



## The Use of Full Thickness Skin Graft Phalloplasty During Adult Acquired Buried Penis Repair

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<b>OBJECTIVE</b>	To evaluate the feasibility and outcomes of full thickness penile skin grafting (FTSG) for phalloplasty during acquired buried penis repair.
<b>MATERIALS AND METHODS</b>	A retrospective cohort study of patients undergoing complex genital reconstruction for buried penis between January 2013 and April 2018 was performed. Patients undergoing FTSG were identified. All patients underwent escutcheonectomy, scrotoplasty, and penile skin grafting by a single Urologist (MM) and Plastic surgeon (JS). Escutcheon tissue was used for the FTSG. The primary outcome was graft take and the secondary outcome was recurrence requiring surgical revision.
<b>RESULTS</b>	Thirteen patients were identified for inclusion in the study with average age of 43.4 and average BMI of 42. Median (range) follow-up for the cohort was 8 (3-44) months. Surgical indication was lymphedema in 6 (46.2%), morbid obesity in 6 (46.2%), and hidradenitis suppurativa in one (7.7%). Seven required concurrent urethromeatoplasty for meatal stenosis and fossa navicularis strictures. All grafts were successful. Two patients developed postoperative wound infections requiring antibiotics. One patient redeveloped lymphedema of the scrotum and required complete revision surgery although the FTSG remained intact. No patients had reburying of the penis. Minor outpatient surgical revision was performed for 2 patients for scarring and edema of the glans.
<b>CONCLUSION</b>	Full thickness skin grafts provide a useful option for penile reconstruction during surgical management of buried penis. Patients had excellent graft acceptance and minimal wound complications. Further research and comparative cohorts are warranted to fully determine the role of FTSG in genital reconstruction. UROLOGY 129: 223–227, 2019. © 2019 Elsevier Inc.

The adult buried penis is increasingly encountered in today's urologic practice as the rates of morbid obesity continue to rise in the United States. These men often require complex genital reconstruction to restore sexual and urinary function along with improving quality of life. Conditions encountered along with obesity can include lymphedema, hidradenitis suppurativa, and lichen sclerosis. These concurrent conditions can involve the penile skin requiring skin resection and grafting. Additionally, many obese men have undergone prior circumcision which can trap the penis under scar and cicatrix, preventing adequate protrusion of the penile shaft leading to hygiene challenges.<sup>1</sup> When conservative

measures fail, current surgical approaches to adult buried penis repair entail escutcheonectomy, scrotoplasty, and split thickness skin grafting of the penis when adequate penile skin is lacking.<sup>2-5</sup> However, the use of full thickness skin grafts (FTSG) for penile shaft tissue has been reported with excellent graft outcomes and minimal wound complications in the setting of hypospadias cripples, penile cancer reconstruction, and extensive penile shaft skin loss.<sup>6-8</sup> Full thickness skin grafts can offer improved cosmesis and wound healing over traditional split thickness skin grafts,<sup>9</sup> with the avoidance of donor site morbidity. While there is no literature demonstrating this in genital reconstruction, the benefits of FTSG over split thickness grafts have been described in forearm grafts as patients have fewer wound complications and no forearm scarring.<sup>9</sup> Similarly, FTSG are well accepted in the management of pediatric hand burns due to improved cosmesis, function, and decreased contracture formation.<sup>10</sup> In the current study, we evaluate the short and intermediate term outcomes of patients undergoing full thickness skin graft to the phallus for management of buried penis.

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## METHODS AND MATERIALS

### Patients

Exempt status was granted for the conduct of this study by the Indiana University School of Medicine IRB. A retrospective cohort study of all adult patients undergoing complex genital reconstruction between January 2013 and April 2018 at a single institution was performed. This identified 22 patients. Of these, 4 were excluded for split thickness grafting due to lymphedema affecting the quality of the escutcheon tissue and 5 were excluded for y-z penoplasty without penile grafting. The remaining 13 underwent full thickness graft to the penis using the escutcheon tissue as a graft source. All patients underwent surgery by a single Urologist (MM) and Plastic surgeon (JS).

