ORIGINAL ARTICLE

Reconstructive Surgery for Severe Penile Injury: One-Stage Penile Reconstruction (Phalloplasty) Using Pedicled Island Anterolateral Thigh Flap

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ABSTRACT

Aim: To evaluate the functional and aesthetic results of one-stage penile reconstruction (phalloplasty) using an island anterolateral thigh flap

Patients and methods: Twelve male patients (age 16 to 43 years) were treated with a penile reconstruction admitted to plastic & reconstructive surgery unit of Bahawal Victoria Hospital Bahawalpur and Sheikh Zayed Hospital, Rahim Yar Khan from November 2008 to June 2011. All patients presented with post-traumatic total or subtotal amputation of the penis. In all the patients an island anterolateral thigh flap (ALTF) was used for penile reconstruction. Mean follow-up was 16 months. The ALTF is an alternative when a free flap is contraindicated or not desired by the patient.

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. Aesthetic results were judged as good in 8 patients and moderate in 3 patients. Five patients developed urinary complications (fistula). Protective and tactile sensitivity was satisfactory in all patients. In 8 patients rib bone graft was used as penile stiffener and they were well satisfied with the regular sexual performance.

Conclusion: The pedicled island anterolateral thigh flap (ALTF) is a very good option for non-microsurgical one-stage penile reconstruction.

Keywords: Penile reconstruction, Phalloplasty, Penile amputation, ALT flap

INTRODUCTION

An absent or inadequate penis is a devastating condition with significant psychological and physical impact on the lives of sufferers. Although uncommon, penile reconstruction or phallus construction 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 by various techniques. Each surgeon's contribution is an important entry in the "menu" of surgical alternatives available to phalloplasty surgeons[1,2].

Historically, several techniques have been described for total penile reconstruction. The first total penile reconstruction was done in 1936 by Bogoras[3], who used a traditional tube pedicle flap without including a competent neourethra. Song[4] has reported one-stage phalloplasty using lower abdominal flaps, scrotal flaps, thigh flaps and costal cartilage. Mukherjee[5] has used a seven-stage procedure utilizing groin and scrotal flaps for reconstructive phalloplasty in male burn victims with successful results. Afterward, Bogoras technique was improved by creating a penis which incorporated a neourethra using the 'tube within a tube' design[6].

The ideal requirements for phalloplasty should include: one-stage procedure, creation of a competent neo-urethra that extends up to the distal tip which permits voiding in a comfortable position, return of both tactile and erogenous sensation, provide enough bulk to allow the insertion and retain a permanent penile prosthetic stiffener for sexual intercourse, and acceptable aesthetic result to the patient. In addition there should be minimal scarring or disfigurement with no functional loss in the donor site[7].

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. During the past two decades, the advent of microsurgical techniques and well-designed composite flaps has made great advances in penile reconstruction. Currently, microsurgical free

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flap phalloplasty seems to be the preferred method to fulfill the goals of penile reconstruction[8]. For many years the radial forearm free flap has been considered the best procedure but, because of the donor site stigmata, other flaps have been attempted to minimize donor site morbidity. The recent development of perforator flap surgery led to introduction of the free anterolateral thigh (ALT) flap phalloplasty as a new technique for penile reconstruction[9] and optimize aesthetic and functional results. However, there are instances where microsurgical phalloplasty is not suitable and there are many centers world wide where microsurgical resources are not available. Pedicled flaps are always considered for their reliability and the decreased risk of total failure[10.11].

Akoz et al[12] have used an iliac osteocutaneous vascularized bone flap for phalloplasty for imitating penile erection. Long-term results were promising in adults. In 2000, Santanelli and Scuderi[13] introduced the use of the island tensor fascia lata flap and Mutaf[14] described his Istanbul flap. More recently, Mutaf et al[15] described a one-stage non-microsurgical technique for phallic reconstruction in a young male patient using a pedicled ALT flap. The ALT flap had been used either as free flap or locally as pedicled island flap over 20 years for reconstruction of various simple and complex soft tissue defects in very difficult anatomic regions. 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 total as well as partial penile reconstruction in post traumatic penile amputation patients. The purpose of this study was to evaluate the functional and aesthetic results of one-stage non-microsurgical reconstruction of the penis using pedicled island ALT flap.

PATIENTS AND METHODS

This case study included 12 patients admitted to Plastic & Reconstructive Surgery Unit of Bahawal Victoria Hospital Bahawalpur and Sh. Zayed Hospital, Rahim Yar Khan from November 2008 to June 2011. All the patients presented with post-traumatic total or subtotal amputation of the penis secondary to belt shaft (patta) injury. (Fig.1A,B). During preoperative counseling with the patient regarding various surgical options of phalloplasty, we explained that the most commonly used flap in our unit is the radial forearm flap. The patients asked if it is possible to avoid scars in their forearms. Then we proposed the use of an island anterolateral thigh flap to reconstruct the phallus and only those patients whose phalloplasty was done using ALT flap were included.

