

Outcome, General, and Symptom-Specific Quality of Life After Various Types of Parotid Resection

Raphael Richard Ciuman, MD; Wolfgang Oels, MD; Rolf Jaussi, MD; Philipp Dost, MD, PhD

Objectives/Hypothesis: To document the outcome and impact on general and symptom-specific quality of life (QOL) after various types of parotid resection.

Study Design: General and symptom-specific QOL assessment at least 1 year after performed surgery. Retrospective data and outcome analysis of patients.

Methods: Between 2004 and 2010, 353 parotid resections in 337 patients were conducted at the Department of Otorhinolaryngology, University Teaching Hospital, St. Mary's Hospital Gelsenkirchen, Gelsenkirchen, Germany. A total of 196 patients fit the inclusion criteria and were available for postoperative evaluation. The general QOL assessment was based on both the global health status and global QOL scales of the European Organisation for Research and Treatment of Cancer (EORTC) Quality-of-Life Questionnaire in 34 patients. Symptom-specific QOL was assessed with the Parotidectomy Outcome Inventory-8 (POI-8). In addition, aesthetic outcome was evaluated with an ordinal scale.

Results: Outcome of parotidectomies in benign disease has little impact on general QOL and global health status. However, hypoesthesia or dysesthesia, Frey's syndrome, and cosmetic discontent are quite common and may affect symptom-specific and general QOL. Correlation with extent of surgery and statistically significant differences of patient evaluation for aesthetic outcome, sensory impairment, and Frey's syndrome between various types of limited parotid surgery (enucleation, extracapsular dissection, partial superficial parotidectomy) and superficial parotidectomy could be shown.

Conclusions: An adequate parotid resection technique must be chosen to achieve the least disturbing outcome. In addition, in our patient collective, there was no increased recurrence rate found after limited parotid resection for pleomorphic adenoma or cystadenolymphoma.

Key Words: Parotid gland, parotidectomy, quality of life, facial nerve, Frey's syndrome, hypoesthesia.

Level of Evidence: 2c.

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INTRODUCTION

Complications and functional outcome after parotid surgery can affect conduct and quality of life (QOL). The Meran Conference on QOL recommended the use of QOL together with conventional outcome measures.¹ QOL after parotid surgery has been discussed in a limited number of studies so far, after superficial parotidectomy using the European Organisation for Research and Treatment of Cancer Quality-of-Life Questionnaire-30 (EORTC QLQ-C30) in 34 patients,² evaluating the impact of great auricular nerve sacrifice during paroti-

dectomy on QOL,³ or using a modified but not validated version of the University of Washington Quality of Life Instrument in 53 patients.⁴ The objective of this study was to document the functional and aesthetic outcome after parotid surgery and its impact on general and symptom-specific QOL in relation to various types of parotid resection.

In recent years, numerous authors advocated more limited types of parotid surgery in benign disease as they do not show higher complication rates and recurrences, exhibit less patient sequelae like sensory impairment, auriculotemporal syndrome (Frey's syndrome, gustatory sweating) or aesthetic discontent, and decrease operation time. Limited parotid resection includes enucleation (breaching of the capsule and removing the tumor from within with or without nerve dissection), extracapsular dissection, and partial lateral parotidectomy, which may include lateral and or medial sections. Extracapsular dissection is ideally used in discrete mobile tumors up to 4 cm, and is by definition a meticulous dissection immediately outside the tumor capsule within a compartment of loose areolar tissue approximately 2 to 3 mm from the tumor without dissection of the facial nerve.⁵ Partial superficial parotidectomy includes by definition the dissection of the main trunk and the facial nerve branch adjacent to the tumor with a minimum of a 1 to 2-cm safety margin.^{6,7}

From the Department for Otorhinolaryngology–Head and Neck Surgery (R.R.C., W.O., P.D.), St. Mary's Hospital Gelsenkirchen, Gelsenkirchen; and Department of Pathology (R.J.), Institute for Pathology, Leverkusen-Wiesendorf, Germany.

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This work is dedicated to Hans-Georg Möller, MD, former head of the Department of Otorhinolaryngology–Head and Neck Surgery, St. Mary's Hospital Gelsenkirchen, Gelsenkirchen, Germany, on the occasion of his 70th birthday.