### Outcomes, Variables, and Statistical Analysis

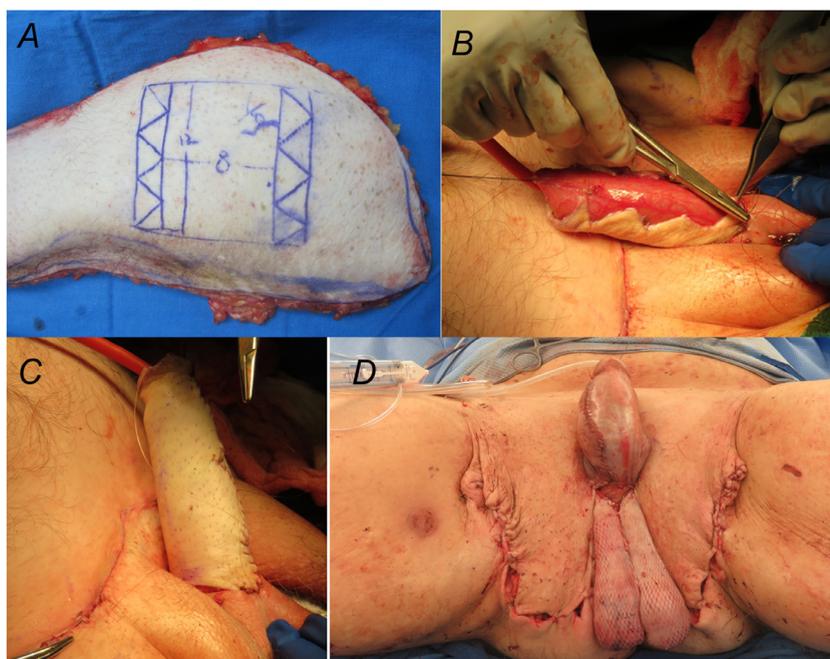
The primary outcome of interest was graft survival with a secondary outcome of need for revision procedures. Preoperative variables included demographic characteristics, BMI, patient comorbidities, and indication for surgery. Intraoperative variables included operative time, concurrent findings and procedures, and surgical technique. Postoperative variables included length of hospitalization, length of follow-up, readmissions, need for subsequent related surgery, and graft survival. FTSG success was defined as viability and adequate skin coverage at 1 month postoperative visit. Descriptive statistics were performed to report the outcomes of split thickness skin graft phalloplasty.

### Surgical Description

Prior to initiating surgery, the prepubic skin was marked out for escutcheonectomy and potential penile grafting. Diseased skin is excluded from transfer consideration. We follow similar surgical approaches described previously<sup>1-5</sup>: release of entrapping scar tissue via dorsal slit to allow glans exposure and subsequent

degloving of the penis. A glanular stitch is highly useful at this stage for penile retraction and mobilization. An escutcheonectomy and concurrent panniculectomy (if needed) is performed. Once the penis is exposed, stretched penile length (Y axis) was ascertained and penile girth was also measured (X axis) for marking out the penile graft tissue on the escutcheon (Fig. 1A). Excess and diseased scrotal tissue was removed. Attempts at hair root removal were performed by the plastic surgeon in hopes of reducing hair production postoperatively. Scrotoplasty was performed utilizing advancement flaps or split thickness grafting as required. The superior prepubic wound is closed by utilizing a well-vascularized tissue flap which is mobilized toward the base of the penis and sutured directly to Buck's fascia to avoid reburying in the future. We ascribe to a technique described by Jun et al where the tension-free play is secured 2 cm up the penile shaft to avoid pitting as the penile base and prevent postoperative infections in this area.<sup>11</sup> We use a zig zag incision on the graft for the phalloplasty in order to avoid a linear incision and more importantly reduce graft circumferential contracture postoperatively and maintain tissue pliability required for long-term erectile activity.

