



Inflammation and infection

## Full thickness penile skin necrosis following HIPEC: Case report and literature review

Madeleine L. Burg<sup>a</sup>, Jonathan Yamzon<sup>b</sup>, Wai-Yee Li<sup>c,\*</sup>

<sup>a</sup> Institute of Urology, USC/Norris Comprehensive Cancer Center, University of Southern California, 1441 Eastlake Ave., Suite 7416, Los Angeles, CA, 90089, USA

<sup>b</sup> Division of Urology, City of Hope National Medical Center, 1500 E. Duarte Rd., Duarte, CA, 91010, USA

<sup>c</sup> Division of Plastic and Reconstructive Surgery, City of Hope National Medical Center, 1500 E. Duarte Rd., Duarte, CA, 91010, USA



### ARTICLE INFO

#### Keywords:

HIPEC  
Colorectal cancer  
Penile necrosis  
Oncology  
Urology  
Plastic surgery

### ABSTRACT

Heated intraperitoneal chemotherapy (HIPEC) is commonly performed at the time of tumor resection for metastatic intraabdominal tumors. Post operative complications, such as superficial wound infections or bowel leaks are common. They are largely thought to be secondary to poor wound healing due to chemotherapy-associated neutropenia. Scrotal eschars resulting in full-thickness skin necrosis have rarely been reported as a delayed complication after HIPEC. Here, we present the first case report of penile full-thickness skin necrosis after abdominal cytoreduction with HIPEC combined with ventral hernia repair and mesh placement.

### Introduction

Heated intraperitoneal chemotherapy (HIPEC) is a type of chemotherapy offered for metastatic abdominal malignancies and administered at the time of primary tumor resection. Common postoperative complications include intra-abdominal abscesses and wound infections due to poor wound healing. Rare occurrences of scrotal ulcers and eschars have been reported, presenting several weeks after HIPEC.

Here, we report the first case of penile full-thickness skin necrosis after abdominal cytoreduction with HIPEC, ventral hernia repair and mesh placement for recurrent metastatic sigmoid colon cancer.

### Case report

A 35-year-old male with stage 4 colorectal adenocarcinoma underwent abdominal wall mass resection, omentectomy, partial gastrectomy, appendectomy, and peritonectomy with HIPEC and ventral hernia repair with mesh placement. His initial postoperative course was notable only for left-sided and lower abdominal pain at time of discharge making him unable to stand fully erect, thought to be due to the mesh. On postoperative day (POD) 47, he presented to his first postoperative clinic visit endorsing left lower quadrant and suprapubic pain, however, did not mention any penile complaints.

On POD 49, he presented to our institution's acute evaluation center endorsing penile pain, swelling, and hyperpigmentation along the dorsal

shaft for 1 week. He recalled significant genital swelling immediately after surgery which self-resolved after discharge. He also reported progressively worsening bilateral groin pain that had been present since discharge. The urology service was consulted and noted a significant eschar on his dorsal penis and penile edema. He was given Keflex and Bactrim-DS for presumed penile dermal infection and sent home.

He again presented on POD 54 and was admitted for intractable burning penile pain, although his swelling had improved significantly. He now had full thickness skin necrosis measuring 3 × 5 cm on the dorsal penile shaft and bilateral inguinal lymphadenopathy. Abdominopelvic CT scan showed scrotal and penile edema, but no intra-abdominal abscess or other etiology for his lymphadenopathy. He was discharged with local wound care instructions (petroleum jelly ointment/soaked dressings and topical Gentamicin) to prevent further skin breakdown. With continued improvement in penile swelling and bilateral groin pain, the penile eschar remained unchanged in size, despite local wound care (Fig. 1). Thus, on POD 110, he was examined under anesthesia by Urology and Plastic Surgery who determined the patient would likely need a skin graft after eschar excision.

On POD 138, he was taken to the operating room with Urology and Plastic Surgery for necrotic skin debridement, split-thickness skin graft, and possible circumcision. 9 × 10 cm of necrotic penile skin and fibrotic Dartos fascia were resected after induced erection showed penile curvature secondary to fibrosis (Fig. 2). A 90 cm<sup>2</sup> split-thickness skin graft (STSG) was harvested from the patient's lateral thigh. After the graft had

\* Corresponding author.

E-mail addresses: [madeleine.burg@med.usc.edu](mailto:madeleine.burg@med.usc.edu) (M.L. Burg), [jyamzon@coh.org](mailto:jyamzon@coh.org) (J. Yamzon), [waiyeeli@coh.org](mailto:waiyeeli@coh.org) (W.-Y. Li).

