Sternocleidomastoid Flap in Parotid Surgery: A Case Series

R. Mehta¹ · M. Punjabi^{1,2} · R. Soni¹ · M. Dagur¹ · P. Patidar¹ · P. Singh¹

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Abstract Superficial and deep parotidectomies are known treatments for benign and malignant neoplasms of parotid glands. Due to the gland's proximity to facial nerve and other vital structures, this surgery carries the highest risk of facial nerve palsy. Another frequently overlooked complication, which can be detrimental to patient's life style is Frey's syndrome, or gustatory sweating. Other complications include flap necrosis and various contour deformities. We conducted this study on a group of 40 patients of parotid swellings to assess usage of sternocleidomastoid flap in prevention of Frey's syndrome, contour deformities, flap necrosis, salivary fistula and drain related injuries. We divided the patients in two groups based on the usage of sternomastoid flap. In Group A, the patients underwent superficial or total parotidectomies with a partial thickness, superiorly based sternomastoid flap. In Group B, no sternomastoid flap was placed. The incidence of Frey's syndrome was seen to be 3 times in Group B, while a visible contour deformity was seen in a third of patients in Group B, with Group A reporting no incidence. Also Group A, did not see any cases of flap necrosis or salivary fistula, while Group B saw 3 and 2 cases respectively. Also, among the two revision cases done in Group A, the one with previously placed sternomastoid flap (done by us 3 years back) had an excellent plane preserved, while another revision case without sternomastoid flap saw a complete adherence of facial nerve to overlying skin, resulting in Grade II permanent facial palsy. Parotidectomy is a technically challenging surgery in regards to important structures in

the vicinity. Even with ostensibly perfect technique, facial nerve injury can occur for unknown reasons. All in all, sternomastoid flap is an acceptable modality to fill the parotidectomy defect, improve the facial contour and reduce the incidences of Frey's syndrome and skin necrosis.

Keywords Parotidectomy · Superficial · Sternocleidomastoid flap · Frey's syndrome · Flap necrosis · Salivary fistula · Facial nerve

Introduction

Parotidectomy, superficial or total, is an accepted treatment for benign and malignant neoplasms of the parotid gland. Regardless of the excellent results of this surgery, many patients experience post op Frey's syndrome and cosmetic deformity, along with varied loss of facial function. Facial deformity and Frey syndrome often lead to a significant degree of patient dissatisfaction [1–3]. Skin necrosis produced due to surgical depression after parotidectomy is another complication.

The incidence of Frey syndrome after parotidectomy is ~ 94% when a starch iodine test is performed [4], but only ~ 12 to 54% in patients who are symptomatic [5, 6]. It is believed to be caused by aberrant regeneration of the injured parasympathetic nerve fibers of the parotid gland. The nerve fibers subsequently innervate the sweat glands of the overlying skin causing gustatory sweating begin within 2 weeks to 2 years [6].

Following conventional parotidectomy using the classic Blair or Lazy S incision (or its modification), a varying degree of cosmetic deformity in the form of visible scar and hollowed out preauricular and infra-auricular defects

✉ M. Punjabi
mohitpunjabi1988@gmail.com

¹ Department of ENT, RUHS-CMS, Jaipur, India

² RUHS College of Medical Sciences, Jaipur, India

occur [7]. These together with the Frey's syndrome constitute the main undesirable consequences of this surgery [8–11].

Although overall quality of life is unlikely to decline after superficial parotidectomy if facial nerve function is preserved, most patients have 1 or more postoperative sequelae, including Frey syndrome, concave facial contour at the operative site after healing, auricular numbness, and an unsightly scar [12, 13].

Many procedures have been introduced to decrease these complications, such as fascia lata grafts; dermal-fat-fascia free grafts; dermal-fat grafts; the platysma muscle flaps; temporoparietal fascia flaps; sternocleidomastoid muscle (SCM) flaps, both superiorly and inferiorly based; superficial musculoaponeurotic system (SMAS) flaps; vascularized fat grafts; vascularized dermis-fat grafts; and polytetrafluoroethylene implants.

The sternocleidomastoid muscle flap with its several designs is among the various methods described to fill up the postparotidectomy defect. The partial thickness design which can be based superiorly or inferiorly is the most commonly described variant. The SCM receives its blood supply superiorly from the occipital artery, the superior thyroid artery in its midportion, and the transverse cervical artery inferiorly; therefore the muscle can be used either as a superiorly or inferiorly based flap.

Patients and Methods

We conducted a prospective study in 40 cases (26 females, 14 males), to test the effectiveness of SCM flap following parotidectomy in preventing Frey's syndrome, flap necrosis and contour deformities. The age range of patients was 34–68 years, with a mean age of 46 years. We divided the patients in two groups based on the usage of sternomastoid flap. In Group A, the patients underwent superficial or total parotidectomies with a partial thickness, superiorly based sternomastoid flap. In Group B, no sternomastoid flap was placed. This study mainly concentrates on incidence of Frey's syndrome, contour deformities and flap necrosis, salivary fistula and ease of revision surgery, after sternomastoid flap in parotid surgery.

Frey's syndrome was evaluated objectively by Minor starch iodine test by applying 1% tincture of iodine in region of the face and upper neck, which was allowed to dry and then dusted with starch; chewing on a lemon wedge was used to assess the gustatory stimulus. The results were categorised as mild, moderate and severe according to criteria laid down by Taylor et al. [14] presence of punctuate discoloration mild, patch less than 2 cm² moderate and more than 2 cm² strong. The aesthetic results evaluated the facial deformity (preauricular and

retromandibular depression) and the incision scar. Incidence of skin/flap necrosis was evaluated 5 days post op.

