

Pediced Radial Forearm Flap in Reconstruction of Complex Defects in the Craniofacial Region

Abstract

The radial forearm flap is a fasciocutaneous flap that has been used for reconstructing defects in the craniofacial region, either as a free flap or a pedicled flap. The pedicled radial forearm flap is a reliable option for reconstructing scalp defects. Microvascular free tissue transfer has, however, remained the preferred choice in the reconstruction of most complex scalp defects in the craniofacial region. We present the cases of a 37-year-old woman with an ulcerated malignant lesion on the forehead and a 40-year-old woman with a large malignant tumor on the scalp. Excision of both lesions, which turned out to be squamous cell carcinomas, resulted in complex defects that were reconstructed with pedicled radial forearm flaps. Both patients had satisfactory results and were counseled for radiotherapy.

Keywords: Craniofacial reconstruction, pediced radial forearm flap, radial forearm flap, scalp reconstruction

Introduction

The radial forearm flap is a fasciocutaneous flap that has been used in the reconstruction of various complex defects in the craniofacial region, either as a free flap or a pedicled flap.^[1-3] The pedicled forearm flap has been used in the reconstruction of diverse forearm defects,^[4,5] and the procedure could be a single-staged one.^[5] This is not feasible for the reconstruction of defects in the head and neck region, where it should be at least two-staged.

The pedicled radial forearm flap is a viable option in a few cases of craniofacial defects requiring reconstruction, especially if there is a challenge in the use of a free flap.^[6] It is also an option for elderly patients and some patients with pre-existing vascular pathology.^[7] Microvascular free tissue transfer has remained one of the most important advances in head and neck reconstruction. The free radial forearm flap is one of the options for the reconstruction of complex defects in the craniofacial region.^[8] Its disadvantages include a relatively long operative time, the need for significant technical expertise, and the need of having some facilities.^[9] Microvascular free tissue transfer has, however, remained

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the preferred choice in the reconstruction of most complex defects in the craniofacial region though it has the disadvantages of being expensive and resulting in longer operation time.^[9] This review will discuss the use of a pedicled radial forearm flap in complex scalp and forehead reconstructions.

Case 1

A 37-year-old Igbo woman was referred by the dermatologists on account of a large ulcer on the right half of the forehead. The wound had lasted for 3 years. It started as a papule on the right side of the forehead but progressively increased in size to about 8 cm in diameter. It was mildly painful, itchy, and ulcerated following excoriation by the patient. The lesion was not pigmented, and the patient was not an albino. There was, however, an associated vitiligo that was noticed from childhood, which was progressive and had lasted up to 20 years. There were no other masses on her body, no associated headache, and no associated visual impairment. There was also no history of weight loss. Various patent medicine dealers were treating her for 2 years prior to presentation, and only went to a hospital just a week before the time she presented to us. The family and social histories were not contributory.

How to cite this article: Achebe JU, Okwesili OR, Uche EO. Pediced radial forearm flap in reconstruction of complex defects in the craniofacial region. *J West Afr Coll Surg* 2023;13:111-5.

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Received: 30-Nov-2022

Accepted: 03-Jul-2023

Published: 16-Sep-2023

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Access this article online

Website:

www.jwacs-jcoac.com

DOI: 10.4103/jwas.jwas_296_22

Quick Response Code:



On examination, she was found to be fully conscious and physically stable but had generalized hypopigmented patches. The ulcer occupying the right half of her forehead measured 8 cm by 5 cm by 1.5 cm [see Figure 1]. The edge was raised, the floor had a moderate amount of slough with exuberant granulation tissue at the medial aspect, and skull was not exposed. The surrounding skin was hyperemic but not tender. Part of the base was fixed; there were no regional adenopathies in the cervical area. There was no visual impairment and no neurological deficit. A diagnosis of right fronto-orbital malignant ulcer in a patient with vitiligo was made. The Allen test was done because the radial forearm flap was considered the flap to be used for soft tissue cover, and it was found to be satisfactory in both upper limbs.

A cranial computed tomography (CT) scan with contrast and bone window was done, and this revealed a cutaneous lesion with right frontal bone erosion but no intracranial tumor. Histopathology report of incisional biopsy showed the lesion to be a well-differentiated squamous cell carcinoma.

