

The Extended Indication of Parotidectomy Using the Modified Facelift Incision in Benign Lesions: Retrospective Analysis of a Single Institution

So-Yoon Lee · Yoon Woo Koh · Bo Gyung Kim ·
Hyun Jun Hong · Jun Hui Jeong · Eun Chang Choi

Published online: 20 August 2011
© Société Internationale de Chirurgie 2011

Abstract

Background Recently, the modified facelift incision (FLI) has gained increasing popularity for its cosmetic benefits in parotidectomy. However, many surgeons remain concerned with the adequacy of the exposure and are unwilling to use the FLI for anterior or superior tumors of the parotid gland because these tumors are closer to the superficially positioned facial nerve branch. To evaluate the changing trends in parotidectomy incisions for benign lesions at a single institute, and to compare the surgical outcomes between the modified Blair incision (BI) and FLI, and determine the adequacy and possible indications or limitations of the FLI, especially for tumors located in the anterior or superior parotid gland.

Materials and methods Retrospective study analyzed 357 patients who had various benign parotid diseases and underwent parotidectomy at Severance Hospital between January 2005 and December 2009. Revisions or recurrences and histologically confirmed malignancies were excluded. Tumor location was divided into superficial and deep lobes. The superficial lobe was subdivided into anterior, superior, inferior, and middle portions. Patients' profiles, surgical outcomes, and cosmetic satisfaction score on a scale of 0 (extremely dissatisfied) to 10 (extremely satisfied) were compared.

Results In all, 344 patients underwent BI or FLI. The FLI was performed increasingly each year. For anterior ($n = 58$) or superior tumors ($n = 32$), there was no significant

difference between the type of incision and tumor size or complications. No facial nerve palsy occurred in either group. For deep-lobe tumors ($n = 67$), the mean tumor size was significantly larger in the BI group ($p = 0.025$). There was a significant difference between facial nerve palsy and tumor size ($p < 0.001$) but no significant difference between facial nerve palsy and tumor location ($p = 0.145$) or the type of incision ($p = 0.530$). The mean scar satisfaction score was significantly higher in the FLI group ($p < 0.001$). There was a positive correlation between the scar and deep hollow satisfaction score (Pearson coefficient of correlation = 0.547; $p < 0.001$).

Conclusions The modified facelift incision is feasible for most benign parotid lesions regardless of tumor location, even for anterior or superior tumors. Using the modified facelift incision may be extended with a surgeon's accumulated experience, but for a large deep-lobe tumor, the modified Blair incision is still considered useful.

Introduction

In head and neck surgery, incisions should provide adequate exposure or access to lesions and a cosmetically acceptable outcome. The incisions used in parotidectomy have been changing. The modified Blair incision (BI) provides good exposure and is relatively easy to perform. However, it leaves a visible scar in the neck, even with meticulous closure [1]. Patients can find the stigma of a visually prominent neck scar following parotid surgery distressing.

The pursuit of an esthetically pleasing scar after parotidectomy has led surgeons to use various approaches [2–5]. The facelift (rhytidectomy) incision has been used for rhytidectomy of the aging face in plastic surgery. The

S.-Y. Lee · Y. W. Koh · B. G. Kim · H. J. Hong ·
J. H. Jeong · E. C. Choi (✉)
Department of Otorhinolaryngology (120-752), Yonsei
University College of Medicine, 250 Sungsan-ro Seodaemun-gu,
Seoul, Korea
e-mail: eunchangmd@yuhs.ac

rhytidectomy incision was first described for a parotidectomy by Appiani in 1967 [6]. Hinderer [7] and Guerrerosantos et al. [8] reported similar approaches to parotid masses. In 1994, Terris et al. described the modified facelift incision (FLI), which is currently used commonly for parotidectomy [9].

The FLI has been used to approach the parotid gland and has gained increasing popularity for its cosmetic benefits. However, as the skin incision is placed further back with this approach than with the BI, many surgeons remain concerned with the adequacy of the exposure and with complications. A few reports have suggested that the FLI and BI provide equally adequate exposure for parotidectomy [10, 11]. Others suggest that this alternative approach is indicated for small, mobile tumors in the tail or for tumors positioned posteriorly or superficially [5, 11]. Many surgeons are unwilling to use the FLI for anterior or superior tumors of the parotid gland because these tumors are closer to the superficially positioned facial nerve branch, increasing the risk of facial nerve damage. There are few reports with clinical data on the adequacy of or possible indications for the FLI for parotidectomy.

We evaluated the changing trends in parotidectomy incisions for benign lesions at a single institute, and we compared the surgical outcomes between the BI and FLI, including subjective parameters (scar and deep hollow satisfaction), and determined the adequacy and possible indications or limitations of the FLI, especially for tumors located in the anterior or superior parotid gland.

Patients and Methods

This study was approved by the Institutional Review Board of the Yonsei University College of Medicine. This retrospective study analyzed 357 patients who had various benign parotid diseases and underwent parotidectomy at Severance Hospital between January 2005 and December 2009. Revisions or recurrences and histologically confirmed malignancies were excluded.

Medical records and reported histological type were reviewed. Radiologic evaluations were reviewed for tumor size and location. The tumor size was the largest size on imaging studies. To identify tumor location, the imaging findings and surgical record were reviewed. Tumor location was divided into superficial and deep lobes using the retromandibular vein on cross-sectional imaging as a landmark: lesions lateral to the retromandibular vein were located in the superficial lobe, whereas lesions medial to the retromandibular vein involved the deep lobe [12]. When the retromandibular vein was not visible because of a large tumor, the facial nerve line that connects the lateral surface of the posterior belly of the digastric muscle with the lateral surface

of the cortex of the ascending mandibular ramus was used as a substitute [13]. The superficial lobe was subdivided into anterior, superior, inferior or tail, and middle portions (Fig. 1). If the tumor was located along the anterior margin of the parotid gland or anterior to the posterior-most point of the ramus on cross-sectional imaging, it had an anterior location (Fig. 1a and b-A). An accessory lobe tumor was considered anterior. If the tumor situated just below the inferior margin of the external auditory canal, it was a superior location (Fig. 1c and b-S). On coronal imaging, if the tumor was located in the most inferior end, it was considered inferior (Fig. 1b-I). The rest of the superficial lobe was considered middle portion (Fig. 1b-M).