Send correspondence to Raphael Richard Ciuman, MD, Department for Otorhinolaryngology–Head and Neck Surgery, St. Mary's Hospital Gelsenkirchen, Virchowstrasse 122, 45886 Gelsenkirchen, Germany. E-mail: ciuman.rafael@cityweb.de

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TABLE I.
Histopathological Classification After Parotid Resection
in Benign Disease.

Adenomas 265/345 (77%)
Cystadenolymphoma 167 (48%)
Pleomorphic adenoma 80 (23%)
Basal cell adenoma 10
Oncocytoma 8
Cysts 26 (8%)
Retention cyst 12
Salivary duct cyst 9
Lymphoepithelial cyst 4
Pseudocyst 1
Miscellaneous
Sialadenosis 10
Salivary duct ectasia 4
Chronic sialadenitis 8
Acute sialadenitis 2
Sialolithiasis 5
Sialometaplasia with cystadenolymphoma 1
Reactive lymphadenitis 14
Toxoplasmic lymphadenitis 2
Tuberculosis lymphadenitis 1
Lipoma 4
Neurinoma 1
Myoepithelioma 1
Branchial cyst 1

More extended types of parotid surgery include subtotal (superficial) parotidectomy, which encloses less than a full superficial lobe and less than a full facial nerve dissection; superficial (lateral) parotidectomy; extended superficial parotidectomy, which includes deep parotid sections; near total (in benign disease) parotidectomy; and total parotidectomy. Radical parotidectomy sacrifices the facial nerve in malignant disease.

MATERIALS AND METHODS

Between 2004 and 2010, 353 parotid resections in 337 patients were conducted at the Department of Otorhinolaryngology–Head and Neck Surgery at the University Teaching Hospital, St. Mary's Hospital Gelsenkirchen, Gelsenkirchen, Germany. Of them, eight patients had bilateral parotid surgery, and seven patients had one or two revisions performed. Histopathology is summarized in Table I. A total of eight patients were excluded from further evaluation due to revision surgery with insufficient data from the previous operations, and another patient was excluded from further evaluation due to transoral resection of a parapharyngeal tumor.

Altogether, 196 patients (102 male, 94 female) were available for evaluation and fit the inclusion criteria (no psychiatric/neurologic disease, date of surgery >1 year ago). Of them, two patients had bilateral surgery, one patient was operated on twice because of cystadenolymphoma (initial extracapsular dissection and lateral parotidectomy for revision surgery), and another patient was treated with superficial parotidectomy for chronic sialadenitis and reoperated on twice because of retention cysts. We usually used the standard modified Blair S-shaped incision. Two patients who were available for evaluation had a subman-

dibular incision performed, and another two patients had a lateral cervical incision.

Complications and Long-Term Outcome

Incidence of complications and long-term outcome (revision parotidectomy, hemorrhage, seroma formation, salivary fistula, wound dehiscence, or necrosis) was recorded in all operations. Incidence of Frey's syndrome, trismus, facial nerve paralysis (transient, permanent, complete, incomplete), scar pain, and sensory impairment (hypoesthesia, dysesthesia, cold or heat intolerance) was surveyed via telephone call in patients who were available for evaluation and fit the inclusion criteria.

Aesthetic Outcome

In patients with parotid resection because of benign disease, satisfaction with the cosmetic result was evaluated with an ordinal scale (0 = normal or very good, 1–3 = good, 4–6 = average, 7–9 = poor, 10 = intolerable). Patients with submandibular or lateral cervical incision were not included in the aesthetic outcome evaluation.

General and Symptom-Specific QOL Assessment

The symptom-specific QOL was assessed with the Parotidectomy Outcome Inventory-8 (POI-8) of Baumann et al.⁸ (original questions in German). It consists of eight Likert-type scaled questions from 0 to 5 (Table II). The general QOL assessment was based on the German version of the two global health status and global QOL scales (question 29 and 30) of the EORTC QLQ-C30, which consist of Likert-type scale questions from 1 to 7. The questions were adapted as the patients were specifically asked how the outcome of parotid surgery affects their QOL and general health (Table II). High values for the general QOL scales indicate high functionality and QOL. For

TABLE II.