Surgical Procedure

At surgery, we noted an 8 cm by 6 cm right frontal malignant ulcer with cranium and frontal sinus infiltration. The first part of the surgical procedure was a complete tumor excision which involved a right fronto-orbital craniectomy and right frontal sinus exenteration. The excision margins were between 5 and 10 mm. The dura was intact, and the brain was pulsating. A forehead wound of 9 cm by 9 cm dimensions was noted, and there was a small bony defect in the inferior aspect that was exposing the dura [see

Figure 1]. Subsequently, a 10 cm by 10 cm distally based radial forearm flap was raised from the right upper limb [see Figure 2]. The flap was first raised from the incision made on the ulnar aspect, the fascia was included in the flap, and dissection was maintained in the subfascial plane until the intermuscular septum was reached. The paratenon over the flexor carpi ulnaris tendon was preserved during dissection. The radial side of the flap was then dissected before ligating and transecting the radial artery proximally, and the flap was then mobilized and applied on the primary defect. The secondary defect on the forearm was covered with a split skin graft.

The second surgery was the flap division and inset that was done 3 weeks later under local anesthesia, and the patient was discharged about 3 weeks after the flap inset. She was seen at the clinic and was worked up for radiotherapy. She was satisfied with the immediate result [see Figure 3]. She was sent to do radiotherapy in another hospital about 2 months post-op, but she did not come back afterward.



Figure 1: The malignant ulcer and the defect after excision of lesion

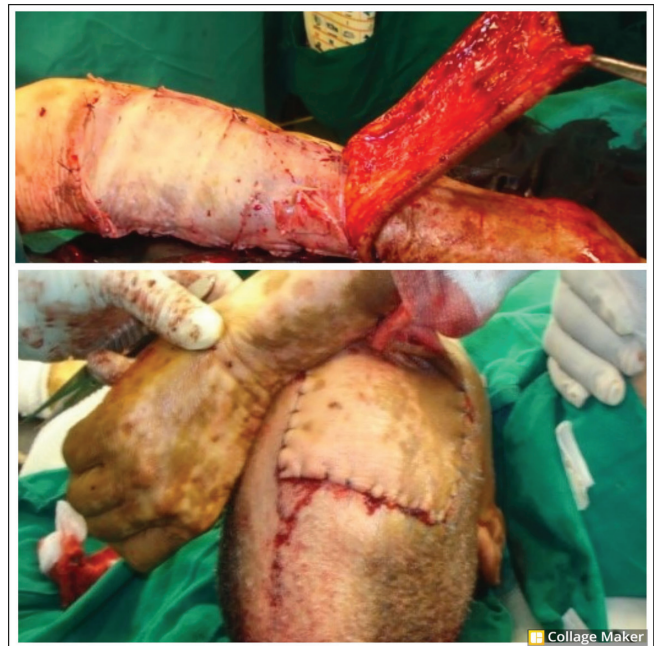


Figure 2: The radial forearm flap was used in covering defect



Figure 3: The forehead after reconstruction with flap

Case 2

A 40-year-old woman presented to the clinic with a recurrent ulcerated scalp growth of 3 years duration. It arose from an old scar on the posterior aspect of the scalp. This old scar she had resulted from thermal burns from hot oil, which she sustained as an infant, and it affected the scalp, right shoulder, and upper limb. The growth was painless. It ulcerated spontaneously and bled occasionally. She had a smaller growth from the same scar 7 years prior to presentation, which was excised, but the biopsy result was not available. There was no associated headache, no vomiting, and no weakness or numbness of any part of the body. She also had no visual impairment. She had not received any significant treatment for the ulcerated lesion though she went to a private hospital that referred her to our hospital. Her family and social histories were not contributory.

On examination of the head, there was a scalp lesion that extended from the occipital region to the anterior part of both parietal scalps; the occipital part was nodular, but the parietal aspect was ulcerative [see Figure 4]. It was attached to the scalp and fixed to the skull. The lesion was surrounded by scar tissue which was hypertrophic with some hypopigmented elements. There were palpable occipital lymph nodes. On examination of the right upper limb, there were amputated digits with their stumps ending at the level of the proximal phalanges with contiguous burnt skin scar. Diagnosis of Marjolin's ulcer of the scalp was made, and a CT scan showed a soft tissue mass with pressure erosion of the adjacent bone. The histopathology of the incisional biopsy of the tumor showed it to be a squamous cell carcinoma.

