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Effectiveness of platysma muscle flap in preventing Frey syndrome and depressive deformities after parotidectomy

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KEYWORDS

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Summary *Background:* Frey syndrome (FS) or depressive deformity (DD) occurring after parotidectomy significantly reduces a patient's quality of life. However, there seems to be no effective treatment strategy against these complications. In this study, we report our experience of using platysma muscle flap (PMF) to prevent the development of FS and DD after parotidectomy, and evaluate its effect subjectively and objectively.

Methods: Superficial parotidectomy was performed for eight cases of parotid gland tumor, and a PMF was transferred to cover the site. The incidence of FS and DD were evaluated subjectively, using a questionnaire to the patients and board-certified reconstructive surgeons, and objectively, using Minor's starch-iodine test.

Results: In seven patients, the defect could be completely covered with PMF, and none of them developed FS or obvious DD. However, in one patient, the defect could be only partially covered, and the patient developed complications in the exact site that the flap did not cover. Overall scores from the questionnaire were high in relation to both cosmetic and functional perspectives from most of the patients and all the surgeons. No patients had major postoperative complications requiring revision.

Conclusions: PMF can be useful to cover the defect and prevent complications after parotidectomy. PMF is relatively easy to perform with fewer complications; however, a complete

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coverage of the defect should be ensured to obtain optimal results.

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Introduction

The treatment of parotid gland tumor (PGT) involves various aspects such as oncological management of the tumor, preservation or reconstruction of facial nerve, and post-parotidectomy complications such as Frey syndrome (FS) or depressive deformity (DD).^{1–3} FS and DD significantly reduce a patient's quality of life¹; however, there seems to be no effective prevention or treatment strategy against these complications.⁴

FS is characterized by flushing or sweating at the site of parotidectomy in response to salivary stimulation immediately after eating, seeing, thinking, or talking about certain food.^{5,6} When severe, the patients cannot eat without holding a towel to the cheek, resulting in social embarrassment and social incapacity.⁷ DD is a facial contour disturbance caused by removing a part of parotid gland tissue. It can occur in almost 100% patients undergoing parotidectomy⁸ and could be a problem when the deformity is noticeable.

FS, first reported by Lucie Frey in 1923,⁹ was considered to be a consequence of parotidectomy in 1932.¹⁰ Parotidectomy exposes the postganglionic parasympathetic fibers from the auriculotemporal branch of the trigeminal nerve that passes through the parotid gland, and these severed fibers can regenerate to aberrantly innervate the vessels and sweat glands of the overlying skin.^{11,12} Thus, when the parasympathetic fibers are activated during eating, they cause localized secretion of the sweat glands (gustatory sweating) and vasodilatation (gustatory flushing).^{11–13} The clinical severity of FS correlates with the surface area involved¹⁴ and the extent of parotidectomy (superficial, total, or recurrent).¹⁵ Although the symptoms of FS may take up to approximately 6 months after parotidectomy to appear,⁷ once activated, they continue for many years.¹² The incidence of FS after parotidectomy as per subjective methods is 12.5%–62% and as per Minor's starch-iodine test is 22%–98%.^{2,16}

Several treatment options for FS have been proposed, such as the local application of anticholinergic ointments¹⁷ and multiple intracutaneous botulinum A toxin injections.¹⁸ Additionally, surgical treatments were proposed, including tympanic neurectomy¹⁹ or interposition of dermal grafts or flaps, such as a temporoparietal fascia (TPF) between the skin and residual parotid tissue after re-elevation of the skin flap from the region.^{4,20} The local application of medication and tympanic neurectomy provide only transient results,⁴ and re-elevation of the cheek flap poses a risk of facial nerve injury⁴; thus, these are not widely employed.^{4,21} Recently, Torretta et al. managed FS using fat injections at subdermal layer of the residual parotid gland and the area of DD.²¹ Although less invasive, their sample size was too small, and its effect seemed to be limited and required multiple sessions.

No valid method is available to effectively resolve FS⁴; therefore, prevention of FS is the most important

approach. FS can be prevented by inserting a barrier between the skin and exposed auriculotemporal nerve during parotidectomy,^{13,22} which can prevent the aberrant re-innervation of the parasympathetic fibers. The following types of barriers have been reported to be useful: sternocleidomastoid (SCM) muscle flap,²² TPF, and superficial musculoaponeurotic system (SMAS).^{23,24} Furthermore, non-vascularized tissues may also be used, such as dermal fat graft,²⁵ acellular dermal (ACD) allograft,²⁶ and artificial materials including ethisorb or gore-tex.¹⁶ However, although all these grafts can markedly reduce the incidence of FS,^{1,2,7} the effects are varied and complete prevention has not been achieved.²

Therefore, we have investigated whether a platysma muscle flap (PMF) would be useful for preventing post-parotidectomy FS and DD and have reported our findings in this study.

Patients and methods

Parotidectomy followed by PMF was performed for eight patients with parotid gland tumors (Table 1). The tumor was evaluated using contrast-enhanced magnetic resonance imaging (MRI), and needle biopsy was performed to check tumor characteristics.

The patients were administered a questionnaire to evaluate their cosmetic and functional outcomes. Additionally, five board-certified reconstructive surgeons answered the same questionnaire regarding the appearance of the patients. Minor's starch-iodine test was performed as an objective test to evaluate the incidence of FS.

Operative procedure

A traditional preauricular submandibular lazy S-shaped incision was created, and to prevent skin necrosis, the curve below the ear lobe was mildly incised (Figure 1a). An incision was made at the neck, and the skin flap was elevated cranially just above the platysma muscle. The flap elevation was continued to the SMAS layer around the anterior edge of the parotid gland beyond the tumor, and the buccal and marginal mandibular branches were then exposed through an anatomical landmark. A superficial parotidectomy including the tumor was performed by preserving facial branches retrogradely, and the size and depth of the defect was confirmed. The platysma muscle was then exposed caudally from an initial cervical incision (Figure 1b). At this point, the posterior edge of the muscle flap was already exposed; so we began elevating the muscle flap anteriorly from the posterior edge, after transecting the caudal side. Care was taken not to damage the cervical and marginal mandibular branches of the facial nerve or the great auricular nerve (Figure 1c). The perforator vessel to

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