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Authors
Stoller, Marshall L
Lue, Tom F
McAninch, Jack W

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CONSTRICTIVE PENILE BAND INJURY: ANATOMICAL AND RECONSTRUCTIVE CONSIDERATIONS

MARSHALL L. STOLLER, TOM F. LUE AND JACK W. MCANINCH*

From the Department of Urology, University of California School of Medicine and San Francisco General Hospital, San Francisco, California

ABSTRACT

Cases of constrictive penile band injury are seen often in the emergency room, and most require only removal of the constriction and conservative management. Occasionally, patients present with long-standing constriction, necrosis of the penile tissue and urethral injury. We report 2 such cases. We believe that a thorough understanding of the penile anatomy, aggressive débridement, skin grafting and temporary urinary diversion are essential for successful management of these severe cases.

Constrictive penile bands (the so-called cockrings), whether expandable or nonexpandable, are used by heterosexuals and homosexuals to prolong erection. Because the bands occlude penile venous flow, most patients present to the emergency room with edema. The bands usually can be removed and the patient is discharged from the hospital the same day. Previous reports have outlined the ingenious methods devised to remove the nonexpandable type of band.[1–5] Most patients seek treatment after venous occlusion of a few hours in duration but we have seen recently 2 psychiatric patients in whom the bands (1 expandable and 1 nonexpandable) were in place for days to weeks.

CASE REPORTS

Case 1. A 49-year-old man presented with perineal pain. Physical appearance was disheveled and he had a long psychiatric history. Blood pressure was 145/90 mm. Hg and pulse was 95 beats per minute and regular. The patient was afebrile. The genitalia were markedly edematous and deformed (fig. 1). No palpable crepitus was appreciated. The bladder was percussable and rectal examination revealed normal sphincteric tone and a small benign prostate. The odor of foul-smelling urine permeated the room but the urinary exit site could not be discerned.

A suprapubic catheter was placed for urinary diversion. Further débridement and washing of the genitalia revealed a rubber band that had eroded dorsally down to and partially through the tunica albuginea of the corporeal bodies and ventrally completely through the scrotal skin, urethra and corpus spongiosum (fig. 2). Upon additional débridement the tunica vaginalis, glans penis and testes appeared to be viable. The tunica albuginea of the corpora was oversewn for hemostasis. The urethral and dorsal arteries, and superficial and deep dorsal veins were obliterated.

The patient did well postoperatively, with a significant reduction in penile and scrotal edema. The wounds had excellent granulation tissue, although edema persisted in the remaining penile skin.

The edematous skin on the penile shaft was excised. Split thickness fenestrated skin grafts were placed over the granulating wounds and a nonfenestrated, deep split thickness skin graft was placed on the penile shaft. Urethral reconstruction was not performed. The patient was voiding without difficulty through a perineal urethrostomy. (Incidentally, he remained unable to tell us when or how the band had been placed.)

Case 2. A 34-year-old man presented to the emergency room 3 weeks after placement of a nonexpandable metal ring. He had placed it initially to increase erotic sensation and he was unable to remove it after approximately 8 hours. Unaccountably, he delayed seeking treatment for 3 weeks.

Examination revealed a markedly edematous penile shaft, erosion at the base of the penis through the corpus spongiosum and urethra (creating a proximal urethrotomy), and erosion to and through the tunica albuginea of the right corpus cavernosum. The urethral and dorsal arteries, and the superficial and deep dorsal veins had eroded with subsequent occlusion.

The fire department was called to assist in removing the ring and suprapubic urinary diversion was performed. Routine wound care resulted in excellent granulation tissue, although the penile shaft remained markedly edematous. A fenestrated split-thickness skin graft was placed to cover the granulating wound after reapproximation of the transected tunica albuginea of the right corpus cavernosum. The edematous penile skin was removed and a nonfenestrated deep split-thickness skin graft was placed. The grafts did well and the patient was discharged from the hospital voiding through the proximal urethrostomy.

FIG. 1. Case 1. Severe penile edema distal to constriction

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* Requests for reprints: Department of Urology, U-518, University of California, San Francisco, California 94143.