Subsequently, we performed the phalloplasty by wrapping the transplanted skin dorsally to ventrally (Fig. 1B) and reapproximating the penile raphe (Fig. 1C, D). The graft is secured proximally to the prepubic advancement flap. The distal coronal collar is secured with interrupted sutures. An important step is the fixation of the graft to Buck's fascia with 2-0 PDS. This step is very important to recreate normal penile shape and contour and prevent reburying. We established penopubic distinction by placing these sutures at the 11 and 1 o'clock dorsal positions, lateral to the penile neurovasculature. The penoscrotal angle was recreated by placed further 2-0 PDS sutures at the 5 and 7 o'clock positions lateral to the urethra. At the end of the case, the grafted phallus was wrapped in Allevyn®Ag (Smith & Nephew, London, UK) bolster



**Figure 1.** (A) Marking of the escutcheon tissue for graft. (B) Placement of the graft. (C) and (D) Final images of the FTSG. (Color version available online.)

**Table 1.** Characteristics of patients undergoing buried penis repair

Characteristic	N (%)
Age, mean (SD)	43.4 (15.3)
BMI, mean (SD)	42.0 (7.3)
Tobacco use, mean (SD)	4 (30.8)
Diabetes, mean (SD)	6 (46.2)
Indication	
Lymphedema	6 (46.2)
Morbid obesity	6 (46.2)
Hidradenitis suppurativa	1 (7.7)
Concurrent panniculectomy	7 (53.8)
Concurrent hydrocelectomy	3 (23.1)
Meatal/fossa stricture	7 (53.8)
Operative time, mean (SD)	226 (45.8)
Length of stay, median (IQR)	2 (2-3)
Wound infection	2 (15.4)
Minor surgical revision	2 (15.4)
Major surgical revision	1 (7.7)

dressings. By splinting the penis firmly against the grafted skin allows proper tissue apposition. We do not fenestrate the graft itself to promote cosmesis. A foley catheter is left in place until dressing removal 1 week postoperatively.

## RESULTS

Thirteen patients were identified for inclusion in the study. Median (range) follow-up for the cohort was 8 (3-44) months. Of the 13 patients, average (SD) age was 43.4 (15.3) and BMI was 42.0 (7.3) (Table 1). Indication for surgery was lymphedema in 6 (46.2%), morbid obesity in 6 (46.2%), and hidradenitis suppurativa in one (7.7%). Average (SD) operative time was 226.0 (45.8) minutes. Three patients underwent simultaneous bilateral hydrocelectomy. Seven required concurrent urethromeatoplasty for meatal stenosis from lichen sclerosis. Each of these patients requiring urethral repair had full cystourethroscopy performed. None of these patients had evidence of proximal urethral stricture disease beyond the meatus.

Median (IQR) length of hospitalization was 2 (2-3) days. Two patients developed postoperative wound infections requiring extended antibiotics per the Plastic surgery team's protocol

following hospital discharge. One of these patients with a wound infection required readmission for IV antibiotics. One patient redeveloped lymphedema and required complete revision surgery although the initial graft remained viable. Two patients required minor revisions for glans edema or scarring at the glans. No patients who underwent urethromeatoplasty have required subsequent intervention for urethral stricture disease. All patients reported subjective satisfaction with the cosmesis of their surgical outcome (Fig. 2).

## DISCUSSION

Adult buried penis can comprise a heterogeneous and complex group of patients. Therefore the management strategy can be challenging. In some mild cases, men may respond to diet, weight loss, and less involved surgical procedures such as liposuction. At the other end of the spectrum are those men where extensive skin changes can occur leading to lichen sclerosis, urethral strictures, cicatrix formation, and lymphedema. Tausch et al have previously described a grading system for buried penis conditions where the extent of repair is predicated on degree of penile involvement along with any abdominal component.<sup>12</sup> This classification system highlights the variation in the spectrum of this disease and the importance of a multidisciplinary approach for an individualized treatment plan.

