risk for penile malignancy and with no suspicious clinical or operative finding, pathology of circumcision tissues would not identify any additional abnormalities.

## MATERIALS AND METHODS

On institutional review board approval, records of all adult patients (age  $\geq$  18 years) who underwent surgery for circumcision between January 2000 and August 2013 at our institution were examined. The patient cohort was determined by query of coding records for the Current Procedural Terminology code of 54161. Preoperative clinical notes were reviewed for the indication for surgery and specifically for any concern with respect to penile cancer. Cases where carcinoma was suspected ( $n = 6$ ) were excluded from this study. Operative reports were reviewed.

### Pathology Analysis

Pathology reports (gross and microscopic) for all specimens were reviewed for pathology identified in gross morphology and microscopic findings. Specimens were then classified according to diagnosis as determined by the pathologist. Those with no mention of any abnormal terms were considered normal. Pathology reports of “balanitis” or “inflammation” were grouped together as “inflammation.”

### Cost

The pathology cost was based on the most common Current Procedural Terminology code reported for adult circumcision, the pathology code of “Foreskin, other than newborn.” The current cost associated with this code for gross and microscopic analysis was \$311 per specimen. This cost is the fee charged to the patient or insurance provider and includes a pathology technical and professional charge. The technical charge comprises the cost for the processing of the specimens by technicians, materials used for sample preparation, equipment cost, laboratory space, and administration or billing expenses. The professional charge is determined by the “relative value units” of the pathologist’s time and work on the specimen. For adult foreskin, the technical charge is \$202 and the professional charge is \$109 for a total charge of \$311.

### Analysis

Statistics examining patient demographics, surgical indication, and pathology findings were performed. Total cumulative and per case pathology costs were also calculated.

## RESULTS

The study cohort consisted of 147 circumcision cases performed during the 14-year study period (average of 0.875 per month). Over the study period, 20 different surgeons from the Department of Urology performed the procedure. Patient age ranged from 18 to 88 years (median, 41 years).

### Indication for Surgery

The stated clinical indication for surgery varied, with the most common described as phimosis or paraphimosis (Table 1). In 1 case, the patient “desired a reduction in cancer risk.”

The overall rate at which foreskin tissue was sent for pathology analysis was 69% (101 of 147). The median age for the entire cohort was 30 years. The group without pathology was significantly younger ( $P < .05$ ), by a 2-sample unpaired *t* test, with 52% being 30 years or younger, whereas only 27% were 30 years or younger in the group where pathology was obtained.

### Pathology Analysis

Of the 101 pathologic specimens obtained where cancer was not suspected, 1 case (1%) was found to have penile carcinoma in situ (Tis; Table 2). In this case, the patient was a 29-year-old human immunodeficiency virus—positive man who was recently treated for a chlamydia infection. No lesions were apparent on examination. The patient elected to undergo circumcision because of constriction of foreskin around his distal penis. The indication for circumcision was “phimosis.” Since the procedure, the patient has had no further treatment and no evidence of recurrence with 2.7 years of follow-up.

No abnormality was found in 21 of cases (21%). Of the remaining cases, 58 (58%) showed specimens with increased inflammatory cells or balanitis.

### Cost

The estimated cost for pathologic analysis of adult male foreskin samples in this time interval was \$31,411 (101 cases × \$311 per case). This amounts to an estimated annual expense of \$2244 at our institution.

## COMMENT

This retrospective case series evaluated the value of routine pathologic analysis of adult circumcision specimens in patients for whom cancer was not suspected. To our knowledge, the clinical value for the detection of malignancy in foreskin specimens has not been well investigated. Furthermore, the clinical indications and cost for pathology analysis have not been reported. Our study found that the incidence of unsuspected penile cancer in pathology analysis of adult male foreskin specimens was 1% (0.7% of total circumcision cases).

Studies have found the incidence of penile cancer to range from 0.3 to 1.0 per 100,000 in the United States and Western Europe.<sup>7</sup> In countries where circumcision is not a common

practice, rates of penile cancer are higher.<sup>8,9</sup> In subpopulations of these countries where circumcision is practiced, incidence of penile cancer is much lower.<sup>7</sup> These studies and others suggest a protective effect of circumcision in preventing penile cancer<sup>5,9-11</sup> and thus an inherent but low penile cancer risk in those men who are uncircumcised.