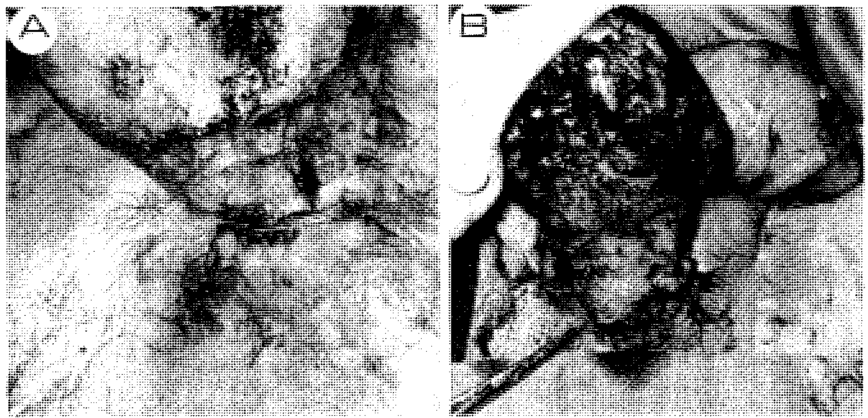

FIG. 2. Case 1. *A*, rubber band was found encircling penile root and scrotum. *B*, clamp points to transected urethra

COMMENT

Anatomical considerations in penile band injury. The arterial supply to the penis originates from a branch of the hypogastric artery, the internal pudendal artery (fig. 3). This becomes the penile artery after giving off the perineal branch in Alcock's canal. The penile artery has 4 branches: one to the urethra that runs laterally to the urethra within the corpus spongiosum and distally to the glans penis, a deep dorsal artery that enters the corpus cavernosum and supplies blood to erectile tissue, the dorsal artery that supplies blood to the glans penis and prepuce, and the artery of the bulb that supplies blood to Cowper's gland and the proximal urethral bulb.

Venous drainage of the penis is 4-fold (fig. 4). The superficial dorsal vein, superficial to Buck's fascia, drains the skin and prepuce and joins the saphenous vein. The deep dorsal vein is the primary drainage route for the glans penis. In the mid and distal shaft of the corpora cavernosa the emissary veins empty into several sets of circumflex veins that join the deep dorsal vein. (Some of the emissary veins empty directly into the deep dorsal vein.) The deep dorsal vein eventually drains into the prostatic plexus. In addition, the base and hilus of the corpora cavernosa are drained via several cavernous veins, which become the internal pudendal vein. Communications usually exist between the deep dorsal vein and the cavernous veins. The urethral veins also join the dorsal vein and the internal pudendal vein.

In dogs and monkeys the cavernous veins provide the sole drainage for the corporeal bodies. In man the mid and distal shaft of the penis has additional drainage through the dorsal vein. We postulate that bipedal men acquired these additional veins during the evolutionary process to drain the dependent portion of the phallus and to prevent stasis when standing.

Penile innervation involves autonomic and somatic fibers. Autonomic input originates in the pelvic plexus, from which the 2 cavernous nerves supply the erectile tissue and the corpus spongiosum. This innervation controls the helicine artery (terminal cavernous artery) and cavernous smooth muscles. The somatic sensory fibers receive afferent impulses from the penis via the paired dorsal nerve. Somatic motor fibers innervate the bulbocavernosus and ischiocavernosus muscles. The pudendal nerves provide the somatic sensory and motor innervation.

The mechanism of penile erection involves increased arterial flow and decreased venous return. Our 2 cases document the occlusive effectiveness of the constrictive band, albeit at great risk to penile tissue. All 4 drainage routes are affected. Thus, these rings cause maximal retention of arterial flow within the tunica albuginea and do not allow penile detumescence. In normal men this prolongs erection, while in men with arterial insufficiency or venous leakage it may improve the quality of erection.

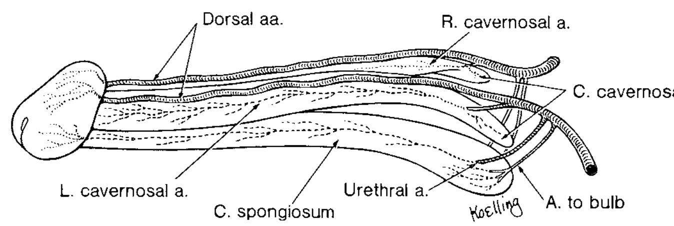

FIG. 3. Arterial supply of penis

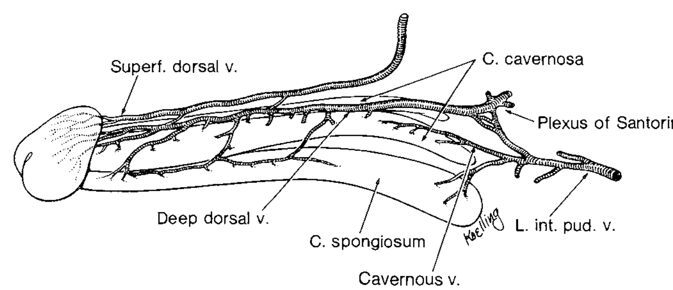

FIG. 4. Venous drainage of penis

Two major types of penile bands are in use. The expandable rings, which are frequently made of rubber, are relatively safe because of the ease of removal. The nonexpandable rings, which are frequently made of metal, are difficult to remove when distal tissue edema has occurred. Safe periods of use depend upon the degree and extent of occlusion. All rings, regardless of type, can with time cause complete occlusion, erosion and necrosis.