To avoid confusing the nomenclature used to name the surgery, in this study, superficial parotidectomy included a complete or partial superficial parotidectomy. Enucleation was defined as extracapsular dissection or lumpectomy. Subtotal parotidectomy was defined as a superficial or partial superficial parotidectomy plus removal of a deep-lobe tumor. We divided the patients into two groups according to the type of incision: BI versus FLI (Table 1).

The following variables were assessed according to the type of incision: age, gender, histopathological diagnosis, facial nerve palsy, incidence of local complications (pain, hemorrhage, hematoma, seroma or sialocele, wound dehiscence, skin necrosis, and keloid scar change), Frey syndrome as a delayed complication, the total volume of drainage, and the duration of drain placement.

Patients were asked to give a cosmetic satisfaction score. Their satisfaction with any scar and deep hollow (the depression deformity following removal of gland bulk) was scored at an outpatient follow-up visit or by phone. The cosmetic result was graded on a scale of 0 (extremely dissatisfied) to 10 (extremely satisfied). The incidence of incision type was determined by year. The time to follow-up ranged from 6 to 71 months (mean: 8.98 months).

Modified Blair Incision

The incision begins superiorly, immediately anterior to the helical rim, passes between it and the tragus, continues inferiorly on the posterior surface of the tragus, curves anteriorly between the tragus and the lobule, curves posteriorly under the lobule to the mastoid process, and then curves gently inferiorly to pass into the neck in a natural wrinkle, approximately 2 cm below the mandible to avoid the marginal mandibular branch of the facial nerve.

Modified Facelift Incision

The traditional facelift incision includes a vertical preauricular incision that enters the temporal scalp posterior to the sideburn hair, and then angles forward in a curvilinear

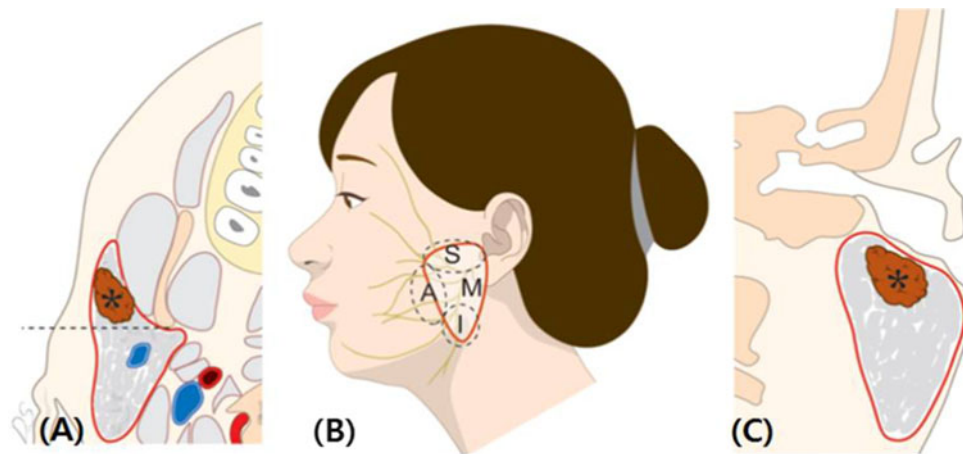


Fig. 1 The four subdivisions of superficial parotid lobe: anterior, superior, inferior or tail, and middle. A tumor situated along the anterior margin of the parotid gland or more anterior than the posterior-most point of the ramus on cross-sectional imaging has an anterior location (**a**, **b-A**). A tumor situated just below the inferior

margin of the external auditory canal has a superior location (**b-S**, **c**). On coronal imaging, a tumor located at the most inferior end is considered an inferior tumor (**b-I**). Tumors in the rest of the superficial lobe were considered middle location (**b-M**). (asterisk-tumor)

Table 1 Comparison of the patient and tumor profiles and surgical outcomes between the modified Blair incision (BI) and modified facelift incision (FLI)

	BI		FLI		<i>p</i> Value
	(n = 162)		(n = 182)		
	Number	%	Number	%	
Age (years)	45.82 ± 14.88		44.12 ± 16.76		0.320
Gender (men:women)	90:72		51:131		
Name of operation					0.518
Superficial parotidectomy	124	76.5	148	81.3	
Subtotal parotidectomy	30	18.5	28	15.4	
Enucleation	8	4.9	6	3.3	
Tumor location	156		178		0.104
Superficial lobe	124		143		80.9
Anterior	26	16.6	32	18.1	
Superior	15	9.6	17	9.6	
Middle	36	23.6	46	25.4	
Inferior	47	29.9	48	27.1	
Deep lobe	32		35		19.1
Mean tumor size (mm)	26.49 ± 11.94		23.76 ± 9.98		0.024
Superficial lobe tumor	24.22 ± 10.40		22.51 ± 9.86		0.171
Deep lobe tumor	35.96 ± 13.45		29.41 ± 8.75		0.025
Local complication	25	15.4	24	13.2	0.643
Facial nerve palsy	24	14.8	20	11.0	0.530
Frey syndrome	57	58.2	41	41.8	0.001
Total drainage amount (ml)	84.10 ± 46.21		90.53 ± 47.43		0.205
Duration of drainage (days)	3.62 ± 1.52		3.62 ± 1.36		0.999
Scar satisfaction score (0–10)	6.89 ± 2.08		8.50 ± 1.79		<0.001
Deep hollow satisfaction score (0–10)	7.74 ± 1.84		8.34 ± 1.68		0.005

fashion superiorly and continues high into the post-auricular area posteriorly. Usually, a horizontal incision that extends posteriorly into the hair from slightly below the mid-conchal region is made [14].