<https://doi.org/10.1016/j.eucr.2020.101430>

Received 15 September 2020; Accepted 27 September 2020

Available online 6 October 2020

2214-4420/© 2020 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



**Fig. 1.** Full thickness penile skin necrosis.

been secured (Fig. 2), induced erection showed resolution of prior curvature. Circumcision was ultimately performed due to a fibrotic band of the foreskin. Final pathology showed non-specific ulceration and reactive changes. He did well postoperatively without any complications from surgery (Fig. 3). He had intact erectile function and was subsequently able to naturally conceive with his partner. Unfortunately, he died from his metastatic cancer 4 years later.

## Discussion

Initially introduced in the late 1970's, HIPEC is administered intraoperatively at time of surgical resection of the tumor. Postoperative complications associated with HIPEC for colorectal malignancies have been extensively reported, with common complications including superficial wound infections, intra-abdominal abscesses, and bowel leaks.<sup>1</sup> Overall, complications are higher after intraabdominal tumor resection with HIPEC than without, which is generally hypothesized to be secondary to neutropenia after HIPEC administration.

Although rare, scrotal ulcers have been reported as a complication after HIPEC. In 2007, Akhavan et al. first reported 2 cases of scrotal ulcers after abdominal cytoreductive surgery with HIPEC using mitomycin-C.<sup>2</sup> One patient presented 4 months after HIPEC with scrotal pain

and edema and developed eschars 2 weeks later, while the other also presented 4 months after HIPEC with scrotal pain and swelling, but did not develop eschars until 2 months later. Silva et al. report a 65-year-old man who developed scrotal pain and itching 9 days after HIPEC and slowly developed scrotal eschars.<sup>3</sup> Abdul Aziz et al. reported a case of a 33-year-old man who developed scrotal pain and multiple eschars 2 months after HIPEC.<sup>4</sup> Bartlett et al. report of a 54-year-old man who developed scrotal pain and eschars 3 months after HIPEC.<sup>5</sup> All cases were trialed on conservative management but ultimately underwent surgical excision, with final pathology for all showing only necrotic tissue. Our patient followed a similar timeline of symptoms and management, as he first presented with penile pain and later developed penile eschars and underwent surgical excision, after failing local wound care.

For scrotal eschars, it is generally hypothesized that they are a result of a patent processus vaginalis (PPV), allowing passage of chemotherapy from the peritoneal cavity to the intra-scrotal space. Male patients with PPV are generally observed to have irrigation fluid collections in the scrotum after surgery. The prolonged exposure of the scrotum to the chemotherapy increases the risk of eschar formation, as it is not able to be washed out at the same time as the peritoneal cavity. In our patient, he was noted to have necrosis and fibrosis of only the penile skin and Dartos fascia. Although the Dartos fascia is continuous with Scarpa's fascia and usually extraperitoneal, there may have been a disruption in the fascial layers from the ventral hernia, allowing chemotherapy to pass in the plane between skin and Dartos fascia. He also complained of genitalia swelling immediately after surgery, which is similar to the reported postoperative scrotal fluid collections in men with PPV.

## Conclusion

Eschars of the scrotum or penis after HIPEC are rare complications, but something every physician should be concerned about in any patient who presents with pain and/or swelling of their genitalia after HIPEC. Surgeons should have low threshold for surgical debridement in any patient with eschars failing conservative management given significant improvement in pain all patients experience after eschar excision.



**Fig. 2.** Penile shaft after debridement and after split-thickness skin graft with 'pie crusting' to allow drainage.



Fig. 3. Two years after surgery, showing fully healed skin graft.

### Credit author contributions

Madeleine Burg: Literature review, Writing - original draft, Writing - review & editing. Jonathan Yamzon: Writing - review & editing, Conceptualization. Wai-Yee Li: Conceptualization, Writing - review & editing, Supervision, Visualization.

### References

1. Newton AD, Bartlett EK, Karakousis GC. Cytoreductive surgery and hyperthermic intraperitoneal chemotherapy: a review of factors contributing to morbidity and mortality. *J Gastrointest Oncol*. 2016;7:99–111.
2. Akhavan A, Yin M, Benoit R. Scrotal ulcer after intraperitoneal hyperthermic chemotherapy. *Urology*. 2007;69:778 e779–710.
3. Silva FA, Joao, Criado Paulo, Pfiffer Tulio, Lobo Alice, Sanches Jose. Scrotum ulcer developed after intraperitoneal hyperthermic chemotherapy with mitomycin-C. *British Int J Urol*. 2012. <https://doi.org/10.1002/BJUIw-2012-019-web>.
4. Abdul Aziz NH, Wang W, Teo MC. Scrotal pain and ulceration post HIPEC: a case report. *J Gastrointest Canc*. 2015;46:60–63.
5. Bartlett K, Derrington S, Jariwala N, Mai C, Koo B. Scrotal ulceration: a complication of hyperthermic intraperitoneal chemotherapy and subsequent treatment with dimethyl sulfoxide. *Cutis*. 2019;104:E1–E3.