Bilateral latissimus dorsi flaps for the reconstruction of extensive scalp defects

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BACKGROUND: The reconstruction of large scalp defects is occasionally required. Several methods of scalp reconstruction have previously been described. This paper presents the authors' experience with two patients in whom traditional methods were not sufficient and in whom bilateral latissimus dorsi free flaps were required.

OBJECTIVES: To evaluate the effectiveness of a new technique in reconstructing extensive scalp defects.

METHODS: Two case histories are presented. These include the rationale for the choice of reconstruction used as well as a discussion on the technical features of the surgery.

RESULTS: Reconstruction was effective in both cases. However, one patient died in the early postoperative period from a pulmonary embolus.

CONCLUSIONS: Bilateral latissimus flaps can be safely and effectively used in closing massive scalp defects in selected cases.

Key Words: Latissimus dorsi; Scalp reconstruction

Defects of the scalp are commonly caused by traumatic avulsion, burns, and following tumour resection. While basal and squamous cell carcinomas are the most common tumours, other lesions are occasionally seen. These include tumours such as soft tissue sarcomas, as well as arteriovenous malformations, osteomyelitis and osteoradionecrosis. While smaller defects can easily be closed with local tissue, larger defects may require alternative approaches. In large defects, if the pericranium is intact, a split thickness skin graft is the simplest treatment. However, if the pericranium is resected or a skull defect exists, regional or free flaps may be indicated.

While local scalp flaps containing hair-bearing skin, subcutaneous tissue and galea provide durable cover with the added cosmetic advantage of hair, they fail to cover more than one-third of the surface area of the entire scalp (1). Thus, beyond a certain size, full-thickness defects of the scalp are not amenable to local flap repair. Moreover, if radiation has been used pre-operatively the vascular supply of local tissue may be compromised and local flaps in this situation may not be reliable. Free-flap transfer of distant healthy tissue from outside the irradiated field has allowed optimal wound closure in a single operative procedure. In addition, it is accepted that post-operative radiotherapy is well tolerated with minimal soft-tissue complications (2).

Many free flaps have been used to reconstruct the scalp. These include the latissimus dorsi (LD) (3,4), combined LD and

L'utilisation de lambeaux bilatéraux du grand dorsal pour reconstruire des anomalies étendues du cuir chevelu

HISTORIQUE : Il est parfois nécessaire de procéder à la reconstruction d'anomalies étendues du cuir chevelu. Plusieurs méthodes de reconstruction du cuir chevelu ont déjà été décrites. Le présent article présente l'expérience de l'auteur auprès de deux patients chez qui les méthodes traditionnelles n'ont pas suffi et chez qui il a fallu utiliser des lambeaux bilatéraux du grand dorsal.

OBJECTIF: Évaluer l'efficacité d'une nouvelle technique de reconstruction d'anomalies étendues du cuir chevelu.

MÉTHODOLOGIE : Deux présentations de cas sont décrites, ainsi que l'explication du choix du type de reconstruction retenu ainsi qu'une discussion sur les caractéristiques techniques de la chirurgie.

RÉSULTATS : La reconstruction a été efficace dans les deux cas. Cependant, un patient est décédé au début de la période postopératoire par suite d'une embolie pulmonaire.

CONCLUSIONS : Des lambeaux bilatéraux du grand dorsal peuvent être utilisés de manière sûre et efficace pour fermer des anomalies très étendues du cuir chevelu dans des cas sélectionnés.

serratus (5), omentum (6), scapula (7), rectus abdominis (8), radial forearm (9), iliac crest-internal oblique osteomyocutaneous flap (10) and a multiterritory (scapular, parascapular, LD and lateral thoracic) flap (11). In our experience, the LD free transfer is the flap of choice for many of these defects. It has a large available surface area coupled with an ability to drape over a convex surface. The pedicle is adequate in length to reach the superficial temporal vessels and the pedicle vessels are of ample diameter. Donor site morbidity is minimal, and the cosmetic appearance of the final reconstruction is excellent. Initially the muscle is too bulky but it atrophies quickly, producing a thin yet durable cover in the long term. Despite the large surface area of this muscle available to cover the calvarium, the muscle will, in exceptional cases, be inadequate to provide total cover of the defect. We present two such cases in which a single LD flap was inadequate to provide cover. In both of these cases a second latissimus free flap was completed to achieve final cover.

CASE PRESENTATION

Case 1 In 1997, a 44-year-old nurse presented with slowly progressive nodular lesions on her scalp. Her history of recurrent scalp lumps dated back to 1967 when her first such lesion was excised from the right temple. She had several recurrences as

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Figure 1) A and B Preoperative appearance of the scalp showing extensive lesions

well as the development of new lesions. Pathological diagnosis of these lumps was consistently reported as neurofibroma. It was not until 1994 when she had another excision and pathology review that the diagnosis of dermatofibrosarcoma protuberans was made. Following that time she had several further excisions followed by recurrence of the tumours. She was then referred to our centre. (Figures 1A and B)

Computed tomographic scan showed a bulky soft tissue mass that extended from the superior orbital rims and glabella to the posterior occiput. There was no evidence of bony invasion. A multidisciplinary team approach was taken, and a combined modality treatment plan was formulated. This consisted of preoperative radiation to a total dose of 50 Gy in 25 fractions to the entire scalp, from nasion to occiput, followed by radical surgical resection with appropriate reconstruction. The rationale for preoperative radiation allows for the delivery of a lower dose of radiation to a smaller target volume and is the method of choice in our program for such tumours (12).

