JPRAS Open 39 (2024) 152–156

Contents lists available at ScienceDirect

JPRAS Open

journal homepage: www.elsevier.com/locate/jpra

Case Report

Refining reconstructive arsenal: Free omental flap with autologous bone graft for complex craniofacial defects after tumor resection and frontal osteoradionecrosis

Larissa Lanzaro[a,*], Leonor Caixeiro[a], Daniel Baptista[a], Horácio Zenha[a], Fernando Viveiros[a], Mário Resende[a], Horácio Costa[a,b]

[a] *Centro Hospitalar de Vila Nova de Gaia/Espinho Serviço de Cirurgia Plástica Reconstrutiva, Craniomaxilofacial e Mão, Unidade de Microcirurgia. Centro Hospitalar Vila Nova de Gaia/Espinho, Rua Conceição Fernandes S/N, 4434-502 Vila Nova de Gaia, Portugal*
[b] *University of Aveiro, Portugal*

ARTICLE INFO

Article history:
Received 25 August 2023
Accepted 3 December 2023
Available online 10 December 2023

Keywords:
Omentum free flap
Craniofacial reconstruction
Osteoradionecrosis
Microvascular reconstruction

ABSTRACT

Skull osteoradionecrosis may happen after radiation therapy for head and neck cancer. Here in, the authors present a case of intracranial carcinoma with osteoradionecrosis and exposure of frontal bone with a large communication between nasal cavity and anterior fossa associated. The patient was successfully treated with resection of the tumor and reconstruction omentum free flap wrapped around autologous bone graft.

Introduction

Osteoradionecrosis is an unexpected sequel of intracranial tumor resection and radiotherapy. Surgical debridement and reconstruction with vascularized tissue transfer is the mandatory.[1]

* Corresponding author.
E-mail address: Larissalanzaro@gmail.com (L. Lanzaro).

https://doi.org/10.1016/j.jpra.2023.12.005

Figure 1. Preoperative photography (left) and preoperative magnetic resonance (right).

The selection of the appropriate flap for a specific anterior skull base reconstruction should be based on the individual patient's needs, co-morbidities and the etiology of the disease.[2]

Here in, the authors present a case of intracranial tumor of nasal fossa carcinoma with osteoradionecrosis and exposure of frontal bone with large communication between nasal cavity and anterior fossa associated with chronic infection. To the best of our knowledge, this is the first report of a reconstruction with autologous bone graft wrapped by free omental to treat skull base and frontal subcutaneous tissue loss.

Clinical case

A 61-year-old female was diagnosed with adenocarcinoma of the left nasal fossa and underwent surgical removal of the tumor through nasosinusal endoscopy. The anatomopathology revealed only partial excision, the treatment was complemented by adjuvant radiotherapy.

Local tumor recurrence was noted 2 years later. An anterior craniectomy was performed, dura mater, the inner wall of the frontal sinuses, ethmoid and nasal septum were also removed. Tumor reappeared 1 year after the second surgery and palliative chemotherapy (cisplatin and 5-Fluorouracil) was initiated.

5 years after the initial diagnosis, the patient presented with: intradural recurrence of the neoplasm; osteomyelitis and osteonecrosis of frontal bone; a large fistula between the anterior fossa and the nasal cavity; as well as a history of multiple intracranial infections (Figure 1). She was then referred to a plastic surgery center.

She underwent radical debridement of the frontal bone and intradural tumor excision through previous coronal incision by the neurosurgery team. This resulted in a large anterior intracranial defect with an extensive communication to the nasal cavity. Dura mater was reconstructed with a fascia lata graft (Figure 2) and frontal bone was reconstructed with costal bone graft harvested from the left 6th rib. A greater omental flap was harvested based on the right gastroepiploic vessel through laparotomy. This flap was used to obliterate the anterior fossa dead space and to wrap partially the rib graft (Figure 3). Posteriorly, end-to-end anastomosis was performed to facial vessels through a submandibular approach.