At our institution, full thickness skin grafting to the phallus provides a useful surgical option for managing patients undergoing more complex reconstruction for buried penis. These challenging patients are becoming more common due to the rising prevalence of obesity and diabetes.<sup>13</sup> Surgical management in these severe cases can involve multiple concurrent procedures including cicatrix release, y-z plasty, extensive escutcheonectomy, scrotoplasty, and split thickness grafting.<sup>3,5,14-16</sup> The importance of resecting the abdominal escutcheon is well established to enable adequate healing and protrusion of the phallus.<sup>3,5,15</sup> The premise of this study is that salvage of the skin portion of the resected escutcheon allows minimization of additional donor site harvesting along with the



**Figure 2.** Before and after image for patient undergoing FTSG to the penis. (Color version available online.)

additional advantage of improved functional/cosmetic results of FTSG over split thickness skin grafting. Although the recycling of salvaged skin can be based on warm ischemia time which is minimal in escutcheon cases where the skin is immediately prepared and transferred.

Overall success for buried penis repair is measured in graft survival and improvements in quality of life. Although we did not formally examine quality of life in the current study, all patients did report donor site scar satisfaction with no long-term activity restrictions. The study's primary goal was the evaluation of the surgical use of FTSG for phalloplasty. We did note universal graft success, which is similar to prior studies.<sup>3,5,14</sup> Two patients (15.4%) developed superficial wound infections that resolved with antibiotics which reflects similar results demonstrated by Hampson et al and Alwaal et al.<sup>14,17</sup> In a recent report on 12 patients who underwent buried penis repair using a split thickness skin graft, 100% of patients reported improved hygiene, 92% reported improved urination, and 41% reported improvements in sexual function.<sup>18</sup> Similarly Theisen et al reported that 88% of their patients reported an improvement in both urinary and sexual function.<sup>19</sup>

Literature directly comparing full thickness and split thickness grafts is uncommon. Traditionally, full thickness grafts are considered more cosmetically appealing and are therefore frequently used on the face. Full thickness grafts require excellent vascularity of the grafted site to ensure graft survival. Fam et al reported full thickness grafting of the penile shaft in hypospadias cripples and noted improved cosmesis and graft outcomes when compared to patients undergoing split thickness grafts as they were more likely to have secondary contraction of the graft.<sup>6</sup> McDougal et al additionally reported improved cosmetic outcomes for patients undergoing full thickness penile shaft skin grafting after wide excision of penile squamous cell carcinoma.<sup>7</sup> We feel that using the full thickness graft was helpful for cosmesis, and as it was harvested from a portion of normal nondiseased escutcheon, we had fewer concerns about graft site healing.

As lichen sclerosis is commonly reported among patients with adult buried penis, it is not surprising that many patients require concurrent management of urethral stricture disease. In the current study, 54% of patients required urethromeatoplasty to manage associated meatal stricture disease. Similarly, Pariser et al reported that 43% of their complex buried penis repairs were found to have urethral strictures.<sup>20</sup> Other studies have reported incidence of urethral stricture in 31%-33% of patients undergoing buried penis report.<sup>21,22</sup> We had a large portion of patients in our series with concurrent lichen sclerosis which speaks to the complexity of our cohort and extensive need for penile resection. Despite these challenging operative and tissue conditions, all FTSG had graft take. We feel this success highlights the versatility of this technique even in the most challenging cases.

There are multiple limitations worth discussing. The study was performed at a single institution upon a small

number of patients and is retrospective in nature. There is no comparison group of patients undergoing split thickness skin grafting of the penis. Given the geographic nature of our referral practice, many men seek local urologist follow-up. Subsequently, there is only short-term follow-up available for the majority of patients and follow-up of greater than a year in only 2 patients. The long-term viability of these full thickness grafts was not assessed in this study. Some patients may develop hair along the graft regardless of attempts of depilation; however, in our experience this was uncommon, perhaps due to the overall poor nutritional status of the patients. Despite these limitations, the current study offers significant insight into the potential benefits of full thickness skin grafts for complex buried penis repair. The etiology of buried penis is mixed among the patients in the study but with no difference in outcomes which suggests that full thickness grafting is an option regardless of etiology.

## CONCLUSION

Adult buried penis is a complex and heterogeneous condition requiring a multidisciplinary surgical approach to care. Full thickness grafting of the penis is safe, effective, and provides excellent cosmetic and functional outcomes for patients requiring complex genital reconstruction avoiding donor site morbidity. Patients should be adequately counseled on the risks of wound infections and glans edema requiring minor revision.

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