

## Penile reconstruction in severe penile injury: Phalloplasty with an island anterolateral thigh flap (ALTF).

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### ABSTRACT

**INTRODUCTION:** Penile amputation is common in our society due to trauma by patta injury or electric burn injury. Phallic reconstruction to treat this devastating condition is a major challenge to the reconstructive surgeon. Each surgeon's contribution is an important entry in the menu of surgical alternatives available to the phalloplasty surgeons. We used an island anterolateral thigh flap (ALTF) for phallic reconstruction.

**PATIENTS AND METHODS:** This study included 12 patients admitted to Plastic & Reconstructive Surgery Unit Bahawal Victoria hospital Bahawalpur from November 2008 to June 2011. Their ages ranged from 16-43 years with mean of 29 years. All the patients were presented by post-traumatic total or subtotal amputation of the penis. All the patients were treated with phallic reconstruction by using island anterolateral thigh flap (ALTF). Aesthetic and functional results were evaluated.

**RESULTS:** Complete necrosis of the flap was not recorded. Partial necrosis of the distal end of the flap was found in two cases which healed completely with conservative measures. In the remaining cases, the post operative course was uneventful. The patient's satisfaction with the final result was acceptable in all the cases. Regular sexual activity and performance was good in the patients where bone graft was used & acceptable in other cases.

**CONCLUSION:** An island anterolateral lateral thigh flap (ALTF) is a very good option for phalloplasty.

*Keywords: Penile reconstruction, Alt flap, Single stage reconstruction.*

### INTRODUCTION

An absent or inadequate penis is a devastating condition with significant psychological and physical impact. Although uncommon, it is a challenging condition to treat. Surgery to find a solution to the problem of "no penis" falls into two broad divisions. Procedures that utilize existing tissue and those that bring in new tissue. Phalloplasty utilizing distant tissue transfer has been accomplished via various techniques. Each surgeon's contribution is an important entry in the "menu" of surgical alternatives available to phalloplasty surgeons [1].

Historically the tube pedicle was used for penile reconstruction [2-5]. Song [6,7] has reported one-stage phalloplasty using low abdominal flaps, scrotal flaps, thigh flaps and costal cartilage. The concept of forming a urethra with less tendency for contraction from split-thickness skin grafts on the deep superficial (Scarpa's) fascia of the groin flap had been contributed [8]. Mukherjee has used a seven-stage procedure utilizing groin and scrotal flaps

for reconstructive phalloplasty in male burn victims with a great successful results [9].

One-stage phalloplasty had been reported in female to male transsexuals with a modified Chinese forearm flap, including the cutaneous nerves anastomosed to the genital branches of the ilioinguinal and iliohypogastric nerves and the perineal branches of the pudendal nerve to obtain true genital sensibility [10]. The lateral groin flap in combination with vascularized iliac crest bone graft had been used successfully [11,12]. In their phalloplasty series, phallus had been reconstructed in one-stage using a large radial forearm sensate flap to form the entire penis. They have used a costal cartilage graft as a stiffener [13,14].

The ideal requirements for free flap phalloplasty should include the following: one-stage procedure, creation of a competent neo-urethra to allow for voiding while standing, return of both tactile and erogenous sensibility, enough bulk to tolerate the insertion of a prosthetic stiffener, acceptable aesthetic result to the patient,

minimal scarring or disfigurement with no functional loss in the donor site [15]. Gilbert et al. have used a one-stage phalloplasty utilizing two arterialized flaps. The lateral brachial fasciocutaneous free flap which forms the surface of the penis is based on the radial collateral artery and includes the lateral brachial cutaneous nerves. This method fabricates the urethra from an inferior rectus abdominis musculocutaneous island flap. No skin grafting was required [16,17].

Akoz et al. have used an iliac osteocutaneous flap for phalloplasty and a vascularized bone flap for imitating penile erection. Long-term results are promising in adults [18]. Free radial forearm osteocutaneous flap had been used in twenty two female to male transsexuals patients with promising results [19]. De Fontaine et al. have used free radial forearm flap in cases of micropenis associated with vesical exstrophy for penile reconstruction [20].