Incidence of salivary fistula was seen 1 week post op, with patients clinically complaining of the same.

The surgery was done under general anesthesia with the patients in supine position and head tilted to the opposite side. Incisions were hidden in the preauricular crease, and neck incisions were hidden in the curvilinear crease ~ 3 cm below the angle of the mandible. These incisions were connected by gentle curve around the lobule of the ear and extended posteriorly behind the mastoid tip and SCM. Superficial parotidectomy or total parotidectomy (if the deep lobe was involved) was performed with conventional identification and preservation of the facial nerve and its branches. Then a superiorly based partial-thickness flap was taken from the SCM and rotated anteriorly to be sutured by 3–0 Vicryl interrupted sutures to the remnants of the parotid fascia and SMAS and preserved the healthy parotid tissue. This covered the facial nerve and its branches, retromandibular vein, and external carotid artery and its terminal branches, filling the defect that appears after parotidectomy, to achieve better facial contour restoration [15].

The thickness of the flap varied from case to case according to the size of the gap and the type of the operation (superficial or total parotidectomy), and the length of the flap was designed before cutting the SCM by measuring the length of the defect. Care was taken to avoid injury to the spinal accessory nerve during cutting and dissection of the flap, and the flap was sutured to cover all the parotid gland bed from the zygomatic arch superiorly to the level just below the mandible. Then the suction drain was placed deep to the flap before closure of the wound (Figs. 1, 2, 3).

Fig. 1 Exposure of Pes Anserinus and the branches leading on to facial muscles

Fig. 2 Harvesting the superiorly based partial thickness SCM flap

Fig. 3 Defect completely covered by SCM flap

Results

Complications	Sternocleidomastoid flap Total cases—20	No sternomastoid flap Total cases—20
Frey's syndrome	1 (on starch iodine only)	3 (all three positive on starch iodine, and 1 clinically complained of gustatory sweating)
Flap necrosis	None	3
Contour deformity	None	7 (Retromandibular and infraauricular hollowing)
Drain related injury	None (Has been reported in several studies, especially without a covering flap)	None

Complications	Sternocleidomastoid flap Total cases—20	No sternomastoid flap Total cases—20
Salivary fistula	None	2
Difficulty in revision	A previous case operated by us with SCM flap underwent revision. Excellent plane was seen for preservation of facial	Extreme difficulty in preserving facial nerve in a revision case, operated elsewhere previously

In studies conducted by Kornblut et al. [4], the incidence Frey's syndrome on minor starch iodine was observed to be 94%. Also in studies conducted by Laage-Hellman et al. [5] and Morfit and Kramish [6], they have mentioned that clinical gustatory sweating can be as high as 12–54%. In our 1 patient from Group A showed positivity on starch iodine, without any clinical symptoms, as compared to 3 cases in Group B, with one of them complaining of flushing of sweating while eating.

Cosmetic deformities including retromandibular hollowing and depression at the gland removal site are known complications after parotid surgery. A superiorly or inferiorly based sternomastoid flap has been proposed to reconstruct the hollow cavity after parotidectomy. Casler and Conley and Rhee et al. mention, that, although the transposition of a sternomastoid muscle flap can, without doubt, improve the facial contour or symmetry of the parotid region, it also creates a 'donor'—site hollow deformity or asymmetry of the upper neck, especially in slim patients [16–18]. The patients in our study were examined by two surgeons after 6 months for any contour deformity, specifically any depression in the parotid region and retromandibular hollowing. There was no contour deformity seen in Group A patients, while 3 cases of infraauricular hollowing were observed in Group B, with patient dissatisfaction as an added factor too. Also in regards to patient satisfaction in Group A, none of the patients complained about the cosmetic result.

Olsen mentions that skin-flap necrosis is usually rare and is usually located in the distal tip of the post-auricular skin flap. Care must be taken in designing the parotid flap to avoid curving too far posteriorly, to avoid this complication [19]. Yugueros and Woods mention the advantage of using SCM myocutaneous flap in various head and neck surgeries to provide a satisfactory vascularised base and avoiding skin flap necrosis [20]. In our study, 3 cases of tip necrosis were observed in Group B, because of a devascularised tendon base, as opposed to SCM flap in Group A, which saw no cases.

Parotid salivary fistula is a relatively common complication after parotidectomy. Salivary fistula or sialocele occurs if the resected edge of the remaining salivary gland leaks saliva and drains through the wound or collects beneath the flap (sialocele). Flow through the fistula increases during meals, particularly during mastication [19, 20]. In dubious cases, analysis of the fluid can confirm parotid secretion due to high amylase content. The flaps provide soft tissue contour, coverage of facial nerves and nerve grafts, act as a healthy bed for skin grafts, and help close salivary fistulas [10]. In Group A we did not encounter any cases of salivary fistula, while 2 cases were reported in Group B. They were treated conservatively by anticholinergic drugs, reducing oral intake, pressure dressings and repeated aspirations.

Conclusion

Parotid surgery is a technically challenging surgery in regards to the important structures in the vicinity. Even in experienced hands, post operative facial function might be reduced to some extent. Another important complication of parotidectomy is Frey's syndrome which can be debilitating at times if it is not properly addressed intra op. Although many techniques are available to fill the parotidectomy defect, improve facial contour and prevent Frey's syndrome, we found that Sternomastoid flap is a good and acceptable modality to prevent these complications, with the advantage of decreased operative time due to its vicinity to the operative site and high uptake rates due to preserved blood supply.

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