Radical resection of the patient's scalp included the entire forehead and brow region as well as the scalp extending to the occiput posteriorly and from ear to ear coronally (Figure 2). The soft tissue scalp resection measured 32 cm from brow to occiput through the vertex and 32 cm from ear to ear through the vertex, an area of 984 cm². A left LD free muscle flap was



Figure 2) The surgical excision extended from nasion to occiput and from ear to ear. The pericranium was excised with the surgical specimen



Figure 3) Bilateral latissimus flaps are revascularized and sutured to each other in the midline

harvested and successfully anastomosed to the dissected left superficial temporal artery and vein. After the pretemporal incision was closed and the flap was inset along the caudal border of scalp resection, it became evident that the flap was not large enough to cover the entire defect. The contralateral temporal region was not covered. At this point, it was decided to harvest the opposite LD. After the second LD flap was reperfused by the right superficial temporal vessels, both flaps were inset at the periphery of scalp resections and sutured to each other in the midline (Figure 3). The muscles were covered with nonmeshed split thickness skin grafts. The patient's initial appearance is shown in Figure 4. Without revision, these flaps atrophied to the extent seen in Figure 5. She has been disease free for five years and her scalp skin remains stable (Figure 6).

Case 2

An 85-year-old female patient presented in 1998 with an extensive basal cell carcinoma of the skull. This lesion had been growing for 12 years and had been neglected by the



Figure 4) Early postoperative appearance showing extensive bulkiness of the flaps

patient, who kept it from her family by adjusting her hair. This subterfuge eventually became impossible. The patient consented to resection because of the need for daily dressings and the frequent extensive bleeding from the lesion. Composite resection of the basal cell carcinoma included a burring of the outer table of the anterior skull, as well as skin down to the nasal root, both upper eyelids, forehead, and scalp resection back to occiput. Once again, because of almost contiguous temporal lesions bilaterally, resection extended from ear to ear coronally. The defect was reconstructed with bilateral LD free flaps anastomosed to both the right and left superficial temporal arteries and veins. Again, muscle flaps were covered with nonmeshed split thickness grafts. This patient made a slow recovery because of her age but her flaps were stable with 100% graft take. Unfortunately on the 14th postoperative day she died unexpectedly of a pulmonary embolus.

DISCUSSION

The original plan in patient 1 did not include bilateral flaps. This decision was made intraoperatively when we realized that the defect was bigger than the surface area of the latissimus muscle. In patient 2, the double flap procedure was planned. In a radical scalp resection, as performed on both our patients, the area of defect requiring reconstruction measured 32 cm from brow to occiput and 32 cm from ear to ear (both measurements taken through the point of vertex). In contrast, the average dimensions of a LD are only about 38 cm \times 20 cm. Thus, it can be seen that when the pedicle from a single LD is anastomosed to the superficial temporal vessels and the free flap is brought over the vertex of the skull, though the width of the flap can adequately reconstruct the scalp defect in the anteroposterior direction, its length is insufficient to reach the opposite ear.

In the past, other groups have reconstructed radical scalp defects using combined LD and serratus anterior muscle flaps (5) or even a multiple-territory flap involving LD, as well as scapular and parascapular territories (11). The method of a combined LD and serratus anterior free flap transfer could not provide the solution in our particular case. When the pedicle from this combination of flaps is anastomosed to the superficial temporal artery, the two muscles contribute to increasing scalp



Figure 5) Appearance of atrophic flaps without revision at one year postoperatively



Figure 6) Current appearance of patient, five years postoperatively, wearing a wig

coverage only in the anteroposterior direction. The combined flaps still do not cover the opposite temporal defect. Probably the only other flap that could be used to reconstruct the entire defect is the omental flap (1,13,14). Had the deficiency of the latissimus in covering the defect been appreciated in patient 1 we would likely have opted for that flap in the first place. However the aesthetic result of this initial reconstruction led us to do the same operation electively on patient 2.

A unique challenge encountered with our technique was the positioning of the patient during the harvesting of the second LD. After the left LD had been inset along the left caudal border of the scalp resection, dissection of the right LD and its revascularization to the right superficial temporal artery necessitated that the patient be turned on her left side. While the patient was turned on the left lateral decubitus position, it was crucial to ensure that no pressure be placed either on the latissimus muscle or its pedicle. A surgical headrest was modified to accommodate the flap. A hole was cut in it such that the flap could be rolled up and allowed to rest free of pressure inside the headrest. We used this modified surgical headrest in both of our patients.

CONCLUSIONS

We feel that in cases of radical scalp resection where a single LD is insufficient in reconstructing the entire defect, harvesting and revascularizing the second LD is an appealing option.

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