In this study, the incision is usually made in the natural pre-auricular fold and continues behind the tragus. The incision is extended distally around the origin of the earlobe and along the retro-auricular sulcus. At about the level of the



Fig. 2 Design of the modified facelift incision. The difference between the “modified facelift incision” and the “modified Blair incision” is whether a cervical incision is made. The incision never

tragus, the retro-auricular incision is extended posteriorly and then curved in an occipital direction below the hairline (Fig. 2). We omitted the temporal scalp incision in the traditional facelift incision and the retro-auricular incision was curved posteriorly at the level of the tragus to avoid making an acute angle. The occipital direction incision was continued along the hairline inferiorly, not horizontally. Thus, we use “modified” because of the differences between our incision and the traditional facelift incision as described by Terris et al. [9]. Depending on the size of the tumor, the mobility of the flap, and the exposure under the flap can be increased by extending the occipital part of the incision or by extending the pre-auricular incision more cranially.

After shaving and draping the marked incision site, the incision was made and a skin flap was elevated. The elevated flap needs to be retracted with a suture or retractor to provide a sufficient surgical field. After exposing the posterior belly of the digastric muscle and tragal (cartilage) pointer, the facial nerve trunk was identified between these two structures. Then, the parotid section containing the tumor can be removed, guided by the facial nerve branches.

After irrigation, a vacuum drain was inserted and guided in a posterior direction to produce an invisible scar and the incision was closed carefully. A compressive dressing was not typically used.

Statistical Analysis

Statistical analysis was performed with the Student’s *t*-test or the Mann-Whitney *U*-test, the chi-square test, analysis of variance (ANOVA), or Pearson’s chi-square test. All

goes toward the neck. It goes along the hairline and is positioned in a hair-bearing area in the modified facelift incision

p values less than 0.05 were deemed statistically significant.

Results

In the present study, 357 patients (144 men and 213 women) with confirmed benign parotid disease underwent parotidectomy. The mean patient age at the time of surgery was 45 years (range: 12–88 years). The histological diagnosis for all patients is detailed in Fig. 3. Pleomorphic adenoma was the most common neoplasm in the parotid gland.

Incisions performed for parotidectomy by year are shown in Fig. 4. The FLI was performed increasingly each year.

A transcervical or retro-auricular incision was used in 13 cases. In all 344 cases underwent BI (162 cases; 45.4%) or FLI (182 cases; 51%). In the BI group ($n = 162$), a superficial parotidectomy, subtotal parotidectomy, or enucleation was performed in 124 (76.5%), 30 (18.5%), and 8 (4.9%) cases, respectively. In the FLI group ($n = 182$), the respective numbers were 148 (81.3%), 28 (15.4%), and 6 (3.3%) cases.

The mean tumor size was 26.49 ± 11.94 mm in the BI group and 23.76 ± 9.98 mm in the FLI group and differed significantly between the two groups ($p = 0.024$). The BI and FLI were compared by the tumor location. For superficial lobe tumors ($n = 267$), a BI was performed in 124 (46.4%) cases and a FLI in 143 (53.6%) cases. For deep lobe tumors ($n = 67$), a BI was performed in 32 (47.7%)

Fig. 3 Histopathological diagnosis. Pleomorphic adenoma was the most common neoplasm in the parotid gland

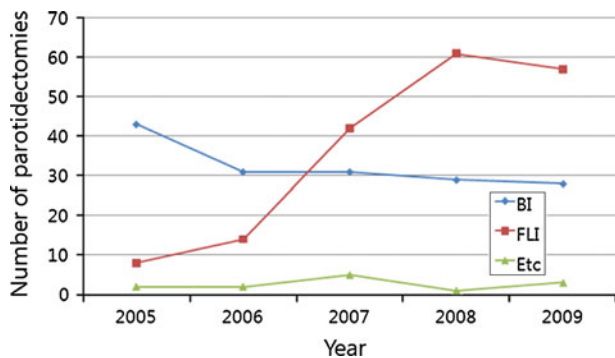
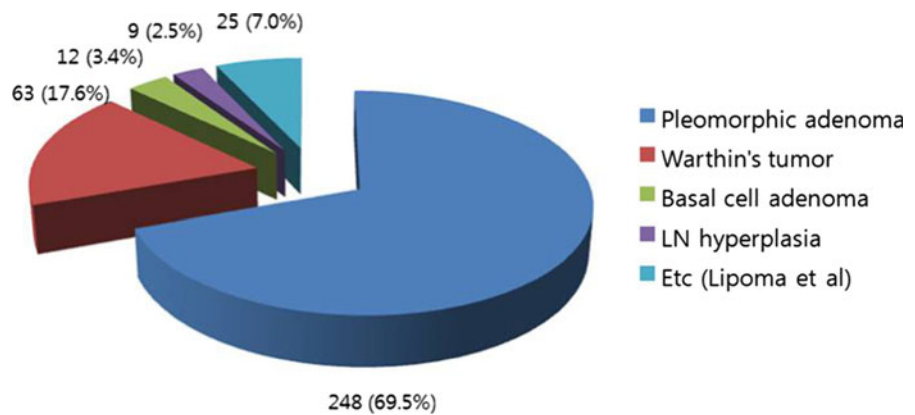


Fig. 4 Changing trends in incisions for parotidectomy (from Jan 2005 to Dec 2009). The modified facelift incision was performed with increasing frequency

cases and a FLI in 35 (52.3%) cases. According to the four different tumor locations in the superficial lobe, for anterior tumors ($n = 58$), a BI was performed in 26 (44.8%) cases and a FLI in 32 (55.2%) cases; for superior tumors ($n = 32$), there were 15 (46.9%) and 17 (53.1%) cases, respectively; for inferior located tumors, there were 47 (49.5%) BI and 48 (50.5%) FLI; and for middle tumors, there were 36 (43.9%) and 46 (56.1%) cases, respectively. There was no statistically significant difference between tumor location and the type of incision ($p = 0.104$) (Table 1).