The (ALTF) flap had been used over 20 years for reconstruction of various simple and complex soft tissue defects in very difficult anatomic regions. The lateral circumflex femoral system is considered as a super-ideal pedicle for a very versatile (ALTF) flap. Its descending branch represent the vascular pedicle of the ALTF. It gives during its course muscular branches to the surrounding muscles and cutaneous branches to the anterolateral aspect of the thigh. The perforating vessels of this flap took their origin from the main trunk and reach the skin via musculocutaneous route or septocutaneous one [21]. Song et al. had introduced the free anterolateral thigh flap (ALTF) as a new flap concept based on the septocutaneous artery[22].

The different cosmetic and functional requirements for penile reconstruction are well known as follows. (i) The aesthetic appearance of the neophallus must be as normal as possible. (ii) The penile shaft must contain a urethra to allow voiding in a standing position and with a normal stream. (iii)The penile shaft must allow the implantation of a penile stiffener in order to allow intercourse. (iv) Morbidity of the donor area must be minimal with an easily concealed scar. Although phallic reconstruction is a complex

surgical procedure, it is nowadays possible to fulfill most of the above-mentioned requirements using the new techniques developed in plastic and reconstructive surgery [23].

The anterolateral thigh flap (ALTF) has been used either as local island or free flap to reconstruct different soft tissue defects in various sites in the body. The elevation and dissection of this flap needs experience and good knowledge of its anatomy. The vast experience of our team in the elevation of this flap encouraged us to use it for phalloplasty.

## PATIENTS AND METHODS

This study included 12 patients admitted to Plastic & Reconstructive Surgery Unit Bahawal Victoria hospital Bahawalpur from November 2008 to June 2011. Their ages ranged from 16-43 years with mean of 29 years. All the patients were presented by post-traumatic total or subtotal amputation of the penis (fig-1).

During preoperative explanation of the various options of phalloplasty, we stressed that the mostly used flap in our unit is the radial forearm flap. The patients asked us if it was possible to avoid scars in their forearms. So we proposed the use of anterolateral thigh flap (ALTF) as an island one to construct the phallus and the patients agreed on that proposal All patients were operated under general anaesthesia. The flap size ranged from 10 x 7 cm to 16 x 12 cm. In all the cases neo-urethra formation was done where an island was made on the flap by de-epithelization of strip 1 cm wide.

### Flap design:

The site of the cutaneous perforator of the descending branch of the lateral circumflex femoral artery was marked 2 cm above the middle of a line joining the anterior superior iliac spine and the lateral aspect of the patella by using handheld Doppler. The flap was designed around this point and its size ranged between 10x7 cm to 16x12 cm on the anterolateral aspect of the thigh. Preoperative photography documented the preoperative status and design of the flap (Fig. 3).

### **Operative technique:**

Under general anaesthesia in twelve patients the preparation and drapping was done. The medial margin of the flap was incised first. The incision was made down through the deep fascia and also includes the epimysium of the rectus femoris muscle. The edges of the deep fascia and epimysium were secured to the subdermal tissue between the deep fascia and subcutaneous fat. The flap was then undermined and raised laterally with sharp dissection towards the intermuscular septum between the rectus femoris and vastus lateralis muscles. Two musculocutaneous perforating vessels were found at the site that was marked preoperatively in eight cases. Dissection of them was done carefully and both musculocutaneous perforators were skeletonized without taking muscle cuff around them. In the other four cases single septocutaneous perforating vessel was found in the septum between vastus lateralis and rectus femoris muscles. Dissection was then continued upward following the descending branch of the lateral circumflex femoral vessels till its origin from the profunda femoris vessels. Harvesting the lateral cutaneous nerve of the thigh was done for its microneuro anastomosis with the dorsal cutaneous nerve of the penis.

