Versatility of the Pedicled ALT Flap in Defect Reconstruction: Experience of a Unit in Rural Sub-Saharan African

Peter Nthumba

AIC Kijabe Hospital, Kijabe, Kenya, and Institute of Social and Preventive Medicine, University of Bern, Switzerland
Correspondence to: Peter Nthumba. Email: nthumba@gmail.com

Abstract

Background: The free anterolateral thigh flap with its large caliber vessels, a reliable skin territory and minimal donor site morbidity is the reconstructive surgeons' workhorse. The pedicled flap though not as popular, has been used extensively for the reconstruction of defects from the mid-leg to the epigastrium. The favorable profile of the anterolateral thigh flap, with minimal variability of its vascular anatomy and donor site complications is well described in most races; literature of its use in sub-Saharan Africa is scanty. **Methods:** The author describes the use of the anterolateral thigh flap in a series of 17 patients in a rural African hospital, illustrating its versatility as well as the complications associated with its use in this patient population. **Results:** Seventeen patients with twenty antero-lateral thigh flaps were followed for an average of 24 months. **Conclusions:** The pedicled antero-lateral thigh flap is an excellent reconstructive tool with very good results in the black African population. This versatile flap has low donor site morbidity. The risk of developing hypertrophic scars and keloids remains a real concern in Black patients and longer term follow-up and a larger number of patients are needed to establish this potential complication.

Key words: Anterolateral thigh flap, Africa

Ann Afr Surg. 2018; 15(1):34-39
DOI:http://dx.doi.org/10.4314/aas.v15i1.8

Introduction

The free anterolateral thigh (ALT) flap with its large caliber vessels, reliable skin territory and minimal donor site morbidity is the reconstructive surgeons' workhorse. Flap components can be customized depending on the needs of the defect to include any or all of the following: skin paddle(s), fascia, and vastus lateralis muscle. The pedicled ALT flap though not as popular, has been used for the reconstruction of defects from mid-leg to the epigastrium (1-5). There is limited literature on the use of the ALT flap in black Africans (1-3). Its vascular anatomy, intra-individual, intra- and inter - racial variability in Caucasians and Asians have been widely reported (5). In black Africans on the other hand, the ALT flap vascular anatomy is largely presumed to be similar to that described in other races as reported anatomical and clinical studies are scanty (7). While skin flap perforators classically originate from the descending branch of the lateral circumflex femoral artery, a wide variability including complete absence has been described (8). To avoid intra-operative complications therefore, some authors advocate for pre-operative vascular studies (6-8). However, considering the favorable profile of the ALT flap, the cost implications of vascular studies and other difficulties related to our clinical and social environment, we do not require vascular studies for our patient population. An internet search using the Google® search engine and PubMed for 'anterolateral thigh flap Africa, African, Kenya' and Bioline International and African Journals Online sites for 'anterolateral thigh flap' returned two papers (1, 2). PubMed had one additional paper (9). The limited literature on the use of the ALT flap in black Africans

Table 1: Patient Characteristics

	S	Age	Diagnosis	Surgical procedure	Complication	Scar
1	M	50	Abdominal wall fibrosarcoma	Full thickness anterior hemi-abdominal wall reconstruction	Recurrence at 3 months	Normal
2	M	35	GSW to anterior abdominal wall	Full thickness abdominal wall reconstruction	None	Normal
3	M	10	Abdominal wall wound dehiscence	Full thickness abdominal wall reconstruction, with VL muscle left within infected pelvic cavity	None	N/A
4	M	20	Ectopia vesicae	Reconstruction of umbilicus (skin island), midline abdominal fascia and bladder-neck angle with VL	Partial incontinence	N/A
5	M	45	Fournier's gangrene	Scrotal reconstruction	None	Normal
6	M	42	Condylomata acuminatum	Scrotal reconstruction	Recurrence at 6 months	Normal
7	M	40	Post-traumatic hip disarticulation	Fasciocutaneous ALT reconstruction	None	Normal
8	F	9	Post-traumatic complex perineal/pelvic injury	ALT/VL reconstruction	None	Hypertrophic scar
9	M	30	Degloved infected knee joint	Reverse ALT/VL	Flap tip necrosis (MDR infection)	Normal
10	M	35	Urethral stricture post GSW/urethral beard	ALT urethroplasty	None	Normal
11	M	50	DSD	Phalloplasty*	Flap failure (MDR infection)	Normal
12	M	20	Peno-scrotal lymphedema	Excision and reconstruction	None	Normal
13	F	25	Post-burn abdominal wall contracture	Contracture release	None	Normal
14	M	36	Condylomata acuminatum of the penis	Penile reconstruction*	Urethral dehiscence	Normal
15	M	27	Post-electrical burn total penectomy	Penile reconstruction	Skin graft loss	Normal
16	M	35	Fournier's gangrene	Scrotal reconstruction	None	Normal
17	M	40	Fournier's	Scrotal reconstruction	Flap failure	Normal

DSD – Disorders of sex development
MDR – Multi-drug resistant
N/A – Not reviewed after 6 weeks
* – Contralateral thigh ALT perforators anomalous
ALT – Antero-lateral thigh flap
VL – Vastus lateralis muscle
GSW – Gunshot wound S – Sex

prompted a review of the author's experience with the pedicled ALT flaps in a series of 17 black African patients.

