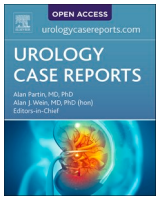
Urology Case Reports 57 (2024) 102878

Contents lists available at ScienceDirect

Urology Case Reports

journal homepage: www.elsevier.com/locate/eucr



Pediatrics

Surgical repair of extensive penile shaft skin injuries following neonatal circumcision

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ARTICLE INFO

Keywords:
Circumcision
Injury
Pediatric

ABSTRACT

Circumcision is a common procedure performed since ancient times with an excellent safety profile and potential health benefits. In the United States, it is commonly performed in the neonatal period using devices such as the Gomco, Mogen, or Plastibell device. In the rare circumstance of a complication, it is often related to bleeding and usually managed conservatively. However, complications requiring surgical intervention can occur and remind practitioners of the importance of proper equipment and technique. Herein, we report a case in which extensive injuries to the penile skin after neonatal circumcision using a Gomco clamp required emergent intervention.

1. Introduction

Circumcision is one of the most common surgical procedures performed worldwide, with a long history dating back thousands of years.[1] Although the origins of the procedure likely stem from a desire for improved hygiene, modern guidelines recommend that the decision for circumcision be left to a child's parents or legal guardians, with few exceptions.[2] The neonatal period is the most common period for circumcisions to be performed in the United States, with approximately 59 % of newborn males circumcised based on national hospital data.[2] These are often performed by obstetricians and pediatricians by using one of several available devices including the Gomco and Mogen clamps, as well as the Plastibell device.[3] Benefits include decreased rates of urinary tract infections in male children, decreased rates of HIV transmission in areas with endemic infection, and decreased risk of penile cancer.[4] However, many risks related to infectious diseases and their sequela can be mitigated without circumcision through improved genital hygiene and safe sexual practices later in life.[5] Although it is a common procedure with a low complication rate of 1–4%,[1] complications do still occur and require vigilance to prevent harm to patients. The most common complications involve bleeding, pain, inadequate skin removal, and infection, all of which are usually managed without surgical intervention.[3] However, in rare circumstances more serious injuries including laceration of the glans, urethra, and/or excessive skin may occur that can require operative intervention.[5] Herein, we describe an uncommon complication of this commonly performed procedure on a neonate.

2. Case

The patient was a male on day of life one, born at full term via cesarean section at an outside hospital without complication. During attempted circumcision using a Gomco clamp at the outside institution, there was concern for significant injury to the penile shaft skin. The patient was subsequently transferred to our tertiary care institution for pediatric urology consultation.

Upon arrival directly to our institution's neonatal intensive care unit (NICU) approximately 3 hours after injury, the patient was noted to be hemodynamically stable and in no distress. Gauze had been placed overlying the penis, which appeared to be intact. The penis initially appeared to be degloved with absence of skin on the dorsal aspect of the penis and residual skin seen bunched on the ventral aspect of the distal penis (Fig. 1). After obtaining informed consent from the patient's parents, he was brought emergently to the operative suite.

General anesthesia was induced and an exam under anesthesia revealed that most of the penile skin appeared to still be attached on the ventral shaft, however much of the skin was pulled over the glans penis (Fig. 2). After prepping and draping the patient in the standard sterile fashion and administration of cefazolin for surgical prophylaxis, we attempted to reduce the penile skin back over the glans. A small dorsal slit was made with scissors to allow complete retraction of the foreskin. Once the penile skin was replaced over the shaft, there appeared to be sufficient skin to cover the entirety of the penis without need for a graft. A 5–0 Prolene suture was placed in the glans to serve as a holding stitch. Re-approximation of the cut edges of the penile skin was performed with

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https://doi.org/10.1016/j.eucr.2024.102878
Received 24 September 2024; Received in revised form 22 October 2024; Accepted 31 October 2024
Available online 5 November 2024

Fig. 1. Initial exam of circumcision injury on presentation.