Fashioning of the new phallus, formation of new urethra, anastomosis of neo-urethra to the urethral stump & fixation of the neo-phallus with penile stump was done in single stage in all the cases. Closure of the donor site was done with split thickness skin graft. Postoperative treatment included antibiotics, analgesics and vitamins.

### **RESULTS**

This study was carried out on twelve patients in the period between november 2008 and June 2011 with a follow-up period that ranged from 4 months to 24 months. All the patients were

of post-traumatic amputation of the penis. Their ages ranged between 16-43 years with a mean of 29 years. All patients were operated on under general anaesthesia. The flap size ranged between 10 x 7 to 16 x 12 cm. The pedicle length was 11-15 cm with a mean of 13.4 cm. The operative time was 3-4 hours with a mean of 3.15 hours. In all the cases the distal end of the flap was fixed to the penile stump. The pedicle was severed two weeks later. In this series, insertion of bone graft as stiffener was done in eight cases 6 months after complete healing. Five of them were already married. Six months after insertion of the bone graft as stiffener, they have enough rigidity for practicing normal sexual activity with good performance.

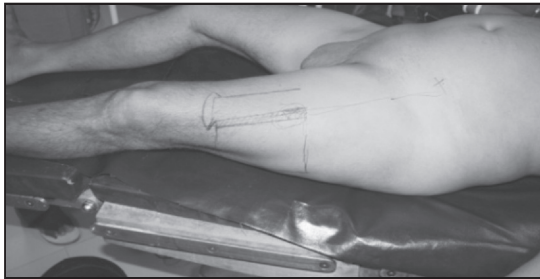
Complete necrosis of the flap was not recorded. Partial necrosis of the distal end of the flap was found in two cases which healed completely with conservative measures. In the remaining cases the post operative course was uneventful. In the post-traumatic cases impaired sensation of the reconstructed phallus was persistent for 9 months and gradually regained with medical treatment one year postoperatively. The patient's satisfaction with the final result was acceptable in all the cases (Figs. 5,7). Regular sexual activity and performance was very good in the patients where bone graft was used. It is not yet evaluated in the other cases. In the post-traumatic partial loss of the penis regular sexual activity was delayed up to 12 months postoperatively as a result of decreased skin sensation of the reconstructed phallus and psychological upset of the previous trauma.



**Fig 1:** Photograph showing traumatic penile amputation.



**Fig 2:** After healing of stump.



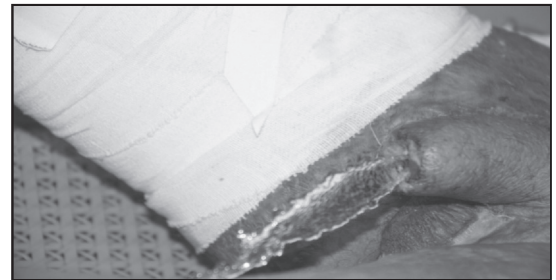
**Fig 3:** Photograph showing flap design.



**Fig 5:** Late post operative photograph showing



**Fig 4:** Early postoperative results with grafted donar area.



**Fig 6:** Reconstructed phallus during voiding reconstructed phallus with good results.



**Fig 7:** Reconstruction of phallus after subtotal traumatic penile amputation with very good results



## DISCUSSION

There is no doubt that the radial forearm flap is considered the standard flap for phalloplasty all over the world. It gives long, sensate phallus with average size and shape with very low failure rate. We have used it in more than 07 cases of phalloplasty in patients at different age groups. Although we were faced with the most famous drawbacks of this flap as donor site unacceptable scar, tendon exposure and urethral problems, the final results were acceptable to a great extent. Free radial forearm flap provides a promising choice for phalloplasty with an excellent result. It considered by many surgeons as a gold standard for penile reconstruction [19,20,24,25]. Urethral complications represent the most frequent complication in free radial forearm flap. In our unit urethrocutaneous fistula was recorded in 54% of cases. In Fang et al. [26] phalloplasty series (56 cases), the urethrocutaneous fistula rate was 38/56 (67.8%). Fang et al. [19] reported 40.9% urethrocutaneous fistula in their transsexuals series. However, Perovic recorded the best result of this complication 2/24 (8.3%) in his series of phalloplasty in children and adolescent with extended pedicle island flap [27].

