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Chimeric anterolateral thigh free flap for reconstruction of complex cranio-orbito-facial defects after skull base cancers resection

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ABSTRACT

Complex cranio-orbito-facial defects after skull base cancers resection entail a functional and esthetic reconstruction. The introduction of endoscopic assisted techniques for excision surgery with the advances in reconstructive surgery and anesthesiology allowed to improve the management of such critical patients. We report a series of chimeric anterolateral thigh (ALT) flaps used to reconstruct complex cranio-orbital-facial defects after skull base surgery.

A retrospective review of patients that underwent cranio-orbito-facial reconstruction using a chimeric ALT flap from March 2013 to October 2015 at a single tertiary care referral Institute was performed. All patients were affected by locally-advanced malignant tumor and the resulting defects involved the skull base in all cases. The ALT flaps were perforator-based flaps with different components: fascia, skin and muscle. The different flap territories had independent vascular supply and were independent of any physical interconnection except where linked by a common source vessel.

Ten patients were included in the study. Three patients underwent adjuvant radiotherapy and to chemotherapy. The mean hospitalization time was 21 days (range, 8–24 days). One failure was observed. After a mean follow-up of 12.4 months, 3 patients died of the disease, 2 are alive with disease, while 5 patients (50%) are currently alive without evidence of disease.

Chimeric ALT flap is a reliable and versatile reconstructive option for complex cranio-orbito-facial defects resulting from skull base surgery. The chimeric flap composed of different territories proved to be adequate for a patient-tailored three-dimensional reconstruction of the defects as well as able to resist to the postoperative adjuvant treatments.

1. Introduction

Cranio-orbito-facial resections for skull base tumors are a challenging procedure requiring multidisciplinary combined efforts between head and neck surgeons and reconstructive specialists. The successful tumor excision according to the oncological principles of radicality and the optimal reconstruction are equally crucial to ensure favorable outcomes. Nowadays microsurgical free flaps are considered the gold standard for head and neck reconstruction after resection of cancers of the cranio-orbito-facial complex (Piazza et al., 2013; Chanowski et al., 2013). Free flaps provide a better functional and esthetic restoration with reduced donor-site morbidity if compared to local or pedicle flaps (Yetzer and Fernandes, 2013). Free tissue transfer has encouraging overall success rates ranging from 91% to 99%, as reported by many

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centers worldwide (Bui et al., 2007; Kim et al., 2015). A variety of free flaps may be employed to this purpose, including anterolateral thigh (ALT) flap, radial forearm (RF) flap, fibula flap, and latissimus dorsi flap (López et al., 2013; Chepeha et al., 2004). Orbital exenteration, with removal of orbital bulb together with the surrounding soft tissues, is a radical procedure associated with a significant psychosocial disability and functional impairment. The evolution of excision surgery with the introduction of endoscopic assisted techniques coupled with advances in reconstructive surgery and anesthesiology, has expanded the rationale of curative surgery far beyond what was originally thought possible. Moreover, since such procedures are usually reserved for the treatment of locally advanced sinonasal malignancies and aggressive orbital tumors associated with poor prognosis, the radical surgery is generally integrated in a multimodal treatment strategy including chemotherapy and radiotherapy in different settings. When the resection includes an extensive skull base defect, the primary goals of reconstruction are to separate the brain from the nasal cavities, to tolerate adjuvant radiotherapy and to accommodate prosthesis if possible. The aim of the present study is to present our experience in the reconstruction of complex cranio-orbito-facial defects resulting from orbital exenteration associated with anterior skull base resection, showing the versatility of the ALT chimeric free flap.

