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Case Report

Single stage traumatic paediatric scalp defect reconstruction with free chimeric anterolateral thigh and vastus lateralis muscle flap – a case report

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Abstract

Introduction: Reconstruction of scalp defects is challenging for plastic surgeons as retaining functionality and achieving excellent cosmesis is essential. Various extensions of the anterolateral thigh (ALT) flap led to the introduction of chimeric flaps that are of immense benefit in complex reconstruction, especially in paediatric patients with favorable outcomes.

Aim: The delicate nature of paediatric patients and the minuscule anatomy warrant an effectual reconstruction method encompassing adequate soft tissue and bony coverage and acceptable cosmetic results due to the obvious scalp visibility.

Case study: We present a case of a 3-year-old boy who presented with a degloving left temporoparietal scalp wound with exposed parietal bone following a motor vehicle accident that necessitated immediate soft tissue coverage after wound bed preparation.

Results and discussion: The advancement in microsurgery has led to the development of various chimeric pattern flaps, which in our case utilizes free tissue transfer using free chimeric fasciocutaneous ALT flap and vastus lateralis muscle flap. By employing different tissue flaps with a long pedicle coming from the same vascular source, it gives more flexibility in complex reconstruction while avoiding donor site morbidity.

Conclusions: Free tissue transfer using free chimeric fasciocutaneous ALT flap and vastus lateralis muscle flap provides a single-stage reconstruction with sufficient tissue coverage and superior aesthetic outcomes.

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1. INTRODUCTION

Scalp defect reconstruction is demanding as it depends on several factors in determining the choice of reconstructive technique. The most common etiology of huge scalp defects are congenital, traumatic, and malignancy. The challenge in scalp reconstruction lies in attaining adequate soft tissue and bony coverage and acceptable cosmetic results due to its distinct visibility.

Multiple reconstructive techniques have been described in the literature, tailored to individual patients especially in children, as poorly reconstructed defects may leave a physically conspicuous scar, and traumatizing psychological effects as the patients grow. The advancement in microsurgery has led to the increased utilization of free tissue transfer in complex defects in paediatric populations with superior outcomes.[1]

2. AIM

The use of free tissue transfer in paediatric patients to cover complex scalp defects results in adequate coverage and excellent cosmesis. We present a case of a young boy with a degloving left temporoparietal scalp wound with exposed parietal bone following trauma that necessitated soft tissue coverage with free chimeric fasciocutaneous anterolateral thigh (ALT) flap and vastus lateralis muscle flap.

3. CASE STUDY

A 3-year-old boy, weighing 14 kg presented to our center following a motor vehicle accident while playing with his tricycle. He was a pedestrian and was hit and dragged by a moving car for 5 m. He sustained a degloving scalp injury over the left temporoparietal region with tissue loss measuring 9 × 6 cm, involving the body and tail of the left eyebrow and left upper eyelid, with a left temporal skull fracture. Surrounding this large wound was an abrasion of the skin around the left cheek region. The was another irregular wound on the right frontal region measuring 5 cm, with an intact periosteum (Figure 1). No other injuries were sustained and the patient was hemodynamically stable. The patient had undergone immediate definitive reconstructive surgery on day 7 post-trauma with free chimeric fasciocutaneous ALT flap and vastus lateralis muscle flap.[2] Intraoperative and postoperative period was uneventful, no complications were observed and the patient was discharged well.

The ALT perforators were first mapped using a handheld Doppler and the signal was reconfirmed preoperatively while the patient was in supine position under general anaesthesia. The perforators were identified through an imaginary line made midway between the anterior superior iliac spine and the lateral border of patella, 3 cm radius from the midpoint. The skin flap was marked while including the perforators. Prophylactic second-generation cephalosporin

Figure 1. Left temporoparietal scalp defect exposing parietal bone following trauma.

was given after general anaesthesia induction before skin incision.

The surgery proceeded with two teams. The first team was in charge of debriding the scalp defect and preparation of recipient vessels, while the second team was involved in harvesting the flap.

The left temporoparietal scalp wound was first debrided. Wound edges were refashioned until bleeding was seen, unhealthy temporalis muscle was trimmed and wound bed was curetted and washed with copious saline. Defect size was 9 × 5 cm. The parietal branch of superficial temporal vessels was identified and prepared as recipient vessels with the artery measuring 3 mm and the vein 3 mm.

Simultaneously, the ALT fasciocutaneous flap and vastus lateralis muscle flap were harvested from the right lower limb along the descending branch lateral circumflex femoral artery (DLCFA). The incision was made medially and deepened through the deep fascia until the intermuscular septum between the vastus lateralis and rectus femoris muscle. These two muscles were separated and the DLCFA was traced and the perforators were identified and dissected before extending the incision laterally.[3] Two musculocutaneous perforators and a single vena comitante were identified, the DLCFA measured 3.5 mm and the vena comitante measured 2 mm. The ALT fasciocutaneous flap was 11.0 × 7.5 cm, harvested together with 3 × 3 cm vastus lateralis muscle flap.

The pedicle was transected and proceeded with vessel anastomosis under the microscope using synthetic, non-absorbable, monofilament suture 10/0. The vastus lateralis muscle was fitted into the anterior temporal depression and the skin paddle was fitted into the defect and closed using non-absorbable sutures at the face and the scalp. Two soft drains were inserted at the anastomosis incision wound and inferior

Figure 2. Post free chimeric ALT + VL flap inset and split thickness skin grafting.

flap wound and a radivac drain size 14 Fr was inserted at the temporal region. The remaining raw wound over the right frontal was grafted using a split skin graft (Figure 2).