Five major disadvantages of the radial forearm flap were recorded [28]. They include tightness of the forearm skin graft, potential loss of the wrist extension, loss of tactile forearm skin and loss of radial artery coupled with the significant aesthetic disadvantages of the grafted donor site. Weinzweg and Daves [29] summarized these disadvantages in unsightly donor site scar especially in young female and skin graft breakdown with tendon exposure. Fang et al. [19] added radius bone fracture as one of the disadvantages of the radial forearm osteocutaneous flap for phalloplasty for female to male transsexuals.

The disadvantages of the donor site of the forearm flap has led to the search for other donor sites. The vast experience of our team in the elevation and dissection of the ALTF encouraged us to use it as an alternative to radial forearm flap for phalloplasty. In our series the age group ranged between 16-43 years with a mean of 18.2 years. Gilbert et al. [30] have done their series (11

patients) of phallic construction in prepubertal and adolescent boys. The age ranged between 12-18 years in Perovic Series [27]. However, in traumatic series (7 children) of ochoa [31] the age group ranged between 4 months to 8 years and 5 patients were younger than one year.

In our study the indication for phalloplasty was post traumatic subtotal or total amputation of the penis. Traumatic amputation whether subtotal or total was the main indication [30-33].

In our study, the flap size ranged between 10x7 cm to 16x12 cm and it proportionate to the patient body built and age. In the study by Zayed E. et al. [1], the flap size ranged between 12x8 cm to 18x13 cm. Sun and Huang [17] reported one stage reconstruction of the penis with composite iliac crest and lateral groin skin flap. The flap size was 11 cm long and 10 cm wide. The flap size depends on the patient built as reported in Perovic series [27].

In our cases, total loss of the island ALTF was not reported as a result of using an island flap with its wide safety profile, absence of the risks of micro-anastomosis and thrombus formation. However, partial loss of the distal end of two flaps was recorded and healed completely conservatively. Single case of total loss out of 56 cases of the free radial forearm flap had been recorded [26]. However, partial flap necrosis were reported in two cases [27] and in one case [1,19].

In our study, insertion of bone graft as stiffener was done in eight cases. It was sufficient for obtaining rigidity in the reconstructed phallus. After insertion of the bone graft as stiffener they have enough rigidity for practicing normal sexual activity with good performance. Zayed E et al. used silicon implant as penile stiffener [1]. Composite iliac crest to provide rigid support with lateral groin skin flap have been used [11]. The osteocutaneous skin flap have been used sexual penetration have been also used [24]. Vascularized iliac bone had been used with good result for sufficient rigidity for a neophallus [18].

In the post-traumatic partial loss of the penis regular sexual activity was delayed up to 12 months postoperatively as a result of decrease skin sensation of the reconstructed phallus and

bad memory of the previous trauma.. No penile fracture had been recorded in the eight cases that have regular sexual activities [19]. The sexual performance on regular basis was rated as highly satisfactory [19,20]

The island anterolateral thigh flap “ALTF” is an option for phalloplasty[1]. It has the following advantages. Flap elevation is both easy and safe, the vascular pedicle is long enough to facilitate its transport to the proper site, the operative time is not long as free flap and with a mean 3.15 hour this series. The flap is potentially sensate one which is an important feature in phalloplasty. There possible side effects and the postoperative course is uneventful in most cases. The skin territory of this flap is very wide and a large phallus can be constructed from the anterolateral aspect of the thigh. Finally the donor site is completely concealed and has a lower rate of complications. The disadvantages of this flap are: the constructed phallus is thick and it was difficult to construct the urethra by folding of this flap. The thickness and difficulty increase in obese patients. A trial of thinning of this flap is going on cautiously.

#### Conclusion:

The island anterolateral thigh flap(ALTF)is very a good option for phallus reconstruction especially when the radial forearm flap is not available or not accepted by the patient.

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