In a second surgery, the greater omental flap was covered with split-thickness skin graft.

The postoperative period was complicated with internal jugular vein thrombosis due to a probable local inflammatory context. Also the patient progressed to septic shock with cardiovascular dysfunction with no identified infection origin solved after 22 days of meropenem and vancomycin. Elective tracheotomy was required due to difficulty in weaning from ventilation and later nosocomial pneumonia to *Stenotrophomonas maltophila* developed.

Despite all the medical complications that occurred, the patient obtained an acceptable esthetic result and no complications related to the flap, the bone graft or the donor sites were registered (Figure 4).

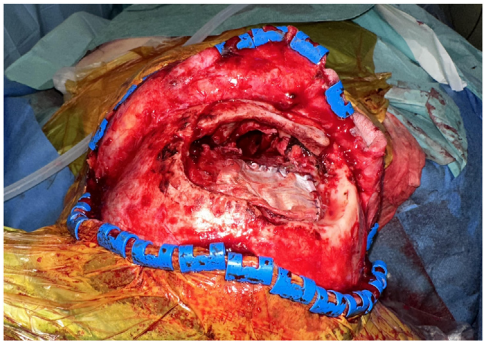

Figure 2. Anterior cranial defect after tumor resection, frontal bone debridement and dural reconstruction with fascia lata graft.

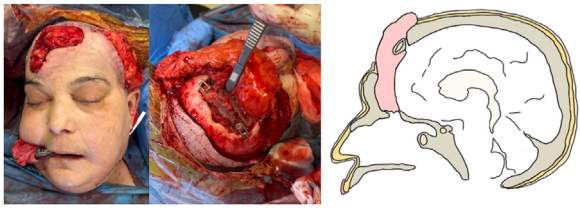

Figure 3. Autologous rib graft inset (left) and immediate postoperative result (middle). Schema of reconstruction (right).

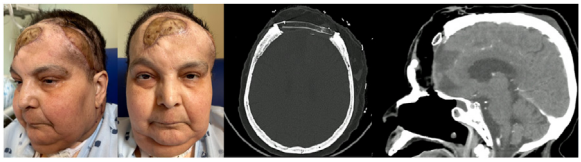

Figure 4. Postoperative results (left) and computerized tomography after 3 months postoperative (right).

Her quality of life has been restored, and she no longer requires multiple surgical drainages, antibiotics on a regular basis, or further dressings.

Discussion

This is a challenging reconstruction with 3 main goals: closure of the anterior skull base communication; reducing the enormous dead space after oncological resection and replacement of frontal subcutaneous soft tissue and bone.

Microsurgical vascularized tissue transfer represents a valuable choice to reconstruct large defects of the anterior skull base, especially when surrounded by irradiated local tissue after the removal of a malignant tumor.[3] Free flaps offer numerous advantages, such as elimination dead space, supplying multiple layers of well-vascularized tissue and lower complication rates then regional flaps.[4]

Alternative strategies could have been considered such as using the vastus lateralis muscle of an anterolateral thigh free flap wrapping autologous bone graft.[5] However, the omentum free flaps not only has anatomical advantages but also physiological ones. It consists of trabecular connective tissue containing vessels, lymphatics and adipose tissue, containing a diverse range of cells including fibrocytes, pericytes, fibroblasts, and adipose cells. This creates a conducive environment that fosters tissue growth through the action of angiogenic factors and cytokines, facilitating processes like wound closure, vascular development, remodeling, and collagen deposition. Additionally, it is proved that the omental tissues is able to regulate the immune response through immunomodulators in a way that it

supports healing and tissue recovery.[6] This makes the omental flap an valuable choice of reconstruction in cases of chronic infections.