Instrument for the Quality-of-Life Assessment With the Parotidectomy Outcome Inventory-8, the Adapted Global Health Status, and Global Quality-of-Life Scales of the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire-C30, and the Assessment With the Satisfaction of the Aesthetic Outcome.

1. Pain in the area of operations and/or face
2. Sensory impairment in the area of operations and/or neck
3. Abnormality of the scar
4. Changed appearance due to facial nerve paralysis
5. Changed appearance due to resection of the parotid gland (tissue loss)
6. Perspiration in the area of operations (particularly at dinner)
7. Dryness of mouth as impact of the operation
8. I have fear of revision surgery
0 = no problem, 1 = very small problem, 2 = small problem, 3 = moderate problem, 4 = severe problem, 5 = it cannot be worse
29. How would you rate the impact of the parotid surgery/whole therapy on your overall health during the past week?
30. How would you rate the impact of the parotid surgery/whole therapy on your overall quality of life during the past week?
1 2 3 4 5 6 7 Very poor Excellent
How would you rate your satisfaction with the aesthetic outcome of the operation?
0 = normal or very good, 1–3 = good, 4–6 = average, 7–9 = poor, 10 = intolerable

comparability reasons the results were linearly transformed: (RAW SCORE-1/range)×100 for the general QOL scales and (1-[x/range]×100) for the symptom-specific QOL scales. Value differences of 10 are relevant.⁹

Statistical Analysis

Correlation analysis between extent of surgery and incidence of patient sequelae (Frey's syndrome, facial palsy, sensory impairment, scar pain) was analyzed using Spearman rank correlation coefficient ($P < .05$). χ^2 test ($P < .05$) was used for comparison between various types of parotid surgery. Patient sequelae were correlated with maximal tumor diameter measured by B-mode ultrasound using the Spearman rank correlation coefficient ($P < .05$).

For aesthetic outcome, relative frequencies and values of central tendency and deviation with their confidence interval of the group, both sexes, and type of parotid resection were calculated. Subsequently, the results were linearly transformed for comparability reasons: $X = 1-(x/range) \times 100$. Afterward, correlation between the extent of surgery and aesthetic outcome using Spearman rank correlation coefficient ($P < .05$) was analyzed. Statistical analysis was performed comparing various types of parotid surgery and aesthetic outcome using the nonparametric Mann-Whitney U test ($P < 0.5$).

The results of the QOL assessment were independently evaluated by type of parotid resection. Correlation between score values of the QOL assessment and extent of surgery was tested using the Spearman rank correlation coefficient ($P < .05$). Differences between various types of parotid resection were analyzed using the Mann-Whitney U test ($P < .05$). Results of the general symptom-specific QOL scales and the aesthetic ordinal scale were correlated using the Spearman rank correlation coefficient ($P < .05$).

RESULTS

We reviewed our data for recurrence after limited parotid surgery in pleomorphic adenoma or cystadenolymphoma. A higher rate of recurrent pleomorphic adenomas after limited parotid resection has not been observed in our study group. We performed limited parotid surgery in 55 of 75 cases of pleomorphic adenoma (seven enucleations, 13 extracapsular dissections, 35 partial parotidectomies). There was no single case of revision surgery due to pleomorphic adenoma in our study group for 7 years and no revision surgeries because of earlier performed surgeries at our clinic. The mean follow-up time for 40 cases of pleomorphic adenoma in our study group (available for follow-up evaluation) was 3 years, 8 months, and 16 days.

We performed five revisions due to pleomorphic adenoma, which were excluded from further analysis because data for preceding types of surgery were not available. Two of these five operations were initially not performed in Germany 3 years earlier. Two of these five operations had initial surgery 17 and 18 years previously, with missing initial data, and another patient had his fourth operation in 19 years with missing data from one operation, but the initial operation for this patient was a partial superficial parotidectomy.

We had to perform in our study group five reoperations due to cystadenolymphomas (one after enucleation, another after extracapsular dissection, two after partial parotidectomy, and one after extended superficial paroti-

TABLE III.
Complications After Parotid Surgery in Benign Disease.

