Classification System for Individualized Treatment of Adult Buried Penis Syndrome

Timothy J. Tausch, M.D.
Isamu Tachibana
Jordan A. Siegel, M.D.
Ronald Hoxworth, M.D.
Jeremy M. Scott
Allen F. Morey, M.D.

Dallas, Texas

Background: The authors present their experience with reconstructive strategies for men with various manifestations of adult buried penis syndrome, and propose a comprehensive anatomical classification system and treatment algorithm based on pathologic changes in the penile skin and involvement of neighboring abdominal and/or scrotal components.

Methods: The authors reviewed all patients who underwent reconstruction of adult buried penis syndrome at their referral center between 2007 and 2015. Patients were stratified by location and severity of involved anatomical components. Procedures performed, demographics, comorbidities, and clinical outcomes were reviewed.

Results: Fifty-six patients underwent reconstruction of buried penis at the authors' center from 2007 to 2015. All procedures began with a ventral penile release. If the uncovered penile skin was determined to be viable, a phalloplasty was performed by anchoring penoscrotal skin to the proximal shaft, and the ventral shaft skin defect was closed with scrotal flaps. In more complex patients with circumferential nonviable penile skin, the penile skin was completely excised and replaced with a split-thickness skin graft. Complex patients with severe abdominal lipodystrophy required adjacent tissue transfer. For cases of genital lymphedema, the procedure involved complete excision of the lymphedematous tissue, and primary closure with or without a split-thickness skin graft, also often involving the scrotum. The authors' overall success rate was 88 percent (49 of 56), defined as resolution of symptoms without the need for additional procedures.

Conclusion: Successful correction of adult buried penis often necessitates an interdisciplinary, multimodal approach. (*Plast. Reconstr. Surg.* 138: 703, 2016.) **CLINICAL QUESTION/LEVEL OF EVIDENCE:** Therapeutic, IV.



dult buried penis syndrome is a rare condition that is more variable and less well described than the more common congenital form. Adult buried penis syndrome patients experience both physical symptoms (e.g., sexual dysfunction, difficulty with urination, recurrent skin irritation, and urinary tract infections) and psychological distress. The adult form of this condition is often acquired secondary to obesity, inflammatory conditions such as lichen sclerosus, lymphedema, or iatrogenic causes.

Multiple anatomical components can contribute to the spectrum of adult buried penis

From the Departments of Urology and Plastic Surgery, University of Texas Southwestern Medical Center. Received for publication September 2, 2015; accepted April

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syndrome sequelae. Although preliminary surgical treatment algorithms have been suggested to help guide management decisions, for the best results, a combination of techniques is often necessary. The degree of dissection, and the strategy of tissue removal or transfer, needs to be tailored for each individual patient. In this article, we present our experience with reconstructive strategies for a wide variety of men presenting for reconstruction of adult buried penis syndrome, and we propose a new, comprehensive classification system and treatment algorithm based both on the degree of pathologic changes in the penile skin and on involvement of neighboring abdominal and/or scrotal components.

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PATIENTS AND METHODS

We reviewed all patients who underwent reconstruction of adult buried penis syndrome at our institution between 2007 and 2015. We stratified patients by location and severity of involved anatomical components. Abdominal and scrotal involvement was determined preoperatively, whereas viability of the penile skin was determined intraoperatively after a ventral slit and penile release. Our classification system and treatment algorithm is presented in Figure 1.

Grade 1 patients (penis skin viable) underwent phalloplasty with or without a scrotal flap (ventral slit with scrotal flap procedure).³ If they had a significant abdominal component, we also

performed an adjacent tissue transfer with panniculectomy to remove the excess suprapubic fat. In grade 2 patients (penile skin nonviable), splitthickness skin graft replaced the denuded skin. We classified patients with genital lymphedema as grade 3, and most of these patients underwent split-thickness skin grafting following excision of the involved tissues with any necessary adjunctive procedures. We reviewed procedures performed, demographics, comorbidities, and clinical outcomes. We defined success as clinical resolution of presenting complaints without need for additional procedures.