For anterior located tumors ($n = 58$), the FLI (Fig. 5) has been used more frequently than the BI since 2006. The mean tumor size was 21.42 ± 8.37 mm in the BI group ($n = 26$) and 20.03 ± 7.19 mm in the FLI group ($n = 32$). In the BI group, 6 (23.1%) patients had minor complications, such as seroma, versus 4 (12.5%) cases in the FLI group ($n = 32$). No facial nerve palsy occurred in either group. There was no significant difference between the type of incision and tumor size ($p = 0.509$) or complications ($p = 0.566$) for anterior tumors.

For superior tumors ($n = 32$), the FLI (Fig. 6) has been performed more frequently than the BI since 2008. The mean tumor size was 23.00 ± 5.54 mm in the BI group ($n = 15$) and 22.00 ± 7.51 mm in the FLI group ($n = 17$).

There were 3 (20.0%) minor complications in the BI group and 1 (5.9%) in the FLI group. There was no significant difference between the type of incision and tumor size ($p = 0.669$) or complications ($p = 0.185$) for superior tumors.

For deep-lobe tumors ($n = 67$), the mean tumor size was 35.96 ± 13.45 mm in the BI group ($n = 32$) and 29.41 ± 8.75 mm in the FLI group ($n = 35$) (Fig. 7). There was a statistically significant difference between the type of incision and tumor size ($p = 0.025$). For deep-lobe tumors, the largest tumor size using a FLI was 45 mm.

In the BI group, the mean tumor size was 24.22 ± 10.40 mm for superficial tumors ($n = 124$) and 35.96 ± 13.45 mm for deep lobe tumors ($n = 32$). In the BI group, there was a significant difference between tumor location and size ($p < 0.001$).

In terms of complications, overall, 49 (14.2%) of 344 patients experienced a complication: 25 (15.4%) of 162 BI cases and 24 (13.2%) of 182 FLI cases (Table 1). A seroma or sialocele was the most common complication ($n = 27$), and the wound healed well after aspiration and/or compression. There was pain in seven cases, a keloid scar in six, a hematoma in five, and retro- or infra-auricular wound dehiscence in four cases. There was no significant difference between the type of incision and local complications ($p = 0.643$).

Facial nerve palsy was identified in 44 (12.9%) of 344 cases. The House Brackmann (HB) grade was II, III, and IV in 38 (84.1%), 4 (10.6%), and 2 (5.3%) cases, respectively. The mean tumor size was 31.10 ± 16.01 mm in the facial nerve palsy group ($n = 44$) and 23.88 ± 9.62 mm in the normal facial function group ($n = 300$). There were 30 (11.4%) cases with superficial tumors and 14 (19.7%) cases with deep lobe tumors. Facial nerve palsy was identified in 24 (14.8%) cases in the BI group and 20 (11.0%) in the FLI group. There was a statistically significant difference between facial nerve palsy and tumor size ($p < 0.001$) but no significant difference between facial nerve palsy and tumor location ($p = 0.145$) or the type of incision ($p = 0.530$).

Fig. 5 Superficial parotidectomy via a modified facelift incision for an anterior tumor. Computed tomography of a 23-year-old woman shows a 2 cm lesion (*arrow*) in the anterior portion of the right parotid gland (**a, b**). The exposure of the lesion and parotid gland was good (**c**). There was no facial palsy after the parotidectomy. The specimen is shown (**d**)

