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Comprehensive approach to reestablishing form and function after radical parotidectomy

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A B S T R A C T

Introduction: The reconstructive goals following radical parotidectomy include restoration of symmetry, reanimation of the face, and reestablishment of oral competence. We present our experience utilizing the anterolateral thigh (ALT) free flap, orthodromic temporalis tendon transfer (OTTT), and facial nerve cable grafting to reestablish form and function.

Material and methods: From 2010 to 2016, 17 patients underwent radical parotidectomy followed by immediate reconstruction. An ALT was harvested to accommodate the volume and skin defect. Additional fascia lata and motor nerve to vastus lateralis (MNVL) were obtained. Anastomosis of the ALT to recipient vessels was performed, most commonly using the facial artery and internal jugular vein. OTTT was performed by securing the medial tendon of the temporalis to orbicularis oris through a nasolabial incision. Fascia lata was tunneled through the lower lip, then secured laterally to the temporalis tendon. The MNVL was cable grafted from either the proximal facial nerve or masseteric nerve to the distal facial nerve branches. ALT fascia was suspended to the superficial muscular aponeurotic system.

Results: Average follow up was 19 months. Only one patient failed to achieve symmetry attributed to dehiscence of OTTT. All patients achieved oral competence and dynamic smile with OTTT activation. Facial nerve recovery was seen in 8 patients. 5 reached a House Brackman Score of 3. Two donor site seromas and two wound infections occurred.

Conclusion: Simultaneous ALT, OTTT, and facial nerve cable grafting provides early reestablishment of facial symmetry, facial reanimation, and oral competence with minimal morbidity.

1. Introduction

Malignant parotid neoplasms are a rare yet diverse group comprised of primary salivary gland tumors and cancers metastatic to the intraparotid lymph nodes [1]. Management of parotid neoplasms is primarily surgical and every effort is made to preserve the facial nerve through careful dissection. However, in cases of advanced disease, a radical parotidectomy, defined as a total parotidectomy with facial nerve resection, may be required to obtain negative surgical margins [2]. Disease that invades beyond the parotid may additionally require a cutaneous resection, mastoidectomy, or a lateral temporal bone resection. These defects present a unique challenge for the reconstructive surgeon, as deficits of both form and function must be addressed.

Aesthetically, patients suffer from a soft-tissue volume deficit along the angle of the mandible leading to noticeable and, in some instances, disfiguring facial asymmetry [3, 4]. Multiple reconstructive methods for addressing post-parotidectomy contour deformities have been described. These include autologous dermal fat grafting, regional muscle transfers, and various free flaps; all with the goal of lasting, atrophy resistant volume restoration at the defect site [5–9].

As a result of facial nerve sacrifice, patients are left with immediate hemifacial paralysis, which has been repeatedly demonstrated to carry significant psychosocial penalties [10, 11]. Functionally, patients are at risk for exposure keratopathy, visual impairment, nasal obstruction, and oral incompetence which results in impaired eating and speech. Options for rehabilitation include facial nerve cable grafting, regional muscle transfers, and static suspension procedures [12, 13].

Factors including advanced age, burden of comorbidity, need for adjuvant radiation, and poor oncologic prognosis favor immediate rather than delayed reconstruction. With these principles in mind, the ideal reconstruction following a radical parotidectomy should address contour deformity, facial paralysis, and cutaneous defects while imparting little additional morbidity beyond the extirpative procedure.

In this study, we describe our experience with 17 patients that underwent anterolateral thigh (ALT) free flap, orthodromic temporalis tendon transfer (OTTT), lip suspension, and reinnervation (when

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Table 1
Patient characteristics.

Preoperative characteristics					Surgical details			Postoperative details					
Patient	Age	Gender	Diagnosis	Stage	Skin Defect	Cable Graft	LOS	Follow up (mo.)	XRT	Adjuvant Procedures	HB	Resting Sym.	Survival (mo.)
1	82	M	Adenocarcinoma	T4aN0M0	N	Y	8	21	Y	EW, ER	5	Y	DOD (29.8)
2	79	M	SCCa	Unstaged	N	Y (V3)	12	4	Y	EW, ER	6	Y	DOD (5.2)
3	82	M	SCCa	Unstaged	N	N	8	8	Y	EW, ER, Rev. OTTT, BL	NA	N	LTFU (9.0)
4	57	M	SCCa	T0N2bM0	Y	Y	5	8	Y	EW, ER	3	Y	DOD (9.2)
5	52	F	Mucoepidermoid carc.	T4aN0M0	N	Y	4	28	Y	EW, SR, BX, RC	3	Y	NED (37.7)
6	51	F	Adenoid cystic carc.	T4bN0M0	Y	Y	4	24	Y	EW	3	Y	NED (34.1)
7	80	F	Melanoma	TxN3M1	Y	Y	7	6	N	ER, BL	6	Y	DOD (23.8)
8	66	F	Mucoepidermoid carc.	T4N0M0	N	Y	7	11	Y	EW, WR	4	Y	NED (22.1)
9	47	F	Carcinoma ex PA	T4N2bM0	N	Y (V3)	5	3	Y	EW	6	Y	NED (21.6)
10	58	F	Adenocarcinoma	T4aN2bM0	Y	Y (V3)	8	11	Y	EW	6	Y	NED (20.6)
11	66	M	SCCa	Unstaged	Y	Y	7	4	Y	EW, ER, BL	6	Y	NED (19.6)
12	68	F	Carcinosarcoma	T4N2bM0	N	Y	8	6	Y	EW, ER	6	Y	Rec. (18.3)
13	32	F	Spindle cell carc.	T0N2bM0	N	Y	7	7	Y	RC	4	Y	NED (17.0)
14	67	M	Salivary duct carc.	T4aN2bMX	N	Y	15	9	Y	EW, ER	6	Y	NED (15.7)
15	49	M	Adenoid cystic carc.	T3N0M0	N	Y	4	3	Y	EW, ER	6	Y	NED (7.5)
16	58	M	Adenocarcinoma	Unstaged	N	Y	7	14	Y	EW, ER, BX, IF, RC	3	Y	LTFU (27.5)
17	35	F	Adenoid cystic carc.	T4aN0M0	N	Y	7	7	Y	EW	3	Y	NED (15.1)