We began each procedure with a penile release by incising the ventral aspect of the phimotic

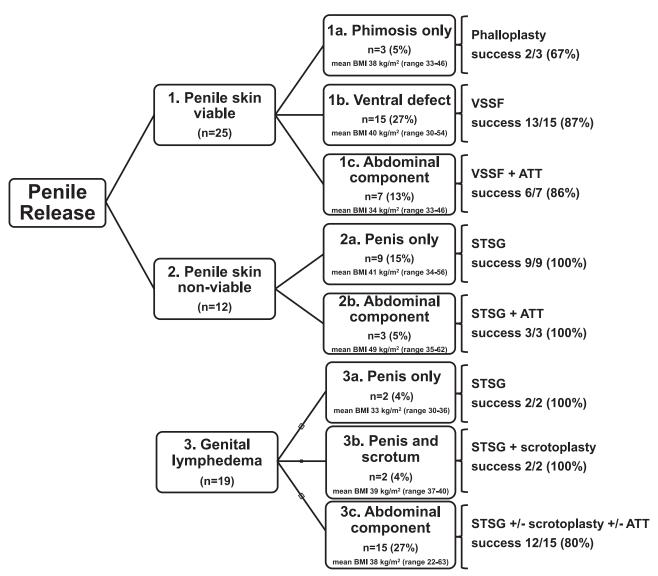


Fig. 1. Classification system with treatment algorithm and outcomes for adult buried penis (n = 56 patients). The overall success rate was 88 percent (49 of 56). *BMI*, body mass index; *VSSF*, ventral slit with scrotal flap; *ATT*, adjacent tissue transfer, *STSG*, split-thickness skin graft.

ring, allowing for exposure of the penis with the assistance of a glans retraction suture (Fig. 2). We then carefully assessed the retracted penile skin to determine its viability. Healthy-appearing epithelial tissue was defined as having no significant degrees of ulceration, thickening, or desquamation. In cases having advanced inflammatory changes, the diseased skin was excised completely in preparation for grafting. In cases where the penile skin was viable circumferentially, we performed a phalloplasty alone by recreating the penopubic and penoscrotal angles with 2-0 braided nonabsorbable sutures securing the tunica albuginea of the proximal shaft to the deep dermal tissues of the surrounding skin. If the dorsal shaft skin appeared healthy but a ventral defect remained, we performed a rotational ventral scrotal skin flap procedure to cover the defect (Fig. 3, left). Penile split-thickness skin grafting was used for men with nonviable penile skin, as determined intraoperatively after penile release and anchoring of the penoscrotal tissues to maximize shaft length projection.

In morbidly obese patients with significant abdominal adiposity, we performed an adjacent tissue transfer to remove the suprapubic fat that was contributing to the adult buried penis syndrome. Phalloplasties were performed to anchor the surrounding tissue to the base of the penis, allowing for exposure. Using a 2-0 braided, nonabsorbable suture material, the superficial tunica albuginea of the proximal penile shaft was secured to the deep dermal tissues of the surrounding skin, recreating the penopubic angle, penoscrotal angle, or both.⁴ Patients with genital lymphedema required removal of the entirety of the involved tissue, with coverage to replace the absent penile and/or scrotal skin (Figs. 4 and 5). We developed rotational scrotal flaps to cover the testicles laterally and posteriorly if a portion of the scrotal skin was uninvolved, and limited split-thickness skin grafts were used to cover any remaining defects anteriorly (Fig. 6). If necessary, we also performed an adjacent tissue transfer in patients with significant adiposity.

RESULTS

During the study period, 56 patients presented to our institution with adult buried penis syndrome. Results are summarized in Figure 1. Nearly all patients [55 of 56 (98 percent)] were clinically obese, with a mean body mass index of 39 kg/m² (range, 22 to 63 kg/m²). A significant proportion [22 of 56 (39 percent)] were

morbidly obese (body mass index ≥40 kg/m²). Obesity was the most common cause, being the primary cause in 21 of 56 patients (38 percent). Other conditions included lymphedema [19 of 56 (34 percent)], circumcision [five of 56 (9 percent)], trauma [one of 56 (2 percent)], and unknown [10 of 56 (18 percent)]. Two patients (4 percent) also received concomitant inflatable penile prosthesis placement because of preexisting erectile dysfunction refractory to medical management.

Twenty-five patients (45 percent) were grade 1, with at least some residual viable penile shaft skin. We noted four of 25 recurrences (16 percent) in this group, which were likely caused by inadequate removal of suprapubic fat or skin affected by lichen sclerosus, resulting in retraction of the penis back into the escutcheon. All of these patients subsequently underwent successful split-thickness skin grafting. In grade 2 patients [12 of 56 (21 percent)], the shaft skin was nonviable, and all of these patients received a split-thickness skin graft with adjacent tissue transfer if necessary, with 100 percent (12 of 12) success. We classified genital lymphedema patients [19 of 56 (34 percent)] as grade 3, and after excision of the involved tissue and splitthickness skin grafting with or without scrotoplasty and adjacent tissue transfer, we noted only three of 19 recurrences (16 percent), two (67 percent) of which underwent a successful repeated procedure.