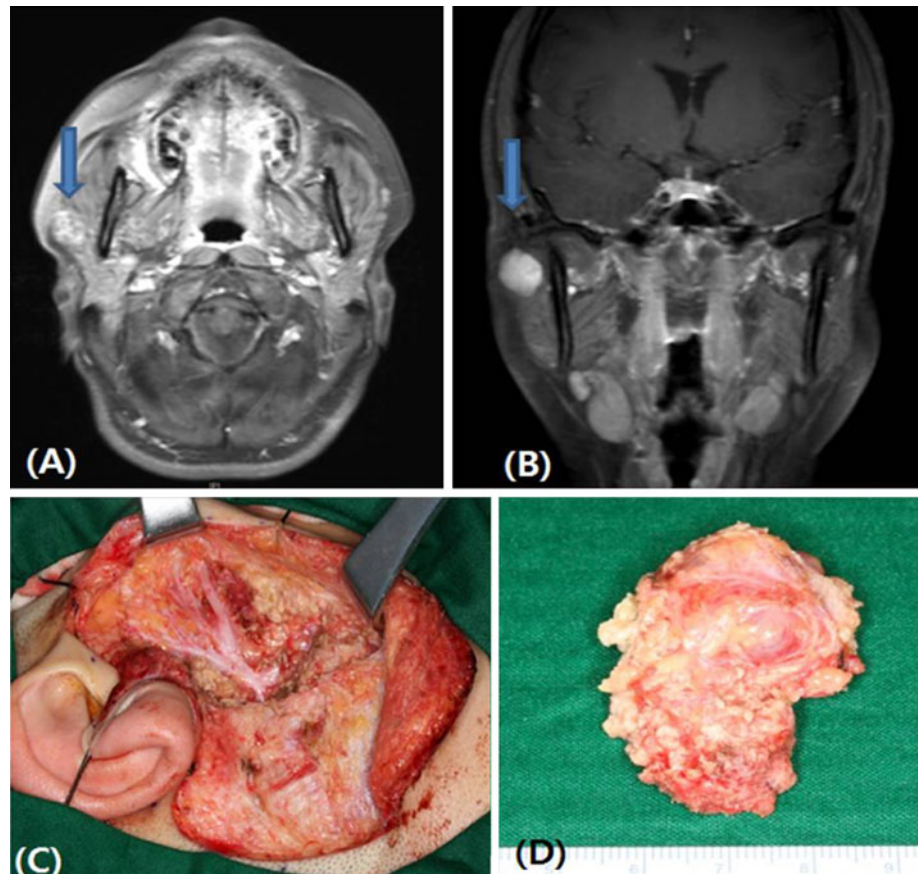


Fig. 6 Superficial parotidectomy via a modified facelift incision for a superior tumor. Computed tomography of a 70-year-old woman shows a 2.5 × 3 cm lesion in the superior portion of the parotid gland (**a, b**). The modified facelift incision was used (**c**). The tumor was removed with adequate exposure. The specimen is shown (**d**)

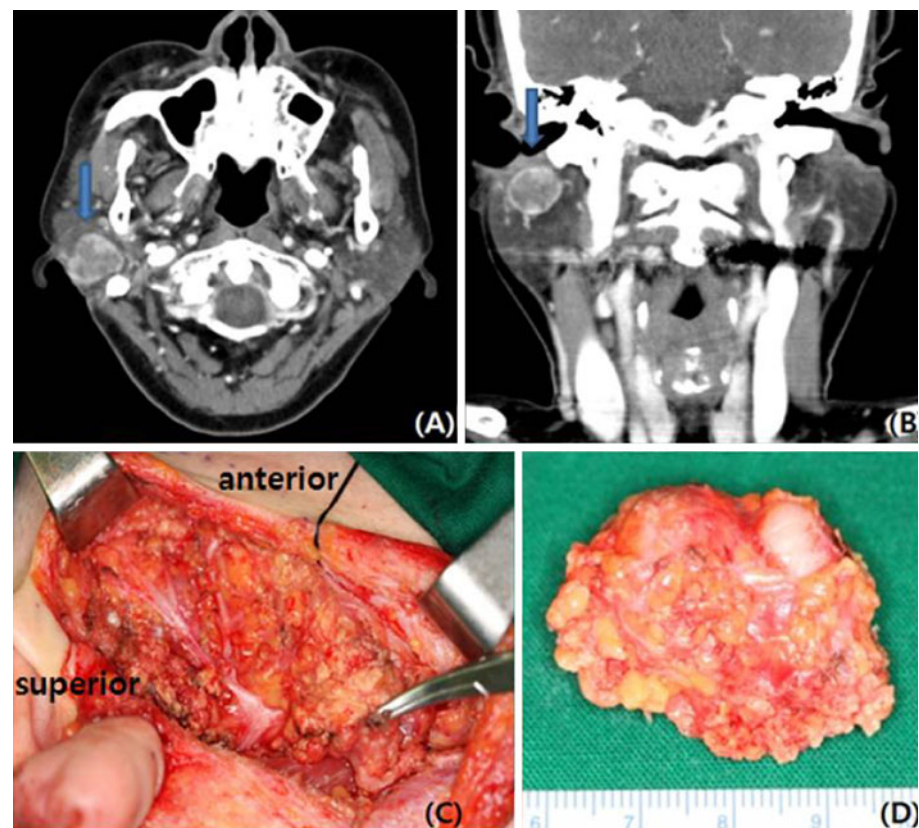
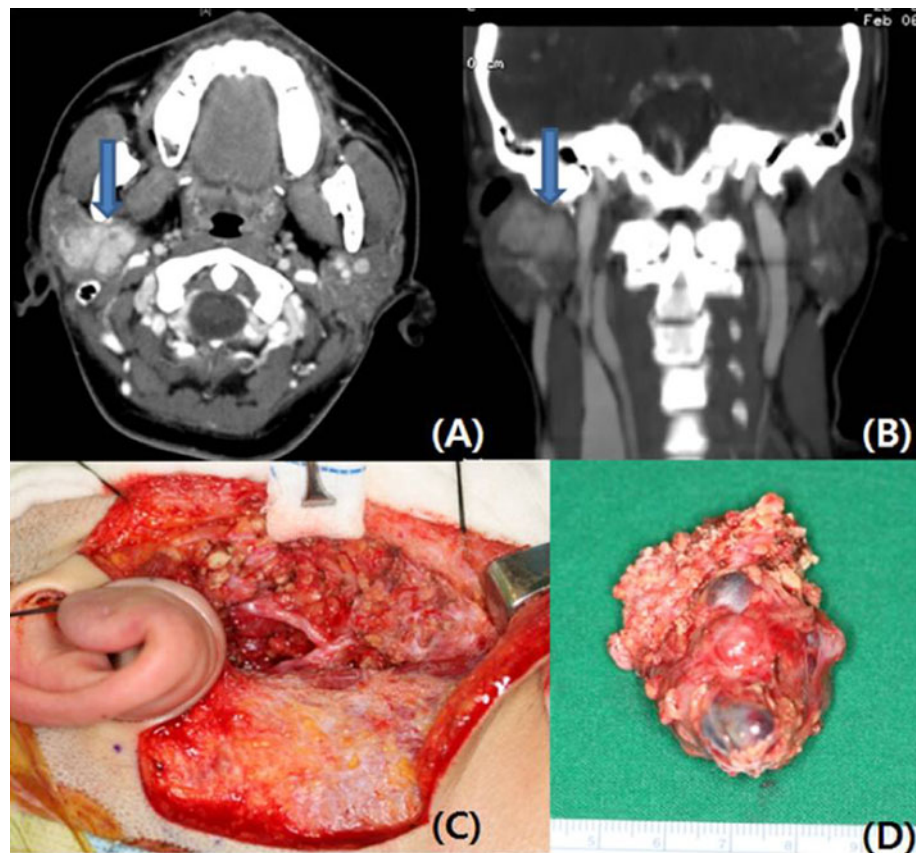