Operative technique: Preoperative planning was started by marking a line from the anterior superior iliac spine to the lateral border of the patella. Then, perforating vessels from the descending branch of the lateral femoral circumflex artery were located using a hand-held Doppler probe. These perforators are usually located just lateral to the marked line and only those located distal to the mid-point of the reference line can be used for pedicled ALT flap in order to obtain increased pedicle length. The outline of the flap was then marked on the skin and the perforating vessel distal to the mid-point was included in the flap design (Fig.1C). A rectangular skin island measuring between 10x7 and 16x12cm on the distal two thirds of anterolateral aspect of the thigh was marked with the proximal border at the mid-level of the reference line. A 1cm wide strip of skin was also marked on the reference line for de-epithelization for the purpose of reconstruction of new urethra.

All the patients were operated under general anesthesia. The medial margin of the flap was incised first. The incision was made down through the deep fascia and the epimysium of the rectus femoris muscle. The edges of the deep fascia and epimysium were secured to the subdermal tissue with 4/0 vicryl interrupted sutures. The flap was then undermined and raised laterally with sharp dissection towards the intermuscular septum between the rectus femoris and vastus lateralis muscles. In eight cases two musculocutaneous perforating vessels were found at the site that was marked preoperatively. Both of these perforating vessels were dissected carefully and skeletonized without taking muscle cuff around them. In the other four cases only single septocutaneous perforating vessel was found in the septum between vastus lateralis and rectus femoris muscles. Dissection was then continued proximally following the descending branch of the lateral circumflex femoral vessels till its origin from the profunda femoris vessels. The lateral cutaneous nerve of the thigh was identified at the proximal border of the flap and harvested for its microneuro-anastomosis with the dorsal cutaneous nerve of the penis.

After raising, the flap was passed through a subcutaneous tunnel in order to reach the debrided penile stump, ensuring that there was no pressure to the pedicle following flap inset and wound closure. The flap is then shaped into a phallus using a tube-in-tube technique. Neo-urethra was anastomosed to the native urethral stump, lateral femoral cutaneous nerve of thigh was coapted to dorsal nerve of the penis and the flap was secured to the penile stump. Closure of the flap donor site was done with split thickness skin graft from the contralateral thigh. Three patients receive a suprapubic urinary diversion postoperatively (Fig.2A). The patients remain in bed for 10 days after which the suprapubic drain was

removed. Antibiotic was given using Augmentin (1.2 g every 8 h for 7 days, i.v.) and gentamycin (80 mg every 8 h for 7 days, i.v.). A urethral catheter was maintained for 2 weeks.

RESULTS

This study was carried out on twelve male patients in the period between November 2008 and June 2011. All the 12 patients were of post-traumatic amputation of the penis, 7 with total and 5 with subtotal or partial amputation. The age range was between 16 and 43 years and a mean age of 29 years. Follow-up period ranged from 6 months to 2 years with a mean of 16 months. All patients were operated under general anesthesia. The flap size ranged between 10 x 7 to 16 x 12 cm and was based on two perforators in 8 cased and a single perforator in 4 cases. The perforators were musculocutaneous in 8 cases and septocutaneous in 4 cases. The pedicle length was 11-15 cm with a mean of 13.4cm. The operative time was 3-4 hours with a mean of 3.15 hours. Primary urethral anastomosis was performed in all the cases. In 8 patients rib bone graft was used as a stiffener after six months of penile reconstruction. Five of them were already married. Six months after insertion of the bone graft they gained enough rigidity for practicing normal sexual activity with good performance. Rest of the 4 patients did not desire to have a penile stiffener.

Partial necrosis of the distal end of the flap was noted in two cases which healed completely with conservative measures. In the remaining cases the flap survived completely and there was no complications noted in the donor area. A persistent fistula at the anastomosis of the neourethra to the native urethra developed in 5 patients, who needed surgical closure of the fistula and was successful in all 5 patients.

After 6 months following phalloplasty aesthetic appearance was excellent in 8 patients (Fig.2 B,C,D) which all expressed their extreme happiness with the result. In 3 patients the aesthetic results were moderate. One patient developed a hypertrophic scar causing deformity of the phallus. A Z-plasty was used to solve this problem

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. Cutaneous sensitivity had improved within 6 months following reconstruction and the satisfactory tactile sensation on the entire neo-phallic shaft was re-established within 12 months period. However, some patients delayed their regular sexual activity up to 12 months postoperatively mainly because of psychological trauma secondary to penile loss.