We sought to determine if pathology analysis of circumcision tissue would be useful to identify abnormal pathology when malignancy was not suspected. Our single institution evaluation identified a single case where unsuspected penile cancer was identified on routine pathology analysis. Individuals with human immunodeficiency virus show 8 times the incidence of penile cancer than the general population, indicating that this patient is at a significantly higher risk for penile malignancy.<sup>12</sup> This finding may suggest that individuals at a higher risk for penile cancer would benefit from pathologic analysis of foreskin tissue. However, in the cases where penile cancer was unsuspected and no underlying immunodeficiency was present, pathology analysis in our cohort did not reveal any cancer or abnormal findings that would have impact on the care of the patient. Thus, the pathology analysis of specimens from these patients may be questioned. Consequently, it may be necessary for clinicians to selectively obtain specimens from individuals at a higher risk for malignancy. As cancerous lesions may not be apparent on visual examination, more detailed pathology should be conducted, similar to that obtained in the single case of squamous cell carcinoma identified in this study. In other words, stratifying pathology analysis by sending high-risk specimens and foregoing low-risk specimens may provide cost-savings without diminishing quality of care.

Inflammation was the most common pathology identified. Another study investigating foreskin dermatopathology also similarly found a rate of 63% for benign inflammatory diagnosis in foreskin pathology.<sup>3</sup> Identifying inflammation and other benign processes (Table 2) in foreskin tissue does not appear to be of clinical benefit as these findings simply confirmed the original diagnosis. This especially raises questions regarding value of pathologic evaluation of circumcision specimens in normal risk patients as this common practice adds cost to the health care system.

It is unclear if gross-only analysis may be a potential means of reducing costs associated with pathology analysis without sacrificing clinical care. It could be that gross analysis may serve as a more thorough screen. However, in our study, all diagnoses were made using both gross and microscopic analysis. Furthermore, multiple organizations such as the American Joint Committee on Cancer and the International Union Against Cancer recommend histopathology analysis for definitive diagnosis of penile carcinoma.<sup>13,14</sup> However, in our cohort, no lesions were identified grossly, and thus, this evaluation does not appear to be of high yield.

Because of increasing health care costs<sup>15</sup> and mounting necessity for cost containment,<sup>16</sup> the use of our clinical resources must be scrutinized. A number of studies have indicated an advantage of adult circumcision in preventing infectious and inflammatory diseases, especially in developing countries.<sup>17-19</sup> For this purpose, the American Urological Association has created the Male Circumcision Task Force to further circumcision in sub-

Saharan Africa.<sup>20</sup> Resource utilization in that setting would likely be of higher value than providing routine pathologic analysis of normal circumcision cases in the United States.

This study has a number of limitations. Our findings require external validation at other institutions as our patient cohort is relatively homogeneous, and the number of cases is limited. Additional studies are necessary. Being a retrospective single-series study, it has no objective measure of clinical suspicion preoperatively or intra-operatively, which was dependent on chart review and documentation. Of the 147 cases, 101 received pathologic specimen analysis, indicating some selection bias. Another important consideration is that this study is reporting the charges for pathology services and not the gross cost. Nevertheless, our findings add to the urologic literature in a unique way.

## CONCLUSION

Over the 14 years of this study, 1 penile carcinoma case was identified in a high-risk patient and was 0.7% of the study cohort who underwent circumcision when cancer was not suspected. In subjects with normal risk, pathology analysis revealed only benign findings. This suggests that the pathologic analysis of foreskin tissue may be avoided as a means to reduce unnecessary spending in individuals at low risk for penile cancer.

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**Table 1**

Frequency of indications for circumcision

	<b>Total Number in Cohort (% of Total)</b>	<b>Cases Without Pathology Samples (% of Total)</b>	<b>Cases With Pathology Samples (% of Total)</b>
Phimosis/paraphimosis	70 (48)	16 (34)	54 (53)
Pain during intercourse	14 (10)	6 (13)	8 (8)
Difficulty in urination	13 (9)	2 (4)	11 (11)
Elective	12 (8)	4 (9)	8 (8)
Pain/discomfort	8 (5)	2 (4)	6 (6)
Bleeding/irritation/swelling	8 (5)	3 (7)	5 (5)
Balanitis	5 (3)	2 (4)	3 (3)
Recurrent infection	5 (3)	3 (7)	2 (2)
Dermatologic/cosmetic	4 (3)	2 (4)	2 (2)
Peyronie disease	4 (3)	3 (7)	1 (1)
Hygiene	3 (2)	3 (7)	0 (0)
Reduction of cancer risk	1 (1)	0 (0)	1 (1)
Overall number	147	46 (31)	101 (69)

**Table 2**

## Pathology findings at circumcision

<b>Pathology Identified</b>	<b>No. of Cases With Pathology (%)</b>
No abnormality	21 (21)
Inflammation	58 (58)
Fibrosis	7 (7)
Hyperkeratosis	5 (5)
Condyloma acuminata	2 (2)
Lichen sclerosus	1 (1)
Lymphatic dilation	1 (1)
Cyst	1 (1)
Subdermal hemorrhage	1 (1)
Verruca vulgaris	1 (1)
Carcinoma (Tis)	1 (1)

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