Hematoma formation	10/353 (3%) of which 7/353 had to be reoperated on
Sialocele/seroma formation	12/353 (3%)
Salivary fistula	3/353 (1%)
Wound infection	4/353 (1%)
Wound necrosis	2/353 (0.5%)
Trismus	3/353 (1%)
Miscellaneous	Two reoperations in one patient due to neuroma, one reported hypoguesia

dectomy). Another revision surgery after initial superficial parotidectomy due to cystadenolymphoma showed reactive lymphadenitis, and one patient with initial superficial parotidectomy due to chronic sialadenitis was reoperated on twice because of retention cysts.

Complications and Long-Term Outcome

Incidence of complications and long-term outcome of patient sequelae are listed in Table III and Table IV, respectively. We found a high incidence of sensory impairment (54% of all patients; 44.3% of them perceive it as disturbing) as we did not preserve the posterior branch of the great auricular nerve routinely. Incidence of Frey's syndrome and scar pain were 16% and 8.5%, respectively. In contrast, Frey's syndrome (75%) and scar pain (82%) are to a higher extent perceived as disturbing.

Correlation analysis showed statistically significant results ($P < .01$) between extent of surgery and Frey's syndrome, sensory impairment, and transient and permanent facial palsy, respectively. No statistically significant results were found between extent of surgery and postoperative scar pain. Statistically significant differences could be shown between all types of limited parotid resection compared with superficial parotidectomy for the incidence of Frey's syndrome ($P < .05$). In our study group, facial palsy, transient or permanent, occurred only after partial superficial and superficial parotidectomy. The results of our study group showed statistically significant differences between these two types of parotid resections and transient and permanent facial palsy ($P < .05$).

No correlation between tumor diameter and incidence of Frey's syndrome, sensory impairment, transient or permanent facial palsy, and scar pain could be shown.

Aesthetic Outcome

Figure 1 summarizes the patient satisfaction with the aesthetic outcome. The mode was 0 (39.7%, very good) and the median was 1 (good) on the ordinal scale. The sex-based analysis showed that 91% of the female patients and 85% of the male patients rated the cosmetic result as good or very good. The mode was 0 (very good) and the median was 1 (good) for female patients and 2 (good) for male patients. After linear transformation to a 100-point scale, the value for the complete group was

TABLE IV.
Patient Sequelae After Parotid Surgery in Benign Disease.

Incomplete transient facial palsy
Enucleation 0/28
Extracapsular dissection 0/20
Partial lateral parotidectomy 7/95
Superficial parotidectomy 9/52
Extended superficial parotidectomy 1/1
Near total parotidectomy 0/1
Total parotidectomy 0/1
Complete transient facial palsy
Enucleation 0/28
Extracapsular dissection 0/20
Partial lateral parotidectomy 2/95
Superficial parotidectomy 4/52
Extended superficial parotidectomy 0/1
Near total parotidectomy 0/1
Total parotidectomy 0/1
Incomplete permanent facial palsy
Enucleation 0/28
Extracapsular dissection 0/20
Partial lateral parotidectomy 1/95
Superficial parotidectomy 6/52
Extended superficial parotidectomy 0/1
Near total parotidectomy 0/1
Total parotidectomy 0/1
Complete permanent facial palsy
None
Frey's syndrome
Enucleation 0/28
Extracapsular dissection 1/20
Partial lateral parotidectomy 10/95
Superficial parotidectomy 19/52
Extended superficial parotidectomy 1/1
Near total parotidectomy 1/1
Total parotidectomy 0/1
Sensory impairment
Enucleation 6/28
Extracapsular dissection 10/20
Partial lateral parotidectomy 52/95
Superficial parotidectomy 35/52
Extended superficial parotidectomy 1/1
Near total parotidectomy 1/1
Total parotidectomy 0/1
Hypoesthesia
Enucleation 3/28
Extracapsular dissection 10/20
Partial lateral parotidectomy 51/95
Superficial parotidectomy 30/52
Extended superficial parotidectomy 1/1
Near total parotidectomy 0/1
Total parotidectomy 0/1

(Continued)