Fig. 7 Subtotal parotidectomy via a modified facelift incision for a deep lobe tumor. Computed tomography of a 29-year-old woman shows a 3.5 × 3-cm lesion in the deep lobe of the parotid gland (a, b). A modified facelift incision was used (c). The tumor was removed after a superficial parotidectomy. Exposure was adequate. The specimen is shown (d)



For deep-lobe tumors, facial nerve palsy developed in 14 cases: 8 (5.0%) with a BI and 6 (2.8%) with a FLI. For superficial tumors, facial nerve palsy developed in 30 cases: 16 (10.0%) with a BI and 14 (7.9%) with a FLI. Complete recovery of facial function was confirmed in 27 cases. The mean time to recovery was 3.87 ± 3.19 months (range: 0.5–12 months).

Frey syndrome occurred in 98 (35.3%) of 278 cases: 57 (46.3%) of 123 cases in the BI group and 41 (26.4%) of 155 cases in the FLI group. There was a significant difference between the type of incision and Frey syndrome ($p = 0.001$).

The mean scar satisfaction score was 6.89 ± 2.08 in the BI group ($n = 122$) and 8.50 ± 1.79 in the FLI group ($n = 153$). There was a significant difference between the type of incision and the scar satisfaction score ($p < 0.001$). The mean deep hollow satisfaction score was 7.74 ± 1.84 in the BI group ($n = 122$) and 8.34 ± 1.68 in the FLI group ($n = 153$) and did not differ significantly ($p = 0.005$).

There was a positive correlation between the scar and deep hollow satisfaction score (Pearson coefficient of correlation = 0.547; $p < 0.001$) (Fig. 8).

In the BI group ($n = 162$), the total drainage averaged 84.10 ± 46.21 ml and the mean drain removal was on postoperative day 3.62 ± 1.52 . In the FLI group ($n = 182$),

the total drainage averaged 90.53 ± 47.43 ml and the mean drain removal was on postoperative day 3.62 ± 1.36 .

There was no significant difference in the total drainage ($p = 0.205$) or drain removal day ($p = 0.999$) between the two incision groups.

The mean hospital stay was 6.50 ± 1.93 days (range: 3–18 days).

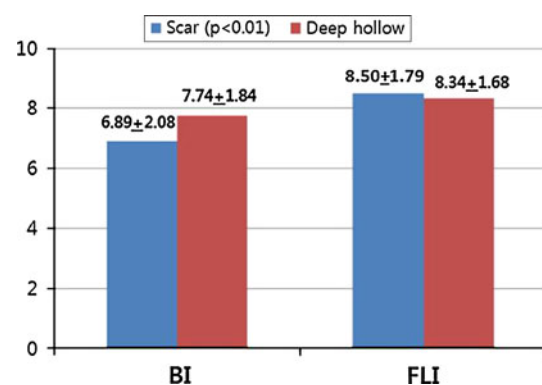


Fig. 8 Scar and deep hollow satisfaction score. There was a significant difference between the type of incision and the scar satisfaction score ($p < 0.001$). There was a positive correlation between the scar and deep hollow satisfaction scores (Pearson coefficient of correlation = 0.547; $p < 0.001$)

Discussion

Traditionally, the modified Blair incision (BI) has been used for parotidectomy. It allows good exposure of the facial nerve and facilitates anterograde resection. However, this incision results in a prominent scar in the neck. The pursuit of an esthetically pleasing scar after parotidectomy has led surgeons to try various approaches [2–5, 15].

There are various landmarks for identifying the facial nerve [16]. This makes it easy to find the facial nerve in a relatively narrow surgical field through minimally invasive or various esthetic approaches.

A few reports suggest that the FLI provides adequate exposure for parotidectomy, the same as the BI [10, 11]. However, many surgeons believe that the FLI is potentially limited for anterior or superior exposure of the parotid and that it is indicated only for small, mobile tumors in the tail, or posterior or superficial tumors [5, 11]. Few articles have reported clinical data on the adequacy or possible indications or limitations of the FLI for parotidectomy, especially compared with the BI.

Recently, the FLI has gained increasing popularity for its cosmetic benefit. In the present study, the FLI was performed increasingly each year, and a change in the incision trend could be identified, especially for benign parotid tumor. As shown in Table 1, the FLI was performed regardless of tumor location in the present study.

We evaluated differences in tumor size, location, surgical complications, and cosmetic satisfaction between the BI and the FLI. There was no significant difference in tumor location, local complications, or the incidence of facial nerve palsy between the two incisions. However, tumor size was larger in the BI group and Frey syndrome was more frequent in the BI group.

We did not actively test for Frey syndrome in our patients, because we assessed only subjective symptoms. Although the pathophysiology of this syndrome is not completely understood, the most widely accepted theory describes parasympathetic nerve fiber regrowth that originally innervated the parotid gland after neuronal injury. The regenerating fibers cause the innervation of interrupted sympathetic fibers of sweat glands and blood vessels in the facial skin [17].