DISCUSSION

Pathophysiology of Adult Buried Penis Syndrome

Buried penis is rare in adulthood, most often resulting from aging, obesity, lymphedema, lichen sclerosus, or iatrogenic causes such as overly aggressive circumcision.⁴ The decreased visible penile length in both flaccid and erect states may have psychological and physical consequences. Patients often suffer from depression, distortion of body image, impaired voiding and hygiene, and sexual dysfunction.⁵

There are two predominant etiologic components of buried penis—excessive adiposity and abnormal penile scar tissue formation. Dysfunctional voiding with urine trapping by the redundant tissue and phimosis results in chronic urinary skin exposure causing incontinence-associated dermatitis. Combined with difficulties in hygiene, incontinence-associated dermatitis often leads to skin irritation and breakdown, resulting

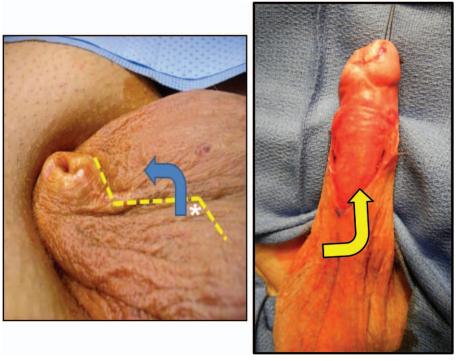


Fig. 2. The ventral slit with scrotal flap procedure. (*Left*) A ventral slit incision is made in the phimotic ring that allows for exposure of the glans and penile shaft, and in this case a ventral defect in viable penile skin remains (*right*). For the ventral slit with scrotal flap procedure, the midline penile incision is extended well onto the scrotum and tailored to form a rotational flap of scrotal skin (*arrow*).



Fig. 3. (*Left*) The scrotal flap is advanced distally, tailored, and anchored into the ventral penile defect (*asterisk*) after the lateral penile skin is anchored onto the proximal shaft. Follow-up reveals an excellent result at 2 years (*right*).

in a lichen sclerosus-like phenomenon that can affect the skin along the entire penile shaft. Less often, primary lichen sclerosus or idiopathic genital lymphedema may contribute to the syndrome, either of which may extend onto the lower abdomen.

Obesity is almost always an exacerbating factor in adult buried penis syndrome, if not the primary cause. Data from 2012 indicate that over one-third (34.9 percent) of Americans older than 20 years are obese, a proportion that has remained stable over the preceding decade.⁷ The mean body mass







Fig. 4. (*Left*) Patient with genital lymphedema with a significant scrotal component. Although he was obese, he did not have significant suprapubic adiposity contributing to his adult buried penis syndrome. We began by resecting the involved tissue and rotated skin flaps to cover the scrotal defect. His penile shaft skin was involved and nonviable, so we covered his shaft with a split-thickness skin graft (*center*) with good external phallic length (*right*).

index of our patients was 39 kg/m² (range, 22 to 63 kg/m²), with 22 of 56 (39 percent) suffering from morbid obesity (body mass index≥40 kg/m²), suggesting that excess abdominal fat added to penile concealment in a majority of our patients. In addition to other adverse effects on overall health (e.g., cardiovascular disease, diabetes), abdominal lipodystrophy seems to propagate the cicatricial scar that conceals the penis in these patients.

Accumulation of excess adipose tissue in the suprapubic area is the preferential location for weight gain in men, and can persist even after significant weight loss.8 As the mass of fatty tissue increases, external phallic length is lost because the penis attaches to the pubis by the suspensory ligament while the adipose tissue hangs loosely, covering the penis. As fat descends over the penis, a moist environment for bacterial growth results in inflammatory contracture of the skin surrounding the distal penis, leading to invagination of the shaft and a circular scar that entraps the penis.^{2,9} Comorbidities such as diabetes mellitus with its associated decrease in immune function may worsen infection and scar tissue formation that buries the penis. In a similar process, bariatric surgery can leave patients with a significant amount of lax skin that overlies the genitals, facilitating a moist environment for infection and scar tissue formation.¹⁰

Genital lymphedema secondary to prior operations, trauma, or genital elephantiasis secondary to filariasis in developing countries may inflame

surrounding tissue to bury the penis. We continue to observe many men referred with severe idiopathic genital lymphedema. Scarring also tends to occur as result of inflammation, but these cases have the added complication of subclinical, microscopic involvement that makes management difficult. Often, high recurrence rates are noted, 11 and we have treated several men who have had recurrence of idiopathic lymphedema in the lower abdomen (excised in the second procedure) years after genital split-thickness skin grafting.

