

A New Technique for Phalloplasty

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ABSTRACT

Penile reconstruction whatever partial or complete remains a difficult and challenging surgical problem. Each surgeon's contribution is an important entry in the "menu" of surgical alternatives available to phalloplasty surgeons. In this work, we evaluated the use of an island anterolateral thigh flap (ALTF) for phalloplasty. Our series included seven patients, six of them were true male hermaphrodites and the seventh one was presented by post-traumatic partial penile amputation. Complete necrosis of the flap was not recorded in this series. However, partial flap necrosis was found in one case and it healed completely with conservative measures. Patient's satisfaction with the final result was acceptable in six cases.

Conclusion: The island anterolateral thigh flap can be used for phalloplasty especially when the radial forearm flap is not available or not accepted by the patient. It considered as a versatile option for penile reconstruction.

INTRODUCTION

Penile reconstruction remains a difficult surgical problem. To produce a phallus capable of erection and with a water-tight urethra to the tip has not been solved satisfactorily even by the introduction of free flap transfers [1].

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. The ideal requirements for free flap phalloplasty should include the following: one-stage procedure, creation of a competent neourethra 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 [2].

Historically the tube pedicle was used for penile reconstruction [3-6]. Song [7,8] has reported one-stage phalloplasty using low abdominal flaps, scrotal flaps, thigh flaps and costal cartilage. The gracilis muscle has been used as well [9-11]. 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 [12]. Mukherjee [13] has used a seven-stage procedure utilizing groin and scrotal flaps for reconstructive phalloplasty in male burn victims with a great successful results.

In their phalloplasty series [14 & 15], a 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. 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 [16].

The lateral groin flap in combination with vascularized iliac crest bone graft had been used successfully [17 & 18]. An extended pedicle island groin flap had been used, forming a combined groin and lower abdominal flap based on the superficial iliac and epigastric vessels [19]. Wu et al. [20] have used abdominal flap in 16 cases at which the cutaneous branches of the inferior epigastric blood vessel and the superficial epigastric blood vessel were the main two sources of blood supply.

Gilbert et al. [21,22] 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 musculocu-

taneous island flap. No skin grafting was required with an excellent sensation. A sensate fibula free flap for phalloplasty have been used [23,24] in cases at which the patients have refused a forearm scar. They recommend preconstruction and secondary anastomosis of the neo-urethra. The osseous part of the fibula should be long enough to be fixed to the tunica albuginea.

Free radial forearm osteocutaneous flap had been used in twenty two female to male transsexuals patients with promising results [25]. De Fontaine et al. [26] have used free radial forearm flap in cases of micropenis associated with vesical exstrophy for penile reconstruction. An inflatable prosthesis may be inserted in the flap to provide erection. Akoz et al. [27] have used an iliac osteocutaneous flap for phalloplasty and a vascularized bone flap for imitating penile erection. Long-term results are promising in adults. Dynaflex hydraulic inflatable penile implants have been used [28,29] in thirty-five female-to-male transsexual patients with acceptable outcome.

Song et al. [30] had introduced the free anterolateral thigh flap (ALTF) as a new flap concept based on the septocutaneous artery. This 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 chimeric 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 [31].

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 [32]. In our unit we have used this flap for foot and leg defects as a free flap in 22 cases [33]. The length of the pedicle of this flap ranged from 10-14 cm. 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 as an alternative to radial forearm flap for phalloplasty.

PATIENTS AND METHODS

This study included 7 patients admitted to Plastic Reconstructive Surgery Unit, Tanta University in the period between August 2000 and September 2003. Their ages ranged from 10-29 years

with a mean of 18.5 years. Six patients were true male hermaphrodites, confirmed by phenotypic and chromosomal pattern. Pelvic U/S was done routinely to exclude the presence of any female internal sex organs. One patient was presented by post-traumatic amputation of the distal half of the penis.

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. They also decided that urethral reconstruction is not mandatory as they can urinate from their scrotal or perineal meatuses of their micropenis. The only exception is the post-traumatic case at which urethral reconstruction was mandatory. 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. One of the six hermaphrodite patients was presented to us with failed previous attempt of penile reconstruction.

All patients were operated on under epidural analgesia, except the patient aged 10 years, who was generally anaesthetized. The flap size ranged from 12 x 8 cm to 18 x 13 cm. No urethral reconstruction was done in any case except the post-traumatic one, where an island was made on the flap by de-epithelization of two strips 1 cm wide on each side. The proximal base of the flap was fixed in the suprapubic region in six patients. In the traumatic case the distal end of the flap was fixed to the penile stump. The pedicle was severed 2 weeks later.

Design of the flap:

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. The flap was designed around this point and its size ranged between 12x8 to 18x13 cm on the anterolateral aspect of the thigh. Preoperative photography documented the preoperative status and design of the flap (Fig. 1).