Surgical Procedure

At the time of the operative surgery, the patient had a giant fungating, highly vascularized, and occipital scalp tumor that was extending from the nape of the neck to the posterior parietal scalp, and there was a mid-occipital/calvarial erosion. There were enlarged left occipital lymph nodes that appeared to be infiltrated by a tumor. The tumor was excised with a 2cm normal margin. Excision of the lesion and removal of the necessary outer cortex of the parietal bone took time. The flap cover was therefore postponed. The post-operative condition was satisfactory.

The second surgery was done one week later. The soft tissue defect was 14cm by 10cm in size, and the defect in the outer cortex of the parietal bone was 6cm by 4cm [see Figure 4]. The postexcisional occipito-parietal defect was covered with a distally based radial forearm flap of the right limb [see Figure 5]. The secondary defect was grafted with a split skin graft, and the right upper limb was supported with a plaster of paris (POP) slab. Flap division and inset were done under local anesthesia 3 weeks later, and the patient was discharged a few weeks after. Her wound

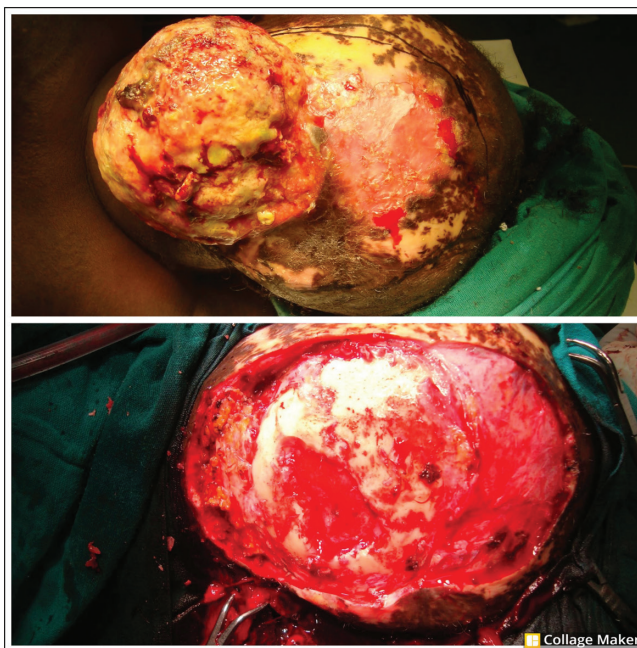


Figure 4: Occipital tumor and resulting defect after excision of tumor

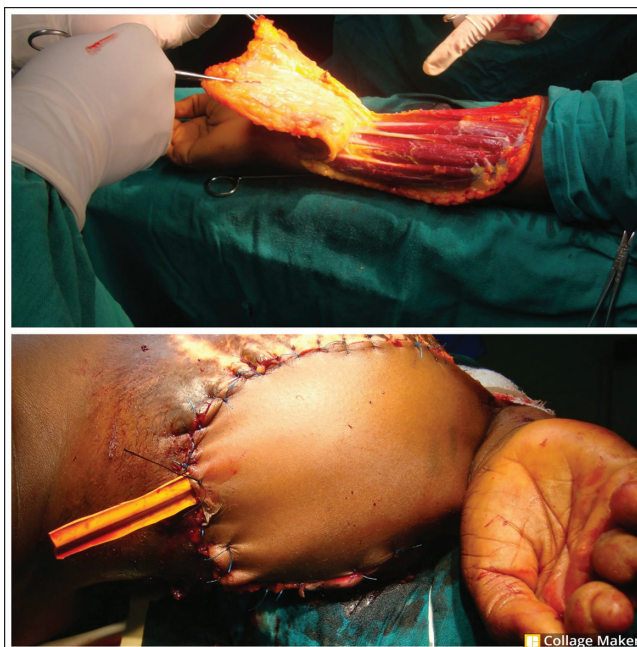


Figure 5: Pedicled radial forearm flap used in covering the scalp defect

healed satisfactorily [see Figure 6]. She was counseled for radiotherapy. She accepted and went for it, but she was eventually lost to follow up.

