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Case Report

Total ear reconstruction with prefabricated radial forearm flap using salvaged ear cartilage

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SUMMARY. there are numerous techniques for total ear reconstruction, either for microtia or for post-traumatic complete amputation, are well described in the literature. Best results although are achieved with successful replantation of the whole amputated ear but the results with classical two stage total ear reconstruction are usually also more than just a mere satisfaction. We report a case of a seven year old boy with an AV malformation of Right ear needing surgical intervention. To ensure the complete removal of the tumor an elective total amputation of the ear was done. The native cartilage skeleton was salvaged and was banked subcutaneously in the left forearm to prefabricate a composite radial forearm free flap for the later on total ear reconstruction. Six months later, after confirming the successful ablation of the tumor, total ear reconstruction was performed with transfer of prefabricated composite radial forearm free flap. Postoperative flap edema took three months to subside revealing an improved contour definition of the embedded cartilage skeleton. The final result was satisfactory for the patient and his parents.

Keywords*: forearm replantation, revascularisation, limb reconstruction*

Gillies first described total ear reconstruction in 1920[1], with a carved costal cartilage placed under the scalp skin. Tanzer[2,3] modified the procedure into stages. Brent[4-6] further improved the techniques into the state of the art procedure. Ear can be reconstructed with other methods[7-13] but results are usually below satisfaction. In cases of traumatic loss of ear the results are more frequently successful on both extremes of the injury i.e. small size amputated fragments have more chances of being salvaged by simple reattachment as a composite graft[14-17]. Similarly large amputated segments or total ear amputates, with suitable vasculature, have equally better chances of successful microvascular replantation[18-23]. Numerous procedures are described in literature to improve the chances of successful outcome. Some authors propose use of the retroauricular tissue pocket principle[24-27]; others prefer the use of either a pedicled or a microvascular free flap, first as a embedding site and then as a carrier latter on[28-30]; and others suggest a standardization of procedure[31].

We are reporting the case of total ear reconstruction. The ear was excised electively as a therapeutic procedure and the cartilage skeleton was embedded in the forearm to prefabricate a composite radial forearm microvascular free flap. It was subsequently transferred to its original site in order to reconstruct the ear.

Case Report

A seven year old boy was referred to our department for the management of a large A-V malformation of Right ear. Clinically and on investigations the tumour was involving entire external ear (Fig.1A).

Indications for intervention were recurrent ulceration leading to episodes of profuse bleeding, increasing size and the eroding nature of the tumour that was progressively deforming the auricular cartilage skeleton. It was planned to amputate the external ear in-Toto, so as to ensure the complete removal of the tumour, and then to bank the cartilage skeleton for delayed total ear reconstruction, Figure.1B. The tumour was resected en-block, the cartilage skeleton was denuded and reduced in size to approximate the normal ear. It was then banked subcutaneously, between fascia and skin, in the distal half of the left forearm, Figure.1C. The defect at operation site was closed primarily with local scalp advancement flap.

Six months later, after confirming the complete removal of tumour, it was decided to proceed for the second stage ear reconstruction. A prefabricated radial forearm free flap, including the embedded salvaged auricular cartilage skeleton, was raised and transferred to the Right auricular area. Microvascular anastomoses were done in the neck, end to side between the radial artery and the external carotid artery and end to side between the cephalic vein the external jugular vein, Figure.1D.

The patient remained in the hospital for one week postoperatively with an uneventful stay. Due to the flap oedema the details of the cartilage skeleton remained obscured for a month or so which improved subsequently with the passage of time, Figure .1E. Secondary surgery was not performed on wish of the patient and his parents, as they are satisfied with the result.

Fig 1. Large A-V malformation of the right ear.

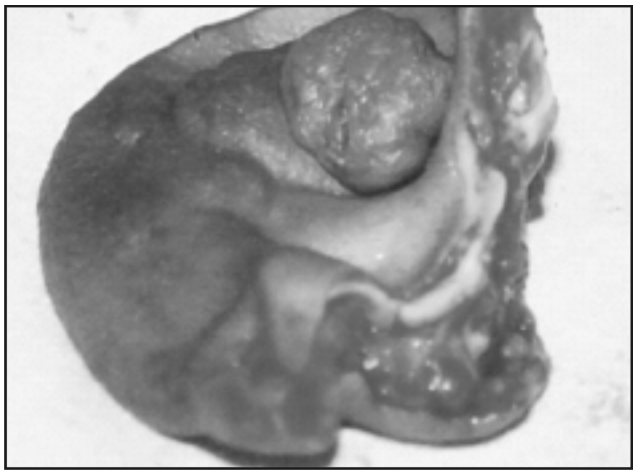

Fig 2.The resected ear with deformed cartilage

Fig 3. The banked auricular cartilage in the distal forearm.

Fig 4. The pre-fabricated radial forearm flap transferred to the right ear.

Fig 5. Result at one month.

Discussion

The concept, of in transient embedding of amputated but otherwise undamaged body fragments for later on transfer to the original site, has been described in literature[32,33]. It has also been proposed in literature to use a prefabricated composite free flap, including the embedded auricular cartilage, for ear reconstruction in the case of trauma[19].

In this era the most commonly done procedure for ear reconstruction involves the use of autologous costal cartilage being carved as auricular framework. In our case we took the opportunity to utilize the native cartilage framework, of excised ear for reconstruction. In this way we managed to conserve a normal body segment that would have been otherwise discarded.

We used the radial forearm free flap that has some advantages beside its role as carrier and skin cover. This flap has thin pliable skin with good color and texture match for the ear. It has a pedicle with large diameter and it can be raised with adequately long pedicle.

We had the option of using autologous costal cartilage but that would have amounted to more donor site morbidity. Most importantly that procedure requires healthy and normal skin in the temporoauricular area for cartilagenous skeleton insertion, which was not available in our case.

The results, with radial forearm flap, can be improved with some modifications such as prior thinning of forearm skin with tissue expander, bolus suturing of cartilage with overlying skin upon insertion or utilization of forearm fascia alone. Contralateral temporoparietal fascia wrapped around cartilage skeleton[34] can also be used as free flap for this kind of total ear reconstruction.

Preformed silicon frameworks[35] have been the most commonly used implants but with a high incidences of infection and implant exposure. A new framework, Medpore surgical implant[36] is a porous polyethylene material that has some advantages over silicon framework implant because of vascularization and in-growth of surrounding tissue into the implant.

Conclusion

Amputations involving the upper limb are frequently seen in the hospitals of this country. However, in the majority of the cases either the patient reaches very late or the amputated part has not been appropriately preserved and transported. In addition many hospitals may not have a plastic surgeon trained in microsurgery. There is, therefore, a pressing need of a program of increased awareness regarding the preservation and transport of amputated part, directed towards not only the lay community but medical professionals as well. With several plastic surgery training programs active at this time it can be hoped that in the future more hospitals will be equipped with plastic surgeons being trained to handle these crippling injuries. The decision to replant, or otherwise, requires expertise and critical judgement. It is a labour-intensive procedure, but if performed in the appropriate cases, can produce dramatic restoration of limb functions.

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