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MICROSURGICAL FREE FLAP RECONSTRUCTION IN LARGE COMPOSITE ONCO-SURGICAL DEFECTS OF THE SCALP: OUR INSTITUTE EXPERIENCE

Plastic Surgery

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ABSTRACT

Large composite scalp defects after onco-surgical resection for cutaneous malignancies presents as challenges for reconstructive surgeons. In this study we included 14 patients (8 males & 6 females), with mean defect size was 265.71 cm^2 and age range from 25 to 62 years. All defects created after excision of squamous cell carcinoma of scalp. Out of 14 defects, 5 composite defects were involving scalp, periosteum and calvarium; & 3 involved dura additionally. Study comprised of total 14 free flaps transfer of which 4 were latissimus dorsi muscle only flaps, 1 latissimus dorsi muscle flap with tensor fascia lata graft, 3 latissimus dorsi muscle with skin paddle, 1 latissimus dorsi muscle with serratus with parascapular flap & 5 anterolateral thigh flaps.

Overall outcome was 100% flap viability with no major donor site morbidity. 5 donor sites received split thickness skin graft, rest were closed primarily. We favor microsurgical free flap reconstruction in large defects of scalp after excision of malignancies.

KEYWORDS

Scalp reconstruction, Microsurgical reconstruction of scalp, Composite defects of scalp

Scalp malignancies are primarily skin cancers. Most of pathologic types are squamous cell carcinoma and basal cell carcinoma. It is difficult to find the early-stage tumors because they originate in hair bearing scalp[1]. After the tumors grow up to a certain large bulk, it will grow quickly with ulceration, bleeding, and suppuration. Tumor infiltration may involve the soft tissues, calvarium, and even the dura mater. Eventually it may be life threatening. Surgical resection of tumors is the most effective method and also a major reason of scalp defects, which often includes massive soft tissues and calvarium, and such complex defects represent a reconstructive challenge to plastic surgeons.

Calvarium exposed defects can't be treated with split thickness skin grafts. Small to moderate sized simple defects can be resurfaced with local flaps [2]. Large composite defects, even involving dura mater can reliably be treated with microsurgical tissue reconstruction with minimal morbidity. Muscle only, myo-cutaneous, fascio-cutaneous and chimeric flap are various types of tissues that are available for reconstruction [3,4].

Although disadvantages of microsurgical tissue transfers are also there, like longer duration surgery, need for microsurgical expertise, lack of hair growth in reconstruction tissue[4] . In this article we are describing our experiences with flap and recipient vessels selection; & microsurgical reconstruction for complex scalp defects; and to analyze outcomes.

Patients and methods

We recorded following data from patient's medical file: Age, sex, size of defect, flap type, recipient vessels, postoperative morbidity and follow-up. Scalp defect was divided into anterior, posterior and subtotal defect according to line of both ears which included 4 anterior scalp defects, 3 posterior defects and 7 subtotal defect.

In our study there were 8 males and 6 females with age ranging from 25 to 62 years . The mean defect size was 265.71 cm^2 (range 150-410). Out of 14, 5 resections included calvarial bone excision, 3 included dura mater additionally. Dura defects were reconstructed by tensor facia lata graft.

The study comprised of total 14 free microsurgical flaps transfer of which 4 were latissimus dorsi muscle only flaps, 1 latissimus dorsi muscle flap with tensor fascia lata graft, 3 latissimus dorsi muscle with skin paddle, 1 latissimus dorsi muscle with serratus with parascapular flap & 5 anterolateral thigh flaps. The sizes of flaps ranged from approx. 20-25 cm in length and from 15-20 cm in width. Muscle only flaps were covered with split-thickness skin graft, all of our patients had defects resulting from resection of scalp malignancies.

Recipient vessels included superficial temporal vessels in 5 cases, facial artery and vein in 9 cases. Vein graft was used in 1 case. To overcome the danger of venous thrombosis in superficial temporal vein we performed anastomosis with main trunk anterior to tragus.

Table:1 Patient's demographic data

No	Age (years)	Sex	Defect (qcm)	Flap used	Comments	Outcome (12 months)
1	30	M	410	ALT TFL composite -FC	Vascularized TFL graft used for dura defect	NER
2	40	F	350	LD+ SA+ parascapular	Skin paddle used on parascapular flap perforator	NER
3	55	M	250	ALT- FC		NER
4	62	M	390	LD- MC		NER
5	43	F	280	LD- M		R
6	59	F	160	LD- MC		NER
7	45	M	360	LD- M	Free TFL graft used for dura defect	NER
8	25	F	380	LD- MC	Skin paddle based on TDAP perforator	NER
9	39	M	200	ALT- FC		NER
10	52	M	150	LD- M		R
11	41	F	160	ALT- FC		NER
12	35	M	180	LD- M		R
13	33	F	220	ALT TFL composite -FC	Vascularized TFL graft used for dura defect	NER
14	55	M	230	LD- M		R

* Etiology in all cases was squamous cell carcinoma
* ALT- anterolateral thigh flap, LD- Latissimus dorsi flap, SA- serratus anterior, TFL- tensor fascia lata, M- muscle only, MC- myo-cutaneous, FC- fascio-cutaneous, r- recurrence, NER- no evidence of recurrence

FIGURE 1. 62 year man, SCC posterior Scalp (A), Large scalp defect including calvarium, dura intact (B), LDMC Flap planned (C), Harvested LDMC flap (D), Post op result at 3 weeks (E).