2. Materials and methods

We performed a retrospective review of medical records of patients with skull base cancer who underwent reconstruction with free flap transfer between March 2013 and October 2015 at a single tertiary care referral Institute. A total of 10 cases were considered (Table 1). The inclusion criteria were as follows: orbital exenteration with resulting defect in Class IV or V according to Brown and Shaw (2010); anterior skull base defect with dura mater resection; reconstruction with a chimeric ALT flap. All the reconstruction procedures were performed immediately after the cancer resection. In collecting data, we considered comorbidity, smoking or alcohol abuse, tumor characteristics, preoperative or postoperative radiotherapy, major complications, defined as flap failure, due to arterial or venous thrombosis and minor complications such as partial flap loss, dehiscence, infection of the donor site, pathologic wound healing at the donor site, and skin flap loss.

2.1. Preoperative evaluation

The decision to undergo surgery was made by joint consultation of a dedicated multidisciplinary tumor board and extensively discussed with patients. Routine preoperative imaging included a computed tomography (CT) and a contrast-enhanced magnetic resonance imaging (MRI) of the head and skull base. Immediately before surgery, we perform only an ultrasound Doppler to identify the thigh perforators. We adopted a two-team approach. The head and neck surgeons resected the tumor, while the reconstructive team harvested the tight flap. All patients were operated on in supine position. We use the FloTrac/Vigileo™ system to derive, from pulse contour analysis of femoral or radial artery, cardiac output and stroke volume variation, which predicts fluids responsiveness.

2.2. Surgical resection

The extent of surgical resection was tailored to the lesion size and location, including the surrounding structures involved by the tumor. The “En Bloc” resection was attempted whenever possible. However, generally, the complex anatomy and important

Table 1
Clinical details.

ID	Age (years)	Sex	Site of onset	Subsites involved	Previous treatment	Neck dissection	Receiving vessels	Histology	Hospitalization time	Stage	Grading	Adjuvant therapy	Follow up (months)	Status
1	79	M	Ethmoid	Orbital content, skin, zygoma	/	mRND	Temporalis Vessels	Carcinosarcoma	27 days	pT4a pN1	G3	IMRT	24	AWD
2	78	M	Sphenoid	Ethmoid, orbital content	Surgery	No	Temporalis Vessels	ITAC	25 days	pT4a	G3	None	20	AWD
3	72	F	Ethmoid	Orbital content, sphenoid, skin	/	No	Temporalis Vessels	Melanoma	8 days	pT4a	n.a.	None	14	DOD
4	73	M	Ethmoid	Maxillary sinus, orbital content, skin	/	No	Facial Vessels	Adenoid cystic carcinoma	22 days	pT4a	G3	None	16	DOD
5	82	M	Frontal sinus	Ethmoid, ASB dura, orbital content, skin	/	No	Temporalis Vessels	Squamocellular carcinoma	25 days	pT4b	G3	IMRT	16	NED
6	27	M	Maxillary sinus	Ethmoid, orbital content, nasopharynx, skin, ITF, ASB dura	/	No	Temporalis Vessels	Pleiomorphic sarcoma	14 days	pT4b	G3	Carbon ion therapy	13	NED
7	62	M	Ethmoid	ASB dura, skin, orbital content	/	No	Temporalis Vessels	Melanoma	30 days	pT4b	n.a.	Carbon ion therapy (stopped)	10	DOD
8	66	M	Supraorbital recess	Frontal sinus, ethmoid, ASB dura, orbital content	Surgery, RT	No	Facial Vessels	Neuroblastoma	9 days	pT4b	Hyams II	IMRT	6	NED
9	60	M	Orbit	Skin	IMRT	No	Temporalis Vessels	Uveal melanoma	20 days	pT4a	n.a.	None	6	NED
10	40	M	Ethmoid	Dura ASB, orbital content, orbital apex, sphenoid, maxillary sinus	Induction CHT	No	Temporalis Vessels	Squamocellular carcinoma	20 days	pT4b	G3	RT-CHT	6	NED

Legend: M, male; F, female. ASB, Anterior Skull Base; ITF, Infratemporal fossa; RT, radiotherapy; CHT, Chemotherapy; ITAC, Intestinal type Adenocarcinoma; n.a., not applicable; IMRT, Intensity Modulated Radiotherapy; AWD, Alive with disease; DOD, Dead of Disease; NED, No Evidence of Disease.

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