Operative technique:

Under epidural analgesia in six patients and general anaesthesia in one patient, 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 five cases. Dissection of them was done carefully and both musculocutaneous perforators were skeletonized without taking muscle cuff around them. In the other two 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 (Fig. 2). Harvesting the lateral cutaneous nerve of the thigh was done for its microneuro-anastomosis with the dorsal cutaneous nerve of the penis. One of the six hermaphrodite patients was presented to us with failed previous attempt of penile reconstruction (Fig. 3). Island (ALTF) was used with insertion of semi-rigid silicon penile prosthesis as stiffener for this case (Fig. 4).

Fashioning of the new phallus and its fixation in the suprapubic region in six cases. This was done in single stage in three cases. In the other three cases, the length of the pedicle has not allowed us to reach the midline. So, in a second stage, the flap was transferred in a waltzing fashion to the midline as a tubed jumped flaps. In the seventh one the distal end of the flap was fixed to the distal half of the amputated penis. Closure of the donor site with split thickness skin graft. Postoperative treatment included antibiotics, analgesics and vitamins.

RESULTS

This study was carried out on seven patients in the period between August 2000 and September 2003 with a follow-up period that ranged from 4 months to 35 months. Six of the patients were presented with true male hermaphrodite and the seventh one was post-traumatic amputation of the distal half of the penis. Their ages ranged between 10-29 years with a mean of 18.2 years. All patients were operated on under epidural analgesia, except the patient aged 10 years, who was generally anaesthetized. The flap size ranged between 12 x 8 to 18 x 13. The pedicle length was 10-14 cm with a mean of 12.4 cm. The operative time was 2-3 hours with a mean of 2.15 hours.

In all hermaphrodite patients, it was possible to fix the base of the flap in the suprapubic region

in the midline. This was done in single stage in three cases, while in the other three cases, it was mandatory to reoperate for fixation of the base of the flap in the midline in two stages. In the seventh case, "traumatic one" the distal end of the flap was fixed to the penile stump. The pedicle was severed two weeks later. In all patients with true male hermaphrodite, no urethral reconstruction was done as the patients can urinate from their scrotal or perineal meatuses.

In this series, insertion of semi-rigid silicon penile implant as stiffener was possible in one case. In two cases, insertion of inflatable penile prosthetic implants was done 3-6 months after complete healing. One of them married 8 months after insertion of the penile prosthesis and have enough rigidity for practicing normal sexual activity with good performance. No penile implant was used in the post-traumatic case.

Complete necrosis of the flap was not recorded in this series. Partial necrosis of the distal end of the flap at the second operation was found in one case out of the three jumped flaps and it healed completely with conservative measures. In the traumatic case, the post operative course was uneventful. In jumped flaps oedema was persistent in distal part of the flap for 3-6 months. It subsided by conservative treatment in the form of pressure garment and elevation of the reconstructed phallus with its fixation to a waist belt.

In the hermaphrodite patients, a sensate island ALTF was used with microneuro-anastomosis of the lateral cutaneous nerve of the thigh with the dorsal cutaneous nerve of the penis in three cases. In the tube pedicle flaps, this anastomosis was not possible. The sensation of the reconstructed phallus was described as excellent in two cases, while it was good in the third one. In the post-traumatic case 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 six cases (Figs. 5,6). Regular sexual activity and performance was accepted in the patient at which a semi-rigid silicon penile implant was used and was good in the other patient at which an inflatable penile prosthesis was used. It was not yet evaluated in the other case. In the post-traumatic partial loss of the penis regular sexual activity was delayed up to 13 months postoperatively as a result of decreased skin sensation of the reconstructed phallus and psychological upset of the previous trauma.

Fig. (1): Preoperative photograph of flap design.



Fig. (2): Intraoperative photograph showing the descending branch of the lateral circumflex femoral vessel taking its origin from the profunda femoris vessel.



Fig. (3): Preoperative photograph of a true hermaphrodite patient with failed previous attempt of penile reconstruction.



Fig. (4): Intraoperative photograph of the same patient showing insertion of semi-rigid silicon penile stiffener.



Fig. (5): Postoperative photograph of the same patient with good result.



Fig. (6): Postoperative photograph showing the reconstructed phallus with grafted donor site.

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 15 cases of phalloplasty in intersex patients at different age group. 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 [23,25,26,34].

Urethral complications represent the most frequent complication in free radial forearm flap. In our unit urethrocutaneous fistula was recorded in 58% of cases. In Fang et al. [35] phalloplasty series (56 cases), the urethrocutaneous fistula rate was 38/56 (67.8%). Fang et al. [25] reported 40.9% urethrocutaneous fistula in their transsexuals series. However, Perovic [19] 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.