One of the methods for cranial vault reconstruction involves the use of an autologous bone grafts such as split cranial grafts or rib grafts. While alloplastic materials have been suggested as alternatives, they are foreign substances that might not achieve long-term integration. These materials could potentially lead to unfavorable reactions within the body, such as infections or even extrusion over time.[7] Nevertheless, it's also known that autologous bone graft may be time consuming procedure with donor site morbidity with an unpredictable rate of resorption.[8]

The omental free flap may not only provide skull base reconstruction but also coverage of an autologous bone graft for preventing infection and exposure postoperatively. *Constatino* et al. advocates that free omental flap is the ideal choice when it comes to craniofacial and cranial base defects with subcutaneous tissue loss, as it can solve difficult three-dimensional contour defects.[9]

The omentum free flap has been considered a secondary choice of flap due to concerns of donor site morbidity. *Hultman et al.* in a study with 135 omentum flaps for extraperitoneal wounds with laparotomy concluded that donor-site complications can be significant but are usually limited to abdominal wall infection and hernia. The authors also say that pedicle flaps had more risk of complications. Free flaps reduce those complications as it allows complete closures of the peritoneal cavity. The safety of omentum harvesting is higher now with laparoscopic techniques.[9,10]

Conclusion

The free omental flap provides vascularized tissue that also enhances immune response. Due to its malleable configuration, the omentum is easily wrapped around bone grafts preventing postoperative complications, especially in cases of damaged subcutaneous tissue. The use of this flap with bone reconstruction should be taken into consideration as the 1st line treatment for craniofacial and anterior skull base defects after tumor resection associated with osteoradionecrosis.

Patient consent

Informed consent was provided by patient to publish the case details and associated images.

Ethical approval

Not required.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Declaration of Competing Interest

The authors have no potential conflicts of interest to declare with respect to the research, authorship, and/or publication of this article.

References

1. Ness JA, HS Chang, Grabowski CM, Marentette LJ. Osteoradionecrosis of the anterior cranium. *Skull Base Surg.* 1996;6(4):259–266.
2. Bell EB, Cohen ER, Sargi Z, Leibowitz J. Free tissue reconstruction of the anterior skull base: A review. *World J Otorhinolaryngol Head Neck Surg.* 2020;6(2):132–136.
3. Dang RP, Ettyreddy AR, Rizvi Z, et al. Free flap reconstruction of the anterior skull base: A systematic review. *J Neurol Surg B Skull Base.* 2021;83(2):125–132.
4. Wang W, Vincent A, Sokoya M, Kohlert S, Kadakia S, Ducic Y. Free-flap reconstruction of skull base and orbital defects. *Semin Plast Surg.* 2019;33(1):72–77 Epub 2019 Mar 8. doi:10.1055/s-0039-1677881.
5. Yano T, Suesada N, Usami S. Esthetic craniofacial bony and skull base reconstruction using flap wrapping technique. *J Craniofac Surg.* 2016;27(5):1234–1238.

6. Mazzaferro D, Song P, Massand S, Mirmanesh M, Jaiswal R, Pu LLQ. The omental free flap-a review of usage and physiology. *J Reconstr Microsurg*. 2018;34(3):151–169. Epub 2017 Nov 15. doi:10.1055/s-0037-1608008.
7. Tan BK, Por YC, Chen HC. Complications of head and neck reconstruction and their treatment. *Semin Plast Surg*. 2010;24(3):288–298.
8. Afifi A, Djohan RS, Hammert W, Papay FA, Barnett AE, Zins JE. Lessons learned reconstructing complex scalp defects using free flaps and a cranioplasty in one stage. *J Craniofac Surg*. 2010;21(4):1205–1209.
9. Costantino PD, Shamouelian D, Tham T, Andrews R, Dec W. The laparoscopically harvested omental free flap: A compelling option for craniofacial and cranial base reconstruction. *J Neurol Surg B Skull Base*. 2017;78(2):191–196.
10. Hultman CS, Carlson GW, Losken A, et al. Utility of the omentum in the reconstruction of complex extraperitoneal wounds and defects: Donor-site complications in 135 patients from 1975 to 2000. *Ann Surg*. 2002;235(6):782–795.