The reported incidence of Frey syndrome after parotidectomy differs according to the incision used or extent of dissection. One report also found that gustatory sweating affected more patients following the BI than the FLI, as in our study. They suggested that this difference may be explained by the fact that the FLI tends to be favored for small benign tumors, requiring less parotid dissection and less disruption of its parasympathetic nerve supply than the BI [2]. Another report

advocated limited resection to decrease the incidence of Frey syndrome. The rationale for their method was that, because parotid gland resection causes Frey syndrome, the resection of less parotid tissue may decrease Frey syndrome, as shown with their data [18]. Other reports suggested that the more gland capsule that remains intact, the lower the risk of developing such neural misconnections [19–22]. In our study, we believe that the tumor size was larger in BI, so more dissection was performed, leading to disruption of its parasympathetic nerve supply. However, one meta-analysis did not find any significant risk factor for the development of Frey syndrome after parotidectomy. Only a trend was seen for a higher incidence in patients with a larger extent of removed parotid tissue (specimen volume ≥ 70 cm³; $p = 0.085$) [23]. Variable sample size, differing methods for evaluating Frey syndrome, and insufficient statistical power give rise to the different results. Still, it does not seem possible to explain clearly.

We divided superficial lobe tumors into four subgroups (anterior, superior, inferior, and middle portions), based on imaging studies, and compared incisions and complications among these subgroups. For anterior or superior tumors, there was no significant difference in tumor size, local complication, or the incidence of facial nerve palsy between the two incisions. The distal branches of the facial nerve run superficially. Poor surgical exposure may increase the incidence of facial nerve palsy. In our study, however, use of the FLI for tumors positioned distal to the facial nerve trunk did not increase the incidence of local complications or facial nerve palsy.

For deep-lobe tumors, there was only a statistically significant difference between the type of incision and tumor size. The mean tumor size of deep-lobe tumors was much larger in the BI group. Because this was a retrospective study, this suggests that surgeons prefer the BI for large, deep-lobe tumors. A deep-lobe tumor could be an indication for the FLI. The largest deep-lobe tumor using the FLI was 45 mm. However, it is possible that the FLI results in limited exposure of large tumors, compared with the BI. The BI is still useful for patients with large, deep-lobe tumors.

In terms of facial nerve palsy, although permanent facial nerve palsy is the most serious complication following parotidectomy, the risk is relatively low. In our study, only tumor size was related to facial nerve palsy, not tumor location or type of incision. The FLI is a useful alternative approach for parotidectomy regardless of tumor location, unless the tumor is large.

Local complications after surgery via the FLI include seroma, wound infection, hematoma, and scar formation. Complications such as skin flap necrosis, alopecia, and earlobe deformities are very rare. Skin flap necrosis may be

caused by longer and thinner flaps and, sometimes, unrecognized hematoma. Earlobe distortion may result from poor incision placement, inaccurate re-approximation of the earlobe to the re-draped skin flap, or excessive tension on the skin closure [9, 24, 25]. In our study, there was no significant difference in local complications between the two incisions. The most common local complication was a seroma or sialocele, and it resolved quickly with aspiration or compression. The FLI skin incision is placed further back than the BI, so many surgeons remain concerned about complications. However, we experienced no skin necrosis in any case. An acute angle between the retro-auricular and hairline incisions should be avoided.

Although the BI had a higher scar satisfaction score compared to the FLI in one article [2], the FLI usually has superior cosmetic satisfaction. In our study, the FLI showed significantly greater satisfaction. The depression deformity following removal of gland bulk can cause cosmetic problems following parotidectomy. To overcome this, a sternocleidomastoid muscle flap or superficial musculoaponeurotic system (SMAS) advancement flap has been performed with parotidectomy recently. There are some advantages of the facelift incision with an SMAS advancement flap: it leaves no visible scar, prevents a conspicuous hollow at the angle of the mandible, and reduces Frey syndrome without additional complications [1, 2, 15, 26–30]. However, we have no experience with this SMAS advancement flap. Nevertheless, we found a positive correlation between scar satisfaction and deep hollow satisfaction score. If the patients are satisfied with the scar, they are also satisfied with the deep hollow deformity. The incidence of Frey syndrome in our study was still high. We should consider methods for preventing Frey syndrome.

In summary, according to our data analysis, the FLI is being used increasingly for parotidectomy regardless of tumor location. The only factor related to facial nerve palsy after parotidectomy was tumor size, regardless of tumor location or the type of incision. When the tumor is large, especially in the deep lobe, surgeons prefer the BI. The incidence of complications did not differ between the BI and FLI. However, the FLI had a superior cosmetic benefit. Although the deep hollow satisfaction score did not differ significantly between the two incisions, the scar and deep hollow satisfaction scores were positively correlated.

When the tumor was located in the anterior or superior portion of the parotid gland, where the facial nerve branches run more superficially, the FLI was used successfully without any difference in the incidence of complications, compared with the BI. This indicates the adequacy of the FLI for parotidectomy, even for anterior or superior tumors.

Conclusions

The advantages of the modified facelift incision are that it leaves no visible scar and allows very good exposure of all divisions of the facial nerve branches. The modified facelift incision is feasible for most benign parotid lesions regardless of tumor location. This incision has similar complication rates and a higher cosmetic satisfaction score than the modified Blair incision. For parotidectomy in benign parotid lesions, use of the modified facelift incision may be extended with a surgeon's accumulated experience, but for a large deep-lobe tumor, the modified Blair incision is still useful.