TABLE IV Continued

Dysesthesia
Enucleation 1/28
Extracapsular dissection 4/20
Partial lateral parotidectomy 15/95
Superficial parotidectomy 8/52
Extended superficial parotidectomy 1/1
Near total parotidectomy 1/1
Total parotidectomy 0/1
Cold intolerance (heat intolerance in one patient after superficial parotidectomy)
Enucleation 1/28
Extracapsular dissection 1/20
Partial lateral parotidectomy 10/95
Superficial parotidectomy 1/52
Extended superficial parotidectomy 0/1
Near total parotidectomy 1/1
Total parotidectomy 0/1
Scar pain
Enucleation 1/28
Extracapsular dissection 1/20
Partial lateral parotidectomy 9/95
Superficial parotidectomy 6/52
Extended superficial parotidectomy 0/1
Near total parotidectomy 0/1
Total parotidectomy 0/1

85. Correlation analysis with extent of surgery showed statistically significant correlation between aesthetic outcome and extent of surgery ($P < .01$). Statistical analysis between the various types of parotid surgery showed statistically significant differences ($P < .05$) between enucleation and superficial parotidectomy, and partial parotidectomy and superficial parotidectomy.

General and Symptom-Specific QOL Assessment

Figure 2 shows the linearly transformed mean values of the general QOL scales for our patients by various types of parotid surgery. Values in the general QOL assessment in benign disease were always above 90 regardless of the type of parotid surgery, proving high QOL in the whole group and with all types of parotid surgery. Differences were always smaller than 10, indicating no relevance.⁹

Figure 3 shows the linearly transformed mean values of the symptom-specific QOL scales for our patients by various types of parotid surgery. Most values are above 90, indicating a high symptom-specific QOL. Only the value for sensory impairment after extracapsular dissection with 84.2 and the values for sensory impairment, Frey's syndrome, and fear of revision surgery after superficial parotidectomy with 87, 87, and 89.8, respectively, are lower than 90 on the 100-point scale. Statistical analysis showed statistically significant differences ($P < .05$) between superficial parotidectomy and all types of limited parotid surgery for Frey's syndrome, and for superficial parotidectomy compared to enucleation and partial parotidectomy for sensory impairment.

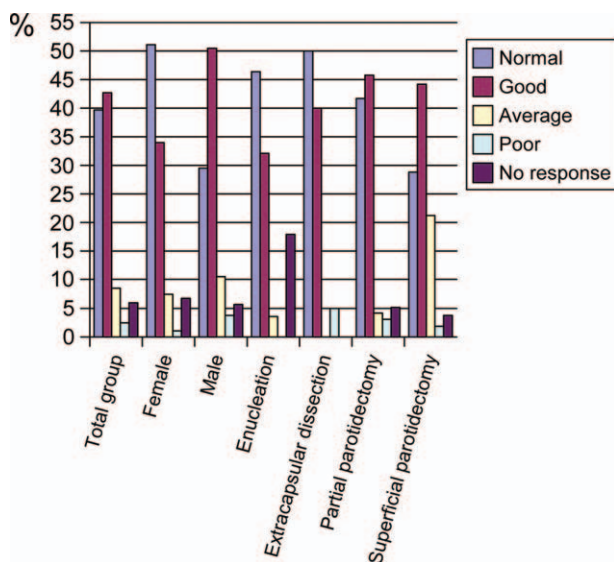


Fig. 1. Patient satisfaction with the cosmetic result in benign disease by gender and type of parotid surgery.

Correlation analysis between aesthetic outcome and general QOL scales, and correlation between symptom-specific QOL scales for Frey's syndrome and sensory impairment, and all general QOL-scales, showed statistical significance ($P < .01$).

DISCUSSION

Beutner et al. reported no changes in QOL in 34 patients after superficial parotidectomy for benign disease compared with preoperative answers using the EORTC QLQ-C30 and EORTC QLQ-H&N35 (EORTC head and neck cancer module).² Nitzan and colleagues used a modified version of the University of Washington Quality of Life Questionnaire in benign and malignant disease and could not detect a severe QOL effect. But patients reported subjective sequelae like altered sensation, change in appearance, Frey's syndrome, and pain