Finally, iatrogenic causes, such as overaggressive circumcision, can cover the penis, trapping it proximally into the suprapubic fat.¹ Although more typical in the pediatric population, adults occasionally will present either delayed or following adult circumcision. Along the same lines, genital skin loss secondary to trauma, burns, infection, or other iatrogenic causes can lead to scar contracture and a buried penis.⁹

Management Techniques

The variety of etiologic factors in adult buried penis syndrome requires different approaches in treatment, as one or multiple anatomical components must be addressed. The focus is on restoring urinary and erectile function and preserving aesthetics, and may involve both urologic and plastic surgeons, depending on the institution. Occasionally, concomitant penile prosthesis placement can be considered in patients with long-standing, refractory erectile dysfunction, as was the case in

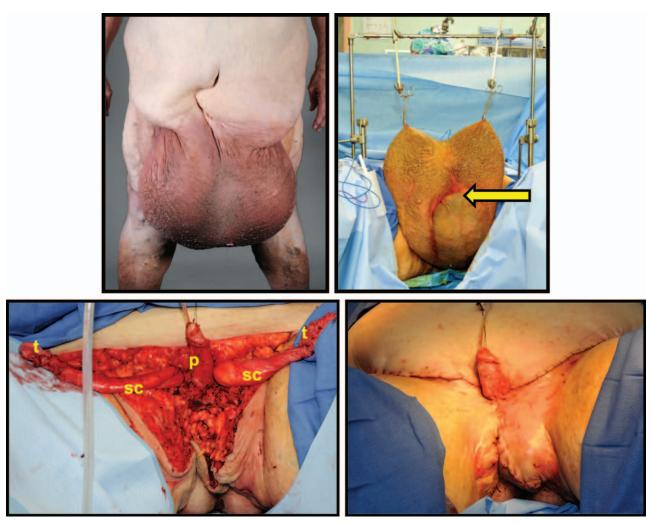


Fig. 5. (Above, left) This patient presented with massive genital lymphedema that involved his lower abdomen and scrotum. The location of his penis is noted by the arrow (above, right). We performed a scrotectomy, panniculectomy, and adjacent tissue transfer (below, left), which revealed the penis (p), spermatic cords (sc), and testes (t). We rotated lateral local skin flaps to cover the scrotum primarily with a split-thickness skin graft harvested from the excised abdominal skin to cover the denuded penile shaft (below, right).

two of our patients (4 percent). Although specific techniques need to be established for each individual patient, our treatment algorithm (Fig. 1) can be used as a guideline to tailor individual treatment.

In beginning the procedure, focus needs to be geared toward releasing the scar tissue to assess the penile shaft skin. The purpose of dissecting the shaft of the penis is to release abnormal dartos attachments to the Buck fascia. Various methods of dissection have been proposed in the literature, such as making the incision at the lateral surface and working proximally, incising at the penopubic junction and proceeding distally, penopubic junction and proceeding distally, special care should be taken to preserve the neurovascular bundle on the dorsal side of the penis.

Furthermore, the dissection should extend far enough toward the proximal end to adequately release the penis. If needed, adequate dissection can be confirmed by inducing an artificial erection. In rare cases, the suspensory ligament may be divided to release the penis off the pubis and add length, although we prefer to avoid this adjunctive maneuver.

Once the penis has been released, lipectomy can be considered to appropriately manage the adjacent adipose tissue. The decision to remove suprapubic fat is made based on the location, amount, and cause of buried penis. In the literature, suprapubic lipectomy, ¹⁵ panniculectomy, ¹⁶ and abdominoplasty ^{17,18} by various approaches have shown favorable results. However, suction lipectomy alone ^{17,18} has largely been



Fig. 6. (Above, left) This patient had genital lymphedema contributing to his adult buried penis syndrome. After the involved tissue was removed and the uninvolved lateral scrotal skin was mobilized, his penile shaft and anterior scrotum needed tissue coverage (Above, right). Split-thickness skin grafts were applied to his penile shaft (unmeshed) and anterior scrotum (meshed) (below, left). A vacuum dressing was applied, and removed after 5 days (below, right).