Methods

Charts of all patients who had a pedicled ALT flap in our institution between 2009 and 2016 were reviewed.

Case Presentations

A total of 17 patients were managed with a pedicled ALT flap over this period (Table 1).

There were 15 males and two females, aged 9 to 50, (average 32 years). Eight patients (47%) were treated for post-traumatic defects (Figure 1). The patients were followed up for between 6 and 48 months. Four illustrative cases are described.

Case 1

A 35 year-old young man who had sustained a gunshot wound injury to his abdomen and pelvis six weeks prior to referral to the authors' institution presented with injuries of the urinary bladder and bowel. Following his initial surgery, he had undergone multiple attempts to close the anterior abdominal wall because of repeated abdominal wound dehiscence. A final attempt at abdominal wound closure using an abdominal wall component separation failed (Figure 1).

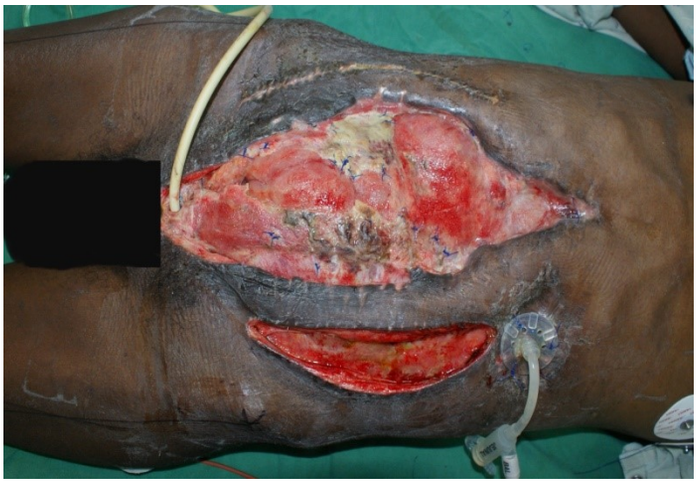

Figure 1: Necrotic rectus fascia and granulation tissue on bowel after a failed component separation

A pedicled fasciocutaneous ALT flap was used to reconstruct the full thickness abdominal wall defect. A larger fascia component was taken to cover the much larger fascial defect. A two layer water-tight closure was performed, and wound closure achieved. A split thickness skin graft was used to cover the donor site. At three months, there was no evidence of hernia, and all wounds had healed (Figure 2).

Figure 2: Three months after ALT reconstruction

Case 2

A 35 year-old male sustained a gunshot wound injury to his pelvis 10 years prior to his presenting to our hospital. He had sustained injuries to his rectum and urethra; a sigmoid colostomy and suprapubic cystostomy had been used to divert stool and urine, respectively. On examination, he had a 'watering can perineum' (10). In 2009, the perineal fistuli were excised, and the urethra reconstructed with a 'Singapore flap' (11). Post-operatively he had a good voiding stream for about a year, after which he started straining. Subsequently, he noted urine leaking from his anus. An attempted urethroscopy failed as the urethra could not be visualized beyond the site of the previous anastomosis. The urethra was also lined with a lot of hair. When contrast was instilled into the bladder, it leaked into the rectum, though a prostato-rectal fistula. A urethral exploration was performed: intra-operatively, the urethra was found to have been completely obstructed by a urethral beard and three stones (Figure 3). Immediately proximal to this obstruction was the prostato-rectal fistula. An ALT flap with no skin was elevated, and a full thickness groin skin graft used to line the urethra, to replace the segment reconstructed using the Singapore flap, as the thigh skin was also hairy. Skin lining on the inside was avoided because of the risk of developing a urethral beard. At 3 weeks follow-up, the urethral catheter was pulled out (Figure 4). He has a good voiding stream, with no rectal leak.