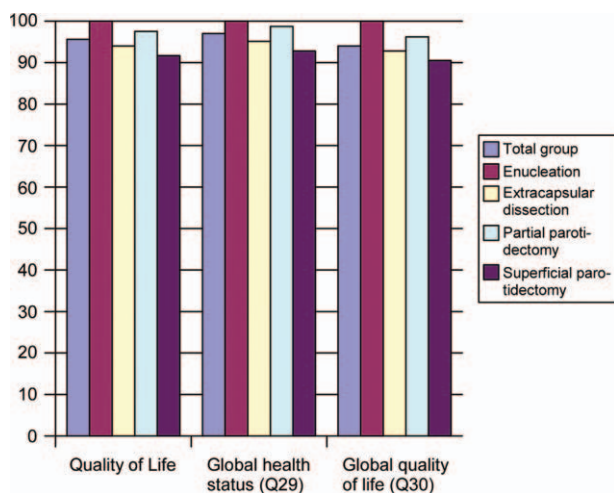


Fig. 2. General quality of life by various types of parotid surgery in benign disease

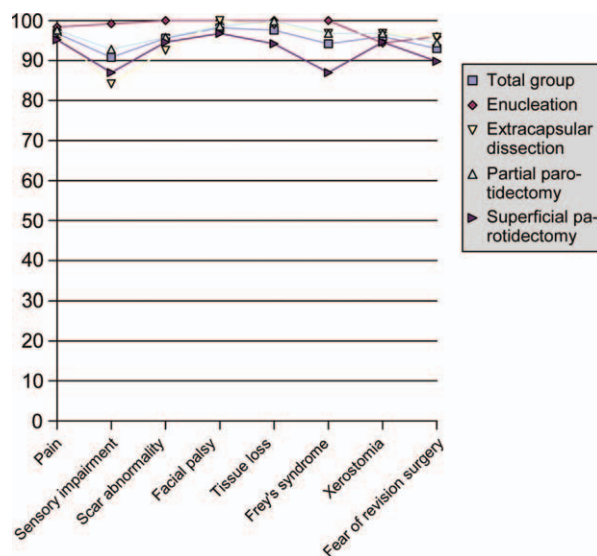


Fig. 3. Symptom-specific quality of life in benign disease by various types of parotid surgery.

that did not affect QOL significantly, and stated that facial nerve paresis is the most important domain for QOL after parotid surgery.⁴ Koch et al. reported no significant impact of parotid surgery on perceived general condition. However, if only patients who sustained complications were considered, their scores of perceived general condition would show significantly positive correlations with the scores of facial nerve paresis, Frey's syndrome, sensory deficit of the auricle, and cosmetic appearance. The authors concluded that these patient sequelae have a potential impact on QOL, and the need for prophylaxis or therapy exists.¹⁰

Our results show that surgery for benign parotid disease has little impact on general QOL and global health status. However, hypoesthesia or dysesthesia, Frey's syndrome, and cosmetic discontent commonly exist and may affect symptom-specific and general QOL. Positive correlation with the extent of surgery, and statistically significant differences between various types of limited parotid surgery (enucleation, extracapsular dissection, partial superficial parotidectomy) and superficial parotidectomy for patient evaluation of aesthetic outcome, sensory impairment, and Frey's syndrome could be shown.

Bianchi et al., in their series of 274 patients, stated that partial parotidectomy is the most essential point for improving aesthetic outcome and a facelift incision, the use of the superficial musculoaponeurotic system, and that the sternocleidomastoid muscle flap could further improve aesthetic outcome.¹¹ Roh et al. reported that patient scores regarding their scar and cosmetic appearance were significantly better after partial compared to superficial and total parotidectomy.¹²

Although we use a standard modified Blair S-shaped incision and do not apply further techniques to improve the aesthetic outcome, over 87% of all patients rated the cosmetic result as very good or good. In addition, our statistical analysis could confirm a statistically

TABLE V.
Studies Comparing Facial Nerve Paresis or Frey's Syndrome After Various Types of Parotid Surgery.