The right thigh donor site was closed with a split skin graft harvested from the medial thigh area. Dressing was applied using paraffin gauze, flavin wool, and bolster.

5. RESULTS

Postoperatively, the patient was kept ventilated for 48 h and was monitored in the intensive care unit. Strict care was taken to ensure that the head was positioned neutral and elevated 30°, without any compression near the anastomosis site. The patient's vital signs and input-output chart were also monitored to ensure adequate hydration and perfusion, normotension, normothermia, and flap was kept warm with an angle poised lamp. Hourly flap monitoring via clinical and Doppler monitoring was done for the first 72 h, followed by 2-hourly monitoring in the next 24 h, 4-hourly then 8-hourly, respectively.

The flap showed a good Doppler signal for both arterial and venous without any signs of compromise or edge necrosis. The drain output and presence of soakage at the soft drain sites were observed, and fluffy gauze was changed regularly to ensure that there was no excessive discharge or bleeding and good wound hygiene. The patient was extubated on post operative day 3 and was then transferred to the ward.

Wound inspection of the grafted sites on day 5, showed 100% split skin graft take on both the right frontal and scalp region. Light dressing was applied on the grafted sites and subsequently left exposed. The patient was always accompanied by the parents to avoid stranger's anxiety and unnecessary fear. IV antibiotics of 3 times a day (TDS) dosing were continued for 1 week after surgery after the wound showed satisfactory results, ie no signs of infection and no graft loss. Adequate pain control and monitoring of vitals and flap were

Figure 3. Frontal profile at 4 months follow up exhibiting symmetrical contour bilaterally, aesthetically appealing.

Figure 4. Left lateral 45° profile: flap is partially covered by the patient's hair and hypertrophic scar formation.

done. The patient was discharged on post operative day 8 after satisfactory progress and was planned for removal of sutures on day 14. Total length of hospital stay was 13 days.

Immediate and 4-month follow-up revealed satisfied parents and cheerful patient, with almost symmetrical scalp contour bilaterally but with early stages of hypertrophic scar formation along the flap edges (Figures 3 and 4). The right thigh donor site healed well after split thickness skin graft and no hypertrophic scar formation.

5. DISCUSSION

Special consideration has to be weighed in when it comes to paediatric patients as options for reconstruction are limited by the patient's age and donor tissue availability, future growth of donor and recipient site, anaesthetic exposure, and postoperative compliance. Methods employed in adults for similar scalp defects may not be feasible in children due to local wound conditions, patient factors, and surgeon factors.

Local wound conditions for consideration include – size and location of the defect, presence or absence of periosteum, quality of surrounding scalp tissue and vascular supply, and presence of suitable recipient vessel of appropriate size. Patient factors include age, comorbidities, socioeconomic support, body habitus, and donor site.[4] The technical difficulty for surgeons in paediatric scalp reconstruction is attributed to the discrepancy in vessel caliber between donor and recipient, and small vessel size.

Free tissue transfer was chosen for this patient as it provided a solution for tissue coverage in a single stage with a good aesthetic outcome.[5] In our patient, we employed a chimeric free ALT fasciocutaneous and vastus lateralis muscle flap which is based on the descending branch of the lateral circumflex femoral system. The chimeric flap consists of flaps compounded from multiple different tissues, each is supplied by different branches from the single source vessel, with each flap having its own long vascular pedicle.[6]

The ALT flap has several preferable characteristics making it a favorable donor site for soft tissue reconstruction such as large amount of thin, pliable skin coverage with a long vascular pedicle. Utilization of chimeric flap helps to overcome the limitations of ALT alone by providing an additional flap component that an individual flap cannot provide. The muscle and skin can be considered as individual units although they base on a single pedicle, thus, more freedom for difficult reconstructions.[6,7]

Despite multiple successful free tissue transfers in paediatrics patients reported, they come with their own set of challenges. Preoperatively, the wound bed needed to be adequately prepared. This required visits to the operation theatre and change of dressings that were done with sedation and analgesia to ensure the child's comfort while ensuring wound sterility. Intraoperatively, finding a donor vessel of similar size to the recipient was technically challenging due to the small vessel size and the small body habitus of this patient, with the risk of vasospasm and vessel thrombosis.[8]

In our center, to ensure anastomotic site patency, we employed longer sedation and paralysis of the patient upto 48 h to 72 h to avoid movements, thus pediatric intensive care facilities and expertise for postoperative monitoring were compulsory. Anticoagulant use was not routinely employed in the immediate post operative period to avoid bleeding and hematoma that may result in flap compromise and the need for flap exploration. Constant monitoring of the patient with special attention to the patient's general condition and head position, vitals, flap perfusion and Doppler signal, drain output, nutrition, and wound hygiene of donor and recipient sites. It was also equally important to ensure that the patient's emotional, mental, and social well-being were cared for by involving and communicating well with the patient and family members.

5. CONCLUSIONS

Free flaps in scalp defects in paediatric age group provide good outcomes. A chimeric flap is the best option for this patient as it obliterates dead space on the the temporal scalp and gives excellent results aesthetically. Preoperative planning is crucial to achieving good function and aesthetic outcomes, followed by thorough intra operative and post operative care and monitoring.

Conflict of interest
None declared.

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None declared.

Ethics
The parents' consent was obtained before this report. The consent form states that the parents have given consent for the images and other clinical information to be disclosed in the report.

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