ineffective unless the procedure was combined with panniculectomy.¹⁸

When closing the lipectomy site, the surgeon should consider methods of decreasing tension. A simple layered closure following suprapubic lipectomy is one option to enable tension-free closure and reduce the risk of wound breakdown, and drainage is performed routinely. All of the standard surgical techniques for a lipectomy and abdominoplasty should suffice for this portion of the procedure. However, during the closure, a

phalloplasty can secure the proximal tunica albuginea of the shaft to the deep dermal layers to prevent retraction of the penis.^{2,4,18,20,21}

Coverage of Skin Defects

Once the penis has been revealed, the skin and soft-tissue defects of the penile shaft need to be addressed with proper coverage. Multiple methods have been proposed, including Z-plasty, skin grafting, flaps, or a combination of these. In rare cases, primary closure of the penis shaft

may be possible but is highly unlikely with the nature of the procedure. The Z-plasty technique has been shown to be effective and preferred for penoscrotal webbing, especially if lengthening of the ventral shaft is desired.^{4,20,21} As mentioned before, tacking sutures on the ventral side from the tunica albuginea to the ventral dartos fascia will aid in preventing retraction of the penis.

Many favor the use of a split-thickness skin graft for coverage, given its high rate of graft survival²²⁻²⁴ and excellent reestablishment of natural penoscrotal anatomy. Usually, the split-thickness skin graft is taken from the thighs and secured onto the penis with sutures to the superficial fascial tissue. Finally, most flap techniques have only been successfully described in the pediatric population.^{25,26} Various flaps such as pedicled flaps from the rectus abdominis or inferior epigastric skin flaps have been tried but with less than favorable results, usually giving way to skin grafts in the adult population.²⁷

Recently, the ventral slit with scrotal flap has shown promising results in adults.^{3,28} We prefer scrotal flaps to grafts because they avoid the additional morbidity, cost, and risk of grafting, and usually provide ample, healthy, uninvolved tissue well suited for proximal shaft reconstruction. Scrotal flaps are more reliable than other local flaps because of the well-vascularized and pliable nature of the skin, and absence of significant subcutaneous fat. In addition, the robust blood supply of the scrotal flaps helps with survival of the tissue.^{3,28} One caveat is that the scrotal flap is a hair-bearing tissue, which may lead to a less than ideal appearance cosmetically, although we have not had any complaints from ventral slit with scrotal flap patients. Alternatively, the ventral slit with scrotal flap is a minimally invasive approach with a higher failure rate. We hypothesize that the higher failure rate in grade 1 patients [two of 25] (16 percent)] may have been attributable to the presence of lichen sclerosus in the penile skin, which was only removed and replaced with a splitthickness skin graft in grade 2 and 3 patients.

Lastly, for postoperative management, many types of wound dressing have been described, including penile splints, petroleum gauze, or negative-pressure vacuum dressings with an indwelling urethral catheter. We prefer vacuum dressings for split-thickness skin graft patients, and in primary closures we dress with antibiotic ointment and gauze with compressive undergarments. Patients need to abstain from sexual activity for a variable amount of time, depending on the reconstructive procedure, but physiologic erections

do not need to be suppressed. Surgeons should also warn patients that penile sensation could be decreased and should educate patients on proper wound care and the signs of graft failure.

Limitations

Although our study is limited by the tertiary practice patterns and the retrospective nature of the review, the overall series raises awareness of the broad clinical spectrum associated with adult buried penis syndrome. Although the main causes were identified as obesity [21 of 56 (38 percent)] and lymphedema [19 of 56 (34 percent)], others have primary associated conditions, such as lichen sclerosus, which may predispose to recurrence. Careful attention to pathologic changes in the skin may allow the surgeon to better ascertain what skin is viable, and increase the chance of success by removing all involved tissue.

CONCLUSIONS

Although adult buried penis syndrome is an uncommon condition, the incidence continues to increase as causative factors such as obesity and diabetes mellitus become more prevalent. We believe our algorithm can be used to tailor individualized treatment to patients with involvement of various anatomical components, with excellent functional results possible in most cases.

Allen F. Morey, M.D.
Department of Urology
University of Texas Southwestern Medical Center
5323 Harry Hines Boulevard
Dallas, Texas 75390-9110
allen.morey@utsouthwestern.edu

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