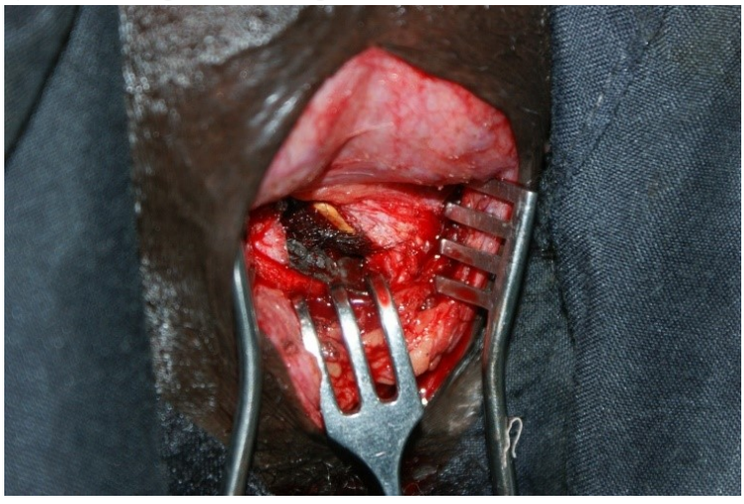

Figure 3: Urethra obstructed by a urethral beard and stones. Note dark skin lining the urethra from a 'Singapore' flap

Figure 4: ALT flap in place after urethral reconstruction

Case 3

A 30 year-old male was transferred to our institution after initial care at another facility for injuries to all four limbs following a motor vehicle accident. All the wounds were heavily infected. The left leg required a below-knee amputation. The right knee was infected with exposed necrotic bone (Figure 5). In order to preserve this extremity, a reverse ALT flap with vastus lateralis muscle was used to cover the knee joint and proximal exposed tibia. Flap tip necrosis resulted from the infection; this was debrided, and the defect covered with a split-thickness skin graft (Figure 6). Pus drainage ceased three weeks post-operatively. This knee infection led to a spontaneous knee joint arthrodesis. At one year, he underwent knee arthrolysis and interposition arthroplasty after which he was able to walk with the aid of crutches and a prosthesis on the other leg.

Figure 5: Infected, exposed knee joint and proximal leg

Case 4

This was a 45 year-old diabetic male with scrotal Fournier's gangrene. The entire scrotum was debrided, and the testes buried in the medial thighs (Figure 7). He was referred to the Plastic surgery unit for scrotal reconstruction. After re-creation of the defect (Figure 8) an ALT flap was used to reconstruct a neo-scrotum (Figure 9).

Figure 6: Defect reconstructed with a reverse ALT flap.

Figure 7: Scrotum completely debrided after a Fournier's gangrene and the defect grafted

Figure 8: Defect recreated prior to ALT reconstruction

Figure 9: Neo-scrotum healed

Discussion

The ALT flap is perhaps the most versatile flap currently in use in reconstructive surgery; literature is replete with its use for different defects (4, 5). It may be used for small defects as reported in case 2, but may also be used for extensive defects, as in case 1. While its foremost use is as a free flap, its use as a pedicled flap may also be unrivalled; the possibilities presented by pedicle size and length, the size of the flap that can be harvested, and the different components that can be included, as well as the fact that a reverse flap can be raised, make it a favourite reconstructive choice for defects within its area of reach (12, 14). Gravvanis et al reported excellent blood flow in reverse ALT flaps they used for the coverage of knee and proximal leg defects (13). The reverse ALT proved useful in preserving the second lower extremity in Case 3.

The pedicled ALT flap is very attractive to the reconstructive surgeon in sub-Saharan Africa as it avails a versatile, dependable flap without the need for microsurgical anastomosis. Post-traumatic and post-oncologic defects offer the most challenging reconstructive needs because of their complexity (1-3). As evidenced by the four cases presented above, reconstruction options are as numerous as the defects requiring reconstruction. The fascial component of this flap has proven indispensable in the reconstruction of fascial defects of the anterior abdominal wall, especially in patients in whom the use of mesh is either contraindicated or unavailable. Five of the patients in the current series required abdominal fascia reconstruction – for these, mesh repair was not an option; four had ongoing abdominal or wound sepsis with exposed bowel, while the fifth, an adult with untreated ectopia vesicae, required a more complex reconstruction than mesh would have offered. Further, six of the patients reported in the current series were not expected to return for follow-up as they would have no means to do so. These patients were discharged home after their wounds were healed, and encouraged to stay within easy reach of the hospital prior to going back home. One patient was thought to have penoscrotal condylomata acuminatum preoperatively, but histology was reported as lymphedema.