Five major disadvantages of the radial forearm flap were recorded [36]. 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 [37] summarized these disadvantages in unsightly donor site scar especially in young female and skin graft breakdown with tendon exposure. However, we do not operate on transsexual cases because of moral and religious believes. Fang et al. [25] 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 10-29 with a mean of 18.2 years. Gilbert et al. [38] have done their series (11 patients) of phallic construction in prepubertal and adolescent boys. The age ranged between 12-18 years in Perovic

series [19]. However, in traumatic series (7 children) of Ochoa [39], 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 true male hermaphrodite in 6 cases and post-traumatic amputation of the distal half of the penis in one case. Traumatic amputation whether subtotal or total was the main indication [38-41]. Carcinoma of the penis was the indication of phalloplasty in Parkash et al., series [42]. Micropenis, intersex and vesical exstrophy were other main indications [19,20]. Female to male transsexuals represent the main indication of phalloplasty in the literature. This was clear in different series [16,34,35,25]. It is obvious that in our countries transsexuals are not given legal identity for moral and religious believes.

In our study, the flap size ranged between 12x8 cm to 18x13 cm and it proportionate to the patient body built and age. 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 [19].

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 one of the three jumped 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 [35]. However, partial flap necrosis were reported in 2 cases [19] and in one case [25].

In our series, oedema was persistent at the distal part of the jumped flaps for 3-6 months and it resolved by conservative measures. Lymphedema were reported for years after reconstruction of reattached traumatized penis in a boy aged 8 years old [39].

In this study, insertion of semi-rigid silicon penile implant was done in one case. It was sufficient for obtaining rigidity in the reconstructed phallus. In 2 cases, insertion of inflatable penile prosthetic implants was done 3-6 months after complete healing. One of them married 8 months after insertion of the penile prosthesis and have enough rigidity for practicing normal sexual activity with good performance. No penile implant was used in the post-traumatic case. Composite iliac crest to provide rigid support with lateral groin

skin flap have been used [17]. The osteocutaneous fibula free flap in obtaining rigidity sufficient for sexual penetration have been also used [23,24]. Fang et al. [25] have used free radial osteocutaneous flap for phalloplasty in 22 transsexuals with good result. No penile fracture was recorded. Kuzanov [43] have used finger transplant in creation, reconstruction and rigidity of the penis. An inflatable prosthesis had been used with an excellent outcome in 35 patients for obtaining rigidity in total phalloplasty [29]. Vascularized iliac bone had been used with good result for sufficient rigidity for a neophallus [27].

In this series, a sensate island ALTF was used with micro-neuro-anastomosis of the lateral cutaneous nerve of the thigh with the recipient nerves in three cases. The sensation of the reconstructed phallus was described as excellent in two cases and good in the other one. In the post-traumatic case impaired sensation of the reconstructed phallus was persistent for 9 months and gradually regained with medical treatment one year postoperatively. True genital sensibility was recorded in one-stage phalloplasty in transsexuals using modified Chinese forearm flap [16]. Genital sensibility is still increasing after a 14 month follow-up of Hage et al., series [34]. All postpubertal patients recovered erogenous sensibility in the reconstructed phallus and the ability to masturbate [38]. Hage et al. [34] recorded that in all cases of free radial forearm flap phalloplasty, tactile sensitivity recurred in the neophallus. However, erogenous sensibility should not be expected. Decrease skin sensibility of reconstructed traumatized phallus was reported in a child aged 8 years old [39]. In hermaphrodite patients, we preserve the micropenis on one side of the reconstructed phallus, so, it may help in the genital sensation during sexual intercourse. In their series (22 cases) of female-to male transsexuals, they preserve clitoris intact in all cases for erotic sensation and all neophalli gained protective sensation within 9 months [25].

In this study, regular sexual activity and performance was accepted in the patient at which a semi-rigid silicon penile implant was used and was good in the other two patients at which inflatable penile prosthesis were used. It was not yet evaluated in the other case. However, in the post-traumatic partial loss of the penis regular sexual activity was delayed up to 13 months postoperatively as a result of decrease skin sensation of the reconstructed phallus and bad memory of the previous trauma. The reconstructed phallus was adequate as a urinary conduit but was unsuitable for sexual function [42]. No penile fracture had been recorded in the nine

cases that have regular sexual activities [25]. The sexual performance on regular basis was rated as highly satisfactory [25,26].

The island anterolateral thigh flap "ALTF" is an option for phalloplasty. 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 2.15 hour in this series. The operation can be done under epidural analgesia. The flap is potentially sensate one which is an important feature in phalloplasty. There is no need for giving anticoagulants with their 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 can be used for phallus reconstruction especially when the radial forearm flap is not available or not accepted by the patient. We consider this flap a versatile option for phalloplasty.

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