Fig. 2. Findings of circumcision injury under anesthesia.

several simple interrupted 7-0 Vicryl suture beginning at the base of the penis, taking care to remove any skin edges that appeared nonviable using electrocautery. The foreskin was completely retracted and an approximately 1cm preputial cuff was marked circumferentially proximal to the coronal sulcus. Excess foreskin was excised using electrocautery bilaterally. Due to a paucity of ventral shaft skin due to penoscrotal webbing, minimal ventral skin was excised. An 8 French feeding tube was introduced into the urethral meatus to ensure easy unobstructed passage and well as to confirm there was no urethral injury. Re-approximation of all cut edges was continued with 7–0 Vicryl until there were minimal gaps in coverage (Fig. 3). At this time, the skin was cleansed, penile block with bupivacaine was performed, the glans stitch was removed, and all incisions were covered with Dermabond. A circumferential dressing consisting of Telfa was also applied and covered with Tegaderm, ensuring the meatus was not obstructed. Finally, Bacitracin ointment was applied to the exposed glans and meatus and the procedure was terminated. The patient was awoken and extubated without issue and returned to the NICU for further observation. After an uneventful evening, the patient was discharged on post-op day one with instructions to allow the dressing to fall off on its own and to return for post-op visit in 3–4 weeks.

At the patient's return visit 3 weeks post-op, he was noted to be in overall good condition. The dressing had fallen off and skin was well-healed with no concerns for bleeding or infection. His parents denied any concerns with voiding or pain.

Fig. 3. Appearance of patient immediately after injury repair and circumcision completion.

3. Discussion

This injury sustained during circumcision as described is an exceedingly rare complication of neonatal circumcision performed using the Gomco clamp. Most often, complications are related to bleeding and resolve either with a compressive dressing, application of hemostatic products including silver nitrate, suture, or some combination of the above.[3]

As one of the most used tools for neonatal circumcision, the Gomco clamp is a simple device that reliably provides a safe means of performing this common procedure. With only 4 parts (bell, platform, hooking arm, screw)[3] that can be sterilized and reused, when used properly on the appropriate patient, physicians are able to provide families with a circumcision with a low rate of complications that achieves their goals. When compared to the Mogen clamp, the Gomco was shown to have a slightly higher rate of bleeding complications, though none considered major in a study of over 1000 circumcisions.[6] When complications do occur, they are usually related to a poorly fit clamp or anatomical differences such as penoscrotal webbing. Urologic consultation is recommended if there is concern for obvious anatomical abnormalities such as hypospadias or epispadias. For example, if there is not an appropriate fit between the bell and the platform, the incision to remove the foreskin will not be stopped by the metal bell and will risk injury to the glans or penile shaft.

The Mogen clamp is similar to the Gomco clamp in that it a reusable device commonly used for neonatal circumcision. Additionally, it is the device used typically for ritual Jewish circumcision. Practitioners prepare the prepuce by lysing adhesions to the glans, elevating the edges of the prepuce, and securing the clamp across the prepuce after ensuring the position of the glans below the clamp. After tightening the clamp to achieve hemostasis, the prepuce above the clamp is amputated sharply.[3] Unlike the Gomco clamp there is no device secured over the glans, placing the glans at theoretical risk of injury if the Mogen clamp is inappropriately placed and inadvertently includes the glans within. Though most complications related to this centuries-old method are minor in nature and managed conservatively, there have been rare reports of glans amputation requiring surgical re-anastomosis.[7] Although rare, such a complication is devastating to both families and practitioners and requires prompt recognition to ensure good outcomes.