Clinically significant variations in the vascular anatomy of the ALT are well reported (6-8). In the current series, three patients (20% of 20 the ALT flaps raised) did not have identifiable ALT perforators in one limb. In all three patients, a Doppler signal suggestive of a perforator of the descending branch of the lateral circumflex femoral artery turned to be a perforator through the rectus femoris muscle, and an attempt to convert it so that we could use the ascending branch of the lateral circumflex femoral artery system was unsuccessful, and the flap harvesting was aborted in all cases. ALT flaps were successfully raised from the contralateral sides in two patients; these two flaps, and all the other flaps in the series conformed to the classic vascular anatomy. A third flap had abnormal veins, and although the flap appeared vascularized immediately after inset, we had to repeatedly manipulate the position of the multiple veins draining the main pedicle vein.

Experience from this small series suggests that as found in studies in other races, the majority of black African patients have an ALT vascular anatomy consistent with that described in literature. There were two complete flap failures; one flap and (the flap tip necrosis in a reverse ALT) were associated with multi-drug resistant infections, while the second complete loss was the result of venous congestion. There were no other flap-related complications, even though seven flaps had been used to reconstruct infected recipient sites.

The average follow-up in this series is 24 months; there has been only one hypertrophic scar in a child (Table 1).

Conclusion

The pedicled ALT flap is an excellent reconstructive tool with very good results in the black African population. This versatile flap has low donor site

morbidity. While our experience suggests that scar complications in this patient population remains low, the risk of developing hypertrophic scars and keloids remains a real concern, longer follow-up and a larger number of patients is needed to establish this.

Disclosures:

The author has no disclosures to make. No grants were given for this work, and no financial benefits are expected from this work. Parts of this paper were presented at the 13th Scientific Conference of the Surgical Society in Mombasa, March 2013. Written informed consent was obtained from the patient for the publication of this paper and any accompanying images. There is no association between the author with any commercial firm, and no grants were given for this article. There are no competing interests in the publication of this article.

References

1. Nthumba P, Barasa J, Cavadas P, et al. A Pedicled Fasciocutaneous Anterolateral Thigh the Reconstruction of a Large Post-oncologic Abdominal Wall Resection Defect. Ann Plast Surg. 2012; 68:188-9.
2. Nthumba PM, Ngure P, Nyoro P. Giant Condyloma Acuminatum of the Scrotum in a Patient with AIDS: a Case Report. J Med Case Rep. 2011; 5:272.
3. Descamps MJ, Hayes PM, Hudson DA. Phalloplasty in Complete Aphallia: Pedicled Anterolateral Thigh Flap. J Plast Reconstr Aesthet Surg. 2009; 62(3):e51-4.
4. Nasajpour H, Steele MH. Anterolateral Thigh Free Flap for "head-to-toe" Reconstruction. Ann Plast Surg. 2011; 66:530-53.
5. Neligan PC, Lannon DA. Versatility of the Pedicled Anterolateral Thigh Flap. Clin Plast Surg. 2010; 37:677-81.
6. Rozen WM, Ashton MW, Pan WR, et al. Anatomical Variations in the Harvest of Anterolateral Thigh Flap Perforators: A Cadaveric and Clinical Study. Microsurgery. 2009; 29:16-23.
7. Sinkeet SR, Ogeng'o JA, Elbusaidy H, et al. Variant Origin of the Lateral Circumflex Femoral Artery in a Black Kenyan Population. Folia Morphol (Warsz). 2012; 71:15-8.
8. Lakhiani C, Lee MR, Saint-Cyr M. Vascular Anatomy of the Anterolateral Thigh Flap: A Systematic Review. Plast Reconstr Surg. 2012; 130:1254-68.
9. Giessler GA, Cornelius CP, Suominen S, et al. Primary and Secondary Procedures in Functional and Aesthetic Reconstruction of Noma-associated Complex Central Facial Defects. Plast Reconstr Surg. 2007; 120:134-43.
10. Segovis CM, Dyer RB. The "watering can perineum". Abdom Radiol (NY). 2016; 41(6):1214.
11. Wee JT, Joseph VT. New Technique of Vaginal Reconstruction using Neurovascular pudendal-thigh Flaps: A Preliminary Report. Plast Reconstr Surg. 1989; 83(4):701-9.
12. Hsu H, Chien SH, Wang CH, et al. Expanding the Applications of the Pedicled Anterolateral Thigh and Vastus Lateralis Myocutaneous Flaps. Ann Plast Surg. 2012; 69:643-9.
13. Gravvanis AI, Tsoutsos DA, Karakitsos D, et al. Application of the Pedicled Anterolateral Thigh Flap to Defects from the Pelvis to the Knee. Microsurgery 2006; 26:432–8.
14. Wong CH, Goh T, Tan BK, et al. The Anterolateral Thigh Perforator Flap for Reconstruction of Knee Defects. Ann Plast Surg. 2013; 70:337-42.