Upton et al. ³⁶	2.7 times greater incidence of immediate postoperative facial nerve weakness in superficial or total parotidectomy compared with partial superficial parotidectomy (34% compared to 12.5%)
Koch et al. ¹⁰	Statistically significant higher rate of transient facial palsy after total than after superficial, and after superficial compared to partial parotidectomy
Klintworth et al. ²²	Series of 377 extracapsular dissections with 6% temporary facial nerve paresis and another 2% of permanent facial nerve paresis after extracapsular dissection
McGurk et al. ²⁶	Series of 475 patients found 11% of transient facial nerve palsy after extracapsular dissection compared to 32 % in superficial parotidectomy
Rehberg et al. ³⁷	Series of 348 operations with 1.9% of temporary facial nerve paresis after partial parotidectomy, 22% after superficial parotidectomy, and 46.7% after total parotidectomy; the rate of persistent facial nerve dysfunction was 0.7% after partial, 2.0% after superficial, and 10.0% after total parotidectomy
Witt and Rejto ³⁴	Meta-analysis by a 38-year Medline research (1970–2008) comparing extracapsular dissection vs. partial parotidectomy; statistically significant differences for permanent in 22/1,202 (1.8%) patients and transient facial nerve dysfunction in 112/1,036 (11.8%) patients after extracapsular dissection vs. 2/924 (0.2%) patients with permanent and 142/793 (17.9%) patients with transient facial nerve dysfunction after partial parotidectomy
Hancock ³⁸	Series of 101 patients with pleomorphic adenoma, of which 78 were treated by superficial parotidectomy and 23 by extracapsular dissection; no case of recurrence after extracapsular dissection, but 18 cases of Frey's syndrome in the superficial parotidectomy group
McGurk ²⁶	Incidence of 5% for Frey's syndrome in patients after extracapsular dissection compared with 38% after superficial parotidectomy
Koch et al. ¹⁰	Statistically significant higher rate of Frey's syndrome in correlation with the extent of parotid surgery after partial, superficial, and total parotidectomy

significant correlation between extent of surgery and statistically significant differences between enucleation and superficial parotidectomy, and partial parotidectomy and superficial parotidectomy for aesthetic satisfaction.

In recent years, numerous authors advocated more limited types of parotid surgery in benign disease as they do not show higher complication and recurrence rates, exhibit less patient sequelae like sensory impairment, auriculotemporal syndrome (Frey's syndrome, gustatory sweating) or aesthetic discontent, and decrease surgery time as well. Table V summarizes studies comparing facial nerve paresis after various types of parotid surgery.

In our study group, only patients after partial superficial or superficial parotidectomy showed transient or permanent facial palsy. A statistically significant higher rate of patients showed transient and permanent facial nerve paresis after superficial parotidectomy compared to partial parotidectomy.

Of the sequelae of parotidectomy for benign disease, Frey's syndrome is of greatest concern to the patients, correlates positive with the extent of surgery, and does not diminish over time.¹³ Table V summarizes studies comparing Frey's syndrome after various types of parotid surgery.

Zhao et al. showed that conserving the subsuperficial musculoaponeurotic system alone or together with a sternocleidomastoid muscle flap decreases the incidence of Frey's syndrome significantly.¹⁴ In addition, function-preserving parotid surgery, which reduces subjective sequelae and improves cosmetic, sensory and salivary functions, consists of modified facelift incision, greater auricular nerve preservation, limited parotidectomy, and coverage with parotid fascia.¹² Furthermore, de Ru et al. advocate extending the incision not too far cranially to spare the auriculotemporal nerve cutaneous branch, which provides sensory innervation to the pinna and temple as well as parasympathetic fibers to the parotid

gland, therefore decreasing Frey's syndrome.¹⁵ But limited parotid surgery seems to be the most important single determinant. We found 16% of Frey's syndrome in our study group, which was within what was reported in the literature data. However, we can confirm the data of the above-mentioned authors that Frey's syndrome occurs more often in superficial parotidectomy than in limited parotid surgery and shows a statistically significant impact on symptom-specific and general QOL.

The hypoesthetic area after parotid surgery may include the ear lobe, and the skin in front, behind, and below the ear lobe extending along the mandible. The great auricular nerve is a sensory nerve arising from fibers of the second and third cervical rami. As it ascends across the sternocleidomastoid muscle toward the parotid gland, it divides into anterior and posterior branches. The anterior branch provides sensory innervation to the skin overlying the parotid gland and at the angle of the mandible, whereas the posterior branch innervates the skin over the mastoid, the posteroinferior surface of the auricle, the lobule, and the concha. The anterior branch that goes to the parotid parenchyma and preauricular skin is usually sacrificed, whereas a posterior superficial branch that goes to the auricle, and a posterior deep branch that goes along the anterior border of the sternocleidomastoid muscle can technically be preserved. In a few patients, it is possible to identify a fourth branch that is inferior and anterior and can be usually preserved as well, and is located at a lower level than the limit of the inferior parotid.¹⁶ Sacrifice of the posterior branch of the great auricular nerve during parotidectomy is correlated with a significant higher percentage of patients with subjective sequelae that may be bothersome enough to warrant efforts to preserve the posterior branch of the great auricular nerve.^{17–19} Porter and Wood reported that the majority of sensory improvement occurred in the first 6 months.²⁰ Ryan and Fee found that at a mean point of