The third device commonly used for circumcisions worldwide is the Plastibell device, in use since 1956.[8] Like the Mogen and Gomco clamps, it is relied upon because of its overall excellent safety profile. It differs mainly in that it is a disposable device that remains in place until the Plastibell falls off. Like the Gomco clamp, the device has assorted sizes that can be used depending on the size of the glans. At the time of circumcision, the foreskin is pulled over the Plastibell, which covers the glans, and a non-absorbable suture is used to secure the foreskin to the device. After excess foreskin is excised, the device is left in place and usually falls off in 5–7 days.[9] Like the Gomco and Mogen clamps, bleeding is the most common complication encountered with the Plastibell device and usually occurs secondary to inadequate hemostatic suture placement.[3] In a study by Talini et al. specifically investigating circumcision complications that required surgical intervention, 3.4 % of patients required surgical intervention after circumcision performed with the Plastibell device.[10] This retrospective study, performed in a country with an overall lower rate of pediatric circumcision compared to the United States,[11] did not demonstrate a significant difference in the rate of complications requiring surgical intervention between circumcisions performed using the Plastibell and free-hand circumcisions.[10] Bleeding was more common in circumcisions performed using the Plastibell, though not to a statistically significant degree. The surgical interventions performed in the Plastibell cohort were most often attributed to dislodgement of the plastic ring, treated with ring removal, hemostasis by cautery and/or suture, or a combination thereof.[10] Although this study population has a relatively high rate of complications requiring surgical intervention, it is important to note that the median age of the patients was 4 years old,[10] and that intervention was most often attributed to technical error when using the device. One can then reasonably infer that their complication rates may have been lower if circumcisions had been performed under one year of age, considering up to a 20-fold increase in the rate of complications when circumcisions are performed above the age of one year.[12] Overall, the main takeaway of this study is the similar safety profile between the Plastibell and freehand circumcision.

For this patient, enough viable penile skin was able to be rearranged to repair the injury without use of a graft. However, this is not always the case, as described in the review by Harris et al. In their retrospective series, extensive penile shaft skin excision required repair using either a full-thickness skin graft or tissue expanders. Skin grafts were harvested from the groin in each patient in this 12 patient study, with full thickness grafts chosen over split-thickness grafts to better accommodate penile growth, minimize contraction, and better withstand eventual frictional forces related to sexual activity.[13] Unlike our patient, the majority of patients in this series had injuries occur during circumcision with a Mogen clamp,[13] which unlike the Gomco clamp or Plastibell device, does not allow for direct visualization of the glans,[9] which can place the glans at risk during removal of the foreskin.

In this case, we suspect that the discrepancy in preputial length between the dorsal and ventral aspects of the foreskin due to penoscrotal webbing contributed to readjustments that resulted in multiple partially circumferential incisions of the penile skin extending as proximally as the base of the penis.

4. Conclusion

Although this case represents a major complication that required immediate surgical intervention, circumcision is an overall safe and personal decision for families that is often tied to cultural norms and expectations. When considering the possible health benefits and rarity of major complications, the American Academy of Pediatrics Task Force on Circumcision has determined that the overall benefits outweigh potential risks of the procedure.[2] Important measures to prevent poor outcomes include thorough assessment of equipment and patient anatomy prior to undergoing the procedure with a low threshold to defer circumcision until after pediatric urology consultation if there is concern for urethral anomaly (epispadias, hypospadias, duplicated urethra) or preputial anomaly (penoscrotal webbing, chordee, penile torsion). Like many decisions parents make regarding their child's health, circumcision is often fraught and there can be significant pressure to provide them with an expeditious and convenient solution, lest physicians risk poor reviews that negatively impact future referrals. However, as physicians that are sworn to first do no harm, it is important to understand our limitations based on personal experience and circumstances outside of our control.

CRediT authorship contribution statement

Randy Casals: Writing – review & editing, Writing – original draft, Conceptualization. **Tyler Overholt:** Writing – review & editing. **Steve Hodges:** Writing – review & editing, Supervision. **Marc Colaco:** Writing – review & editing, Supervision.

Ethics

All authors deny conflicts of interest.

Funding

No funding source was used in the production of this report.

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