Discussion

Complex defects in the craniofacial region are by their nature wide and deep and occasionally in the background of radiation therapy which has been administered preoperatively or anticipated postoperatively. Such complex defects cannot be appropriately reconstructed by simple

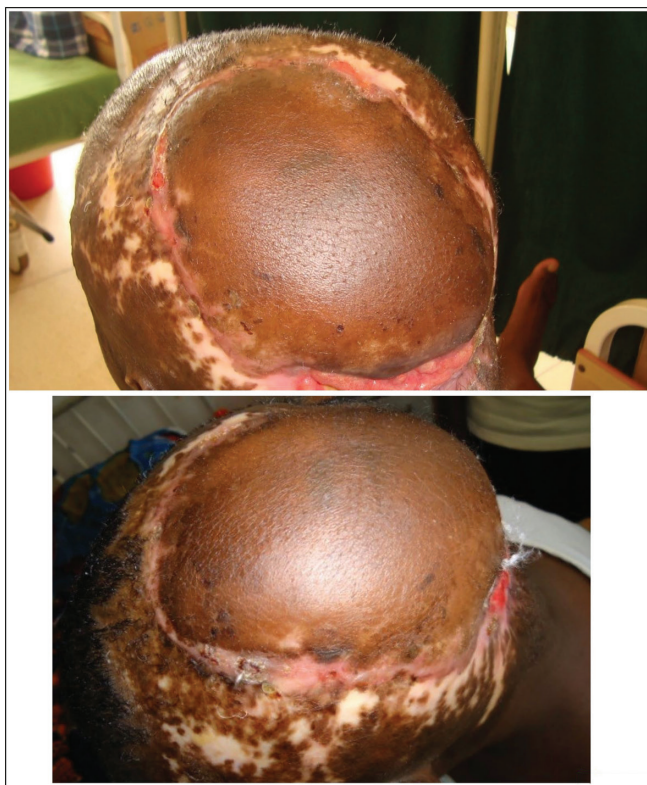


Figure 6: Posterior and lateral views of the reconstructed scalp

methods like split-thickness skin grafts or local and regional flaps. Flaps from a distant site will be required. Where facilities and expertise for microvascular surgery exist, such defects are usually reconstructed with free flaps, and there are several sources of such flaps.^[1,2,10] However, in a developing country like ours, where facilities and expertise for microvascular surgery are not uniformly available, such complex craniofacial defects present difficult reconstructive challenges. To transfer a distant flap to the craniofacial region in the conventional way of migrating a tubed flap is time consuming and with unpredictable outcome.

To address this problem, Govila *et al.* introduced the use of a radial forearm flap in which a distally based flap is elevated in the forearm and brought to the craniofacial defect for inset.^[3,4] The second stage, which is a division of the flap pedicle and completion of the inset, is done in about three weeks. This is usually a minor surgery under local anesthesia. Many other surgeons have pedicled radial forearm flaps in a similar way for craniofacial reconstruction.^[7,11-13]

Our method is similar to that of Govila^[3] but with an important difference. Unlike the previous report, we did not find it necessary to use an island radial forearm arm flap with a long vascular pedicle, which may be prone to kinking and vascular spasm that could compromise the viability of the flap if the vascular pedicle is not meticulously protected with a split-thickness skin graft. In the patients presented, the flaps completely survived and effectively covered the defect.

A few downsides to the use of the radial forearm flap in this way is the need to immobilize the upper limb to the trunk and craniofacial region using light POP and crepe bandages for at least 3 weeks. A stick padded with POP was used as a supporting strut between the trunk and the elbow slab. Physiotherapists were invited to aid the patient exercise the digits and shoulder joint after the skin graft had been taken. However, there was mild joint stiffness of the wrist and elbow joints, but these were amenable to physiotherapy.

We found the pedicled radial forearm flap effective in the reconstruction of complex defects in the craniofacial region in our two patients. In situations where facilities and expertise in microvascular surgery are not available, it should be considered. The method does not require any special training^[3] and is within the competence of a general plastic surgeon.

Conclusion

A radial forearm flap is very useful in head and neck reconstruction. It is widely used as a free flap in such reconstructions. The pedicled radial forearm flap is still an option in places that lack facilities or expertise for microvascular free tissue transfer and a few other situations.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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