Rehabilitative procedures. After the band is removed, routine general surgical principles should be followed with adequate débridement of necrotic tissue. In clean cases skin edges may be reapproximated. In contaminated cases one must ensure that all necrotic tissue is removed to facilitate adequate granulation tissue, which will provide the blood supply necessary for subsequent skin grafts. Grafts may be placed only after nonviable tissue is removed, and contraction potential is a primary consideration. Epithelialization via the edge of granulating wounds or the fenestrated edges of the split-thickness skin grafts may lead to significant contraction with subsequent functional impairment. Thus, when possible, nonfenestrated skin grafts should be used on the penile shaft. A longitudinal incision along the penile shaft, especially at the penoscrotal junction, also may bear significant contraction potential. Circumferential, circumcision-like incisions decrease the risk of functional impairment.

For success of the graft one must ensure that the blood supply at the base of the wound is adequate and that secretion of serum or blood will not separate the graft from the blood supply. The fenestrated skin grafts on the scrotal areas of our 2 patients easily allowed oozing of serum and blood without separation of the graft from its granulating base. The nonfenestrated grafts on the penile shaft decreased contraction potential. A pressure dressing, applied with xeroform and fluffs, was secured with the circumferential silk suture used to secure the graft in place at the coronal sulcus and the base of the penis. This pressure dressing and dependent positioning postoperatively allowed for good coaptation of the graft to its blood supply. Following these principles one can expect excellent results of skin grafting.

With respect to long-term results, venous and lymphatic insufficiency may be as critical as arterial supply. In our 2 patients significant residual edema of the penile shaft, despite strict bed rest, necessitated removal of this skin and subsequent grafting. Had the patients been ambulatory the edema would have progressed and skin breakdown would likely have occurred. Grafting allowed arterial and venous communication at the base of the wound and significantly decreased the penile shaft edema.

Urinary diversion via suprapubic cystostomy is crucial for maintaining a clean wound. In some cases urethral reconstruction can be considered. The psychotic state of our 2 patients confined us to proximal perineal urethrostomy to expedite rehabilitation and to de-emphasize the genitalia in these troubled men.

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EDITORIAL COMMENT

While the principles of treatment of the incarcerated penis are not new, the authors describe and display diagrammatically in a precise fashion the vascular anatomy comprised by this type of injury, and they stress the important principles of grafting necessary for successful rehabilitation.

They mention the use of fenestrated and nonfenestrated grafts. The term fenestrated graft would be presumed to be a split thickness skin graft that is meshed. It is unclear as to whether the term nonfenestrated graft refers to a full or split thickness skin graft.

Graft contraction is a function of graft thickness. The thicker the graft the less the amount of contraction. It is true that a mesh graft contracts more than a nonmeshed graft if the mesh is expanded. The contraction occurs because of the scars that develop in the area of the expanded mesh. However, there is no need in reconstruction of the genitalia to expand the mesh, since there usually is no shortage of skin, and the mere act of meshing (fenestrating) accomplishes the purpose of allowing escape of seromas and hematomas.

Our choice of graft for the procedure described in this article (in clean granulating wounds) would be a full thickness skin graft, thereby obviating much of the potential for graft contraction. Should the potential for seromas or hematomas exist then an occasional slit can be made in the full thickness skin graft to allow for escape. Bolsters are used classically to limit graft-to-graft bed slippage but really they do little to affect the potential for sub-graft collections. We use bolsters of monofilament knitted polypropylene batting as opposed to cotton. The monofilament knitted polypropylene bolsters limit graft slippage but they do not apply pressure to the graft bed, which could affect vascular ingrowth adversely.

The fact that this article is authored by individuals noted for their expertise in potency and trauma lends support to their state-of-the-art management program.

Paul F. Schellhammer and Gerald Jordan
Department of Urology
Hague Medical Center
Norfolk, Virginia