Fig 1: (A) Showing traumatic penile amputation, (B) after penile stump healed completely, (C) Anterolateral thigh flap: preoperatively the vascular pedicle is marked just distal to the mid-point of reference line with hand-held dopler and the flap marking

(A)

(B)

(C)

Fig 2: (A) Early postoperative results showing suprapubic catheter, transurethral catheter, and grafted donor site of flap. **(B)** Two weeks postop where by both the catheters were removed. **(C)** Patient during voiding in a comfortable position. **(D)** Six months following phallus reconstruction with good aesthetic results

(A)

(B)

(C)

(D)

DISCUSSION

Reconstructive surgery for severe penile injury is necessary because it has devastating effect on the psychological and sexual functions. There is no doubt that the radial forearm flap is considered the best 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 as pedicled flap in 07 cases of phalloplasty in patients of different age groups. Although we were faced with the most famous drawbacks of this flap such as unacceptable depressed donor-site scar, tendon exposure, urethral problems, scarifying a major artery of the forearm, uncomfortable position for the patient and need for division of flap pedicle in 2-3 weeks time. However, the final functional and cosmetic results were acceptable to the patients.

Free radial forearm flap provides a promising choice for phalloplasty with an excellent result. It is considered by many surgeons as a gold standard for penile reconstruction.[16,17,18,19] Urethral complications represent the most frequent complication in free radial forearm flap. In our unit urethrocutaneous fistula was recorded in 41.6% of cases. Fang et al.[16] reported 40.9% urethrocutaneous fistula in their transsexual phalloplasty series, (n=22). The disadvantages of the donor site of the forearm flap has led to the search for other donor sites. Djordjevic et al.[20] reported the musculocutaneous latissimus dorsi free flap, Sengezer et al[21] suggested the osteocutaneous free-fibula flap, and N. Felici and A Felici[22] described the free anterolateral thigh flap. They all report satisfactory results. The type of free flap that is used mostly depends on the personal preference and the experience of the plastic surgeon that is involved in phalloplasty.

The vast experience of our team in the elevation and dissection of the ALT flap encouraged us to use it as an alternative to radial forearm flap for phalloplasty. This flap avoids visible donor site morbidity as occurs with radial forearm flap and also reduces the risk of total flap failure and prolonged operative time of microsurgical techniques. The donor site is located in a non-exposed part of the body and cane be hidden easily with boxer-type underwear.

The major drawbacks of phalloplasty are the urethral complications and the problems with the penile stiffeners. Secondary procedures are usually needed to treat these complications in which the treatment of urethral strictures, especially, is challenging and difficult. Obtaining sufficient rigidity to allow penetration is also a difficult task because there is no good substitute for the unique erectile tissue of the penis[23,24]**.** The radial forearm flap and ALTF are too soft and, insertion of a penile stiffener is needed for sexual intercourse. We used rib bone graft as penile stiffener in eight cases after 6 months following phalloplasty. It provided sufficient rigidity for sexual intercourse. No penile fracture had been recorded in the eight cases which have regular sexual activity. The regular sexual performance was rated as highly satisfactory. Zayed et al[25] used silicon implant as penile stiffener. Sun et al[26] used iliac crest to provide rigid support with lateral groin flap. Hage J[27] used osteocutaneous free fibula flap to provide the rigidity to the neo-phallus.

In our study the indication for phalloplasty was post traumatic total or subtotal penile loss. The ALT flap size (10x7 and 16x12cm) was proportionate to the patient's body built. In the study by Zayed et al[25], the flap size ranged between 12x8 and 18x13cm. Sun and Huang[26] reported one stage reconstruction of the penis with composite iliac crest and extended lateral groin flap measuring 11x10cm.

In our case series, total loss of flap was not noticed as a result of using it as an island flap with its wide safety profile, absence of micro-anastomosis and its risk of thrombus formation. However, partial loss of the distal end of two flaps was recorded which healed with conservative treatment. Fang et al[16] reported single case of total and 2 partial flap loss out of 22 free radial forearm flaps for female transsexuals**.**

The island anterolateral thigh flap is a reliable option for Phalloplasty[27]. 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 as long as for free flap (3.15 hour in this case series). The flap is potentially sensate which is an important feature in phalloplasty. 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 drawbacks of the flap include flap bulk especially in large built obese patients in which the constructed phallus is thick and difficult to construct the urethra by folding of the flap. In such cases secondary thinning procedures are usually required to obtain satisfactory functional and aesthetic results.

CONCLUSION

In case of severe penile injury due to whatever condition, a phalloplasty is the preferred treatment nowadays. The free radial forearm flap is still the method of choice. The anterolateral thigh flap can be a good alternative, especially when radial forearm free flap is contraindicated or not accepted by the

patient. This flap has comparable aesthetic and functional results with radial forearm free flap phalloplasty.

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