Yrs, years; SCCa, squamous cell carcinoma; carc., carcinoma; PA, pleomorphic adenoma; N, no; Y, yes; V3, indicates cable graft utilizing masseteric nerve; LOS, length of stay; mo, months; xrt, radiation therapy; ew, eyelid weight; er, ectropion repair; Rev. OTTT, revision orthodromic temporalis tendon transfer; BL, brow lift; SR, scar revision; BX, onabotulinumtoxinA injection; RC, recontouring; WR, wedge resection lower lip; IF, injectable filler; HB, House Brackman Score; NA, not applicable; Sym, symmetry; DOD, died of disease; LTFU, lost to follow up; NED, no evidence of disease; Rec; recurrent disease.

possible) to address the aforementioned deficits of form and function following radical parotidectomy.

2. Material and methods

Institutional Review Board approval was obtained from the Cleveland Clinic (Cleveland, OH). Seventeen patients underwent radical parotidectomy with complete facial nerve sacrifice followed by immediate ALT free flap, OTTT, lip suspension, and attempted facial nerve cable grafting from January 1, 2010 to December 31, 2016. Patients were excluded if they had less than three months of follow up after their initial surgery. A summary of preoperative details is displayed in Table 1. The average age at the time of surgery was 60.5 years old. Eight (47.1%) patients were male, 9 (52.9%) were female. Metastatic squamous cell carcinoma was the most common indication for surgery. All patients underwent a concurrent planned neck dissection.

2.1. Reconstructive surgical technique

A comprehensive description of each step of the reconstruction by Fritz et al. is available [14]. Briefly, the reconstruction was performed as follows: ALT free flap harvest occurred simultaneously during the ablation using a perforator dissection technique. A branch of motor nerve to vastus lateralis (MNVL) and an additional slip of fascia lata was obtained (Fig. 1). The ALT was debulked and/or deepithelized as needed to account for the defect volume. Mastoidectomy with facial nerve dissection was used for oncologic margins and/or to obtain exposure of the proximal facial nerve for grafting. Revascularization of the free flap was performed using vessels exposed during the extirpative procedure. The senior author prefers the facial artery and the internal jugular vein (end to side anastomosis) as recipient vessels, however other options include the superior thyroid artery paired with the internal jugular vein or the transverse cervical vessels. The superficial temporal vessels are often ligated during the extirpative procedure and are not available for microvascular anastomosis. In most instances following a radical parotidectomy, the coronoid insertion of the temporalis tendon is readily accessed. The medial tendinous fibers of the temporalis were freed from the mandible with a subperiosteal dissection. The coronoid was removed with a sagittal saw. The temporalis tendon fibers were secured to the superficial muscular aponeurotic system (SMAS) at the orbicularis oris through a nasolabial incision with 4-0 PDS suture. A lower lip suspension was accomplished by tunneling a slip of fascia lata secured to the midline orbicularis with 4-0 PDS to the temporalis tendon (Fig. 2). A branch of the MNVL was used as a cable graft from either the proximal stump of the facial nerve or masseteric nerve to the distal facial nerve branches (Fig. 3). Finally, the fascia of the ALT was suspended to the SMAS and surrounding tissues to control volume correction and the deep and superficial soft tissues were reapproximated.

Data regarding postoperative form and function including facial symmetry, evidence of reinnervation, and oral competence was obtained retrospectively from outpatient documentation as evaluated by the senior authors.

3. Results

A summary of preoperative, operative, and postoperative details is displayed in Table 1. Four (23.5%) patients had large cutaneous defects requiring a fasciocutaneous flap. One patient did not undergo facial nerve cable grafting due to the extent of the resection of the distal facial nerve. In three instances, when the proximal facial nerve stump was unavailable, the masseteric nerve was grafted to distal facial nerve branches. The average follow up period after surgery was 19 months. Complications included three donor site seromas, two wound infections, and one partial dehiscence of the OTTT. No chronic leg weakness secondary to MNVL harvest was reported. All but one patient underwent postoperative radiation. Sixteen patients achieved good facial symmetry (Figs. 4, 5). The individual that did not achieve symmetry was found to have dehiscence of their OTTT and required midface resuspension. All patients achieved a dynamic smile defined as elevation of the ipsilateral oral commissure with activation of their OTTT and good oral competence. Eight of the 16 patients that underwent cable grafting exhibited signs of neural recovery, with 5 of the 8 reaching a House-Brackman (HB) Score of 3. Adjuvant procedures performed concurrently or in the postoperative setting included upper eyelid weight, ectropion repair, scar revision, flap recontouring, mid-forehead brow lift, and onabotulinumtoxinA injection. Three patients died of metastatic disease, 2 within one year of their initial surgery.