Acknowledgments The authors are grateful to Dong-Su Jang (Medical Illustrator, Medical Research Support Section, Yonsei University College of Medicine, Seoul, Korea) and Kyounghee Lee (Coordinator of Head and Neck surgery) for their help with the figures and the survey. The English in this document has been checked by at least two professional editors, both native speakers of English. For a certificate, please see: <http://www.textcheck.com/certificate/AYcS8U>

References

- Honig JF (2004) Facelift approach with a hybrid SMAS rotation advancement flap in parotidectomy for prevention of scars and contour deficiency affecting the neck and sweat secretion of the cheek. *J Craniofac Surg* 15:797–803
- Wasson J, Karim H, Yeo J et al (2010) Cervicomastoidfacial versus modified facelift incision for parotid surgery: a patient feedback comparison. *Ann J Coll Surg Engl* 92:40–43
- Meningaud JP, Bertolus C, Bertrand JC (2006) Parotidectomy: assessment of a surgical technique including facelift incision and SMAS advancement. *J Crani Maxillofac Surg* 34:34–37
- Marti PC, Garcia DE, Garcia AL et al (2007) Minimal incision in parotidectomy. *Int J Oral Maxillofac Surg* 36:72–76
- Lohuis PJFM, Tan ML, Bonte K et al (2009) Superficial parotidectomy via facelift incision. *Ann Otol Rhinol Laryngol* 118:276–280
- Appiani E (1967) Handling of a parotidectomy and muscular graft. *Prensa Med Argent* 54:1242–1243
- Hinderer UT (1977) Prevention of unsatisfactory scarring. *Clin Plast Surg* 4:199–205
- Guerrerosantos J, Dicksheet S, Guillen C et al (1982) Hidden incision in surgery of parotid, submandibular, cervical, and cheek benign tumors. *Ann Plast Surg* 9:402–408
- Terris DJ, Tuffo KM, Fee WE Jr (1994) Modified facelift incision for parotidectomy. *J Laryngol Otol* 108:574–578
- Nouraei SAR, Al-Yaghchi C, Ahmed J et al (2006) An anatomical comparison of Blair and facelift incisions for parotid surgery. *Clin Otolaryngol* 31:531–534
- Upile T, K.Jerjes W, Nouraei SAR et al (2010) Further anatomical approaches to parotid surgery. *Eur Arch Otorhinolaryngol* 267:793–800
- Divi V, Fatt MA, Teknos TN et al (2005) Use of cross-sectional imaging in predicting surgical location of parotid neoplasms. *J Comput Assist Tomogr* 29:315–319
- Lim CY, Chang HS, Nam KH et al (2008) Preoperative prediction of the location of parotid gland tumors using anatomical landmarks. *World J Surg* 32:2200–2203

14. Biley BJ, Johnson JT (2006) The aging face (rhytidectomy). In: Kridel RWH (ed) *Head and Neck Surgery—Otolaryngology*, 4th edn. Lippincott Williams & Wilkins, Philadelphia, p 2635
15. Paris J, Richard O, Lafont B et al (2007) Aesthetic parotidectomy: face lift incision and SMAS flap]. *Rev Laryngol Otol Rhinol (Bord)* 128:261–264
16. Upile T, Jerjes W, Nouraei SA et al (2009) The stylomastoid artery as an anatomical landmark to the facial nerve during parotid surgery: a clinico-anatomic study. *World J Surg Oncol* 7:71
17. Biley BJ, Johnson JT (2006) The aging face (rhytidectomy) In Kridel RWH, editor, *Head and Neck Surgery-Otolaryngology*, 4th edn. Lippincott Williams & Wilkins, Philadelphia, p 555
18. Myssiorek D (1999) Removal of the inferior half of the superficial lobe is sufficient to treat pleomorphic adenoma in the tail of the parotid gland. *Arch Otolaryngol Head Neck Surg* 125:1164–1165
19. Gordon AB, Fiddian RV (1976) Frey's syndrome after parotid surgery. *Am J Surg* 132:54–58
20. Yu GY, Ma DQ, Liu XB et al (1998) Local excision of the parotid gland in the treatment of Warthin's tumour. *Br J Oral Maxillofac Surg* 36:186–189
21. Yamashita T, Tomoda K, Kumazawa T (1993) The usefulness of partial parotidectomy for benign parotid gland tumors. A retrospective study of 306 cases. *Acta Otolaryngol Suppl* 500:113–116
22. Wennmo C, Spandow O, Emgard P et al (1988) Pleomorphic adenomas of the parotid gland: superficial parotidectomy or limited excision? *J Laryngol Otol* 102:603–605
23. Guntinas-Lichius O, Gabriel B, Klussmann JP (2006) Risk of facial palsy and severe Frey's syndrome after conservative parotidectomy for benign disease: analysis of 610 operations. *Acta Otolaryngol* 126:1104–1109
24. Moyer JS, Baker SR (2005) Complications of rhytidectomy. *Facial Plast Surg Clin North Am* 13:469–478
25. Marshall AH, Quraishi SM, Bradley PJ (2003) Patients' perspectives on the short- and long-term outcomes following surgery for benign parotid neoplasms. *J Laryngol Otol* 117:624–629
26. Curry JM, Fisher KW, Heffelfinger RN et al (2008) Superficial musculoaponeurotic system elevation and fat graft reconstruction after superficial parotidectomy. *Laryngoscope* 118:210–215
27. Wille-Bischofberger A, Rajan GP, Linder TE et al (2007) Impact of the SMAS on Frey's syndrome after parotid surgery: a prospective, long-term study. *Plast Reconstr Surg* 120:1519–1523
28. Foustanos A, Zavrvides H (2007) Face-lift approach combined with a superficial musculoaponeurotic system advancement flap in parotidectomy. *Br J Oral Maxillofac Surg* 45:625–652
29. Cesteley L, Helman J, King S et al (2002) Temporoparietal fascia flaps and superficial musculoaponeurotic system plication in parotid surgery reduces Frey's syndrome. *J Oral Maxillofac Surg* 60:1284–1297 discussion 97–98
30. Allison GR, Rappaport I (1993) Prevention of Frey's syndrome with superficial musculoaponeurotic system interposition. *Am J Surg* 166:407–410