RESULTS

Overall flap viability rate was 100% and no morbidity was recorded regarding vessel compromise and donor site. We didn't observe leakage of CSF in any case. We followed up all patients for 12 months in view of recurrence. All except 3 patients healed very well without major complications. There was partial loss of skin graft in 2 cases due to hematoma under graft. In 1 case, superficial partial loss of ALT flap on distal aspect was noted. All 3 patients managed with local debridement and STSG application.

All donor sites healed satisfactorily. 2 ALT cases and 3 LD myo-cutaneous cases were covered with STSG at donor site, rest were closed primarily. All patients were satisfied with bulk and appearances of flaps except one with LD myo-cutaneous flap but revision was not done in that case.

DISCUSSION

After resection of scalp malignant tumor, resulting composite defect present as a considerable challenge to plastic surgeons[1-3, 7-9]. For ideal scalp reconstruction some factors should be considered, such as anatomic involvement of layers of scalp and general condition of patient. Detailed understanding of scalp anatomy and vascularization as well as general consideration of individual status are critical for good prognosis[5,6].

Because of non-survival, calvarium exposed defects can't be treated with split thickness skin grafts. Local tissue options for resurfacing of small to moderate sized simple defects include: rotation, advancement, transposition, specialized types like double hatchet flap, pin wheel flap and bipedicled fronto-occipital flaps for large defects of the lateral scalp[10]. Loco-regional flap to cover defects of posterior scalp is trapezius myo-cutaneous flap[11]. Drawbacks include uneven resurfacing of scalp due to STSG placement on donor site, lack of bulk, & lack of ability to reliably cover large and composite defects.

Another option to cover large defects is pre-expansion of nearby scalp by introduction of tissue expander, but expansion time to reach needed size of flap can range anywhere between 2 to 4 months. Obviously, patients with malignant tumor can not wait for such long time when other options are already available. Moreover, when patient presents with such a large tumor, it has already been ulcerated and suppurated. This criteria also present as exclusion of tissue expander placement. Although, in literature, this technique has been described for some low grade favorable malignancies[12-13].

Microsurgical reconstruction of scalp and head defects is considered now as low risk, low complication and low donor site morbidity procedure[14-17]. Owing to possibility of elevating large size free flaps, insetting using microsurgical techniques allows surgeon for wide and complete reception of malignant tumor keeping safe margins which leads to safe long term outcomes.

Advances in microsurgical techniques have provided reliable wound closures and with less donor morbidities simultaneously achieving single stage resurfacing, even in post irradiation or infection setting. Irradiated and infected cases have high probability of local flap failure[18].

There are multiple options of free tissue transfers that can be chosen for repair of scalp defects, such as free omentum covered by STSG, groin flap, LDMC flap, LDM flap covered by STSG, RAM flap, RF flap, scapular flap and ALT flap[16-20].

The LDMC is excellent choice for large scalp defect due to its large size, reliable & long pedicle anatomy, ease of harvesting and limited donor site morbidity. Need for intraoperative positional change will add complexity to procedure. Sacrifice of an important functioning muscle is also a disadvantage.

ALT fascio-cutaneous flap has gained its popularity in reconstruction of large and composite defects based on its long and large caliber pedicle, adjustable flap thickness, no sacrifice of major vessel or important muscle, two team approach, no changing of intraoperative patient position, less donor site morbidity and hidden scar. It can be used as sensate flap, and its vascularized fascia lata can be used to cover dura mater defect in water tight manner simultaneously. Thus, possibility of infection can be reduced[20].

In our study group, we used ALT fascio-cutaneous, LD muscle or myo-cutaneous flaps and their modifications. Wide resection of malignant tumors will result in large composite defect. We strongly advise that when planning the reconstruction always plan for a bigger flap in dimensions than anticipated. This will allow tensionless suture on convex scalp surface and comfortable vessel inset.

CONCLUSIONS

Patients presenting with malignancy of scalp require wide local resection and complex reconstruction. Large amount of tissues can be transferred into the resultant large composite defect with microsurgical free tissue transfer, especially with ALT fascio-cutaneous[20] and LD myo-cutaneous flaps[19]. Advantages include enough tissue reconstruction in single stage, vascularized fascia lata to reconstruct defect of dura, reliable flap survival even in irradiated environment, minimal complications and less donor site morbidity.

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