2 years, symptoms had either completely ablated or stabilized.²¹ Patel et al. reported in a group of 53 patients, 30 patients (57%) with sensory impairment, but symptoms decreased significantly during the first 5 years after surgery. Among patients experiencing symptoms, 23 (77%) reported only a little or no bother caused by the symptoms, and 27 (90%) reported no interference or almost none with their daily activities.³ Klintworth et al. reported in their series of 377 extracapsular dissections 10% of patients with hypoesthesia.²²

In our study group, we found a high rate of sensory impairment (hypoesthesia, dysesthesia, temperature intolerance). Altogether, 54% of our patients had some kind of sensory impairment, and 44.3% of them perceived it as disturbing. Consequently, we will step up efforts to preserve the posterior branch of the great auricular nerve routinely. In our study group, single patients reported sensory improvement after 3 or 4 years, but we could not find statistically significant differences by dividing our study group by the time since surgery that was shorter or longer than 5 years.

In the last 2 decades, there has been discussion on whether limited parotid surgery for pleomorphic adenoma and cystadenolymphoma is sufficient.^{23–25} As capsular exposure cannot be avoided in every operation and numerous tumors have branches of the facial nerve in contact with the tumor capsule, extracapsular dissection was proposed with significant morbidity reduction.²⁶ Pleomorphic adenomas are characterized by cellular pleomorphism composed of an epithelial and connective tissue component embedded in a stroma of mucoid, myxoid, chondroid, or osteoid origin.^{27,28} Only approximately 50% of pleomorphic adenomas have a distinct capsule. Otherwise there is an indistinct boundary between the tumor and the gland, and small projections of pleomorphic adenoma exist through the capsule.^{29,30} A truly multilocular pleomorphic adenoma is uncommon. Higher recurrence rate after partial superficial parotidectomy¹⁰ and extracapsular dissection^{26,31} for pleomorphic adenoma could not be reported. Witt correlated retrospective series of pathological specimens with their clinical outcomes and reported that virtually all operations for small pleomorphic adenoma, regardless of tissue sacrifice, have focal capsular exposure, and that capsular rupture results in a significantly higher rate of recurrence but does not vary significantly among surgical approaches (total parotidectomy, partial superficial parotidectomy, extracapsular dissection). Witt concluded that the most common cause of recurrence for pleomorphic adenoma today is enucleation.³² Ghosh et al. reanalyzed a series of 83 pleomorphic adenomas histologically and found a recurrence rate of 17.6% in cases where tumor cells were present at the margin, but only of 1.8% if they were found within 1 mm of the margin but not directly at it. Therefore, they concluded that a one or two cell rows of connective tissue are sufficient to prevent recurrence.³³ Recently Witt and Rejto performed a meta-analysis by a 38 year Ovid Medline search (1970–2008) and found a statistically significant higher recurrence rate 36/1,183 (3%) in extracapsular dissection versus 1/340 (0.3%) in partial parotidectomy.³⁴

Wierzgon et al. reported a recurrence rate of about 5% after partial parotidectomy in cystadenolymphoma, but only in cases with multilesional tumor in histopathological examination.³⁵

In our study group, we did not have to perform revision surgery for pleomorphic adenoma at all and did not find an increased recurrence rate after limited surgery for pleomorphic adenoma, although the mean follow-up time of our study patients of 3 years, 8 months, and 16 days does not permit a final conclusion. In addition, we had to perform a second surgery due to cystadenolymphoma in five cases (four after limited surgery and one after extended superficial parotidectomy), but are not of the opinion that extended parotid surgery is justified because of possible current or future multilocal disease.

We perform all types of parotid surgery at our department as each type has distinct relevance in clinical practice, particularly as sometimes combined types have to be performed at the same time (e.g., pleomorphic adenomas often have to be partly enucleated due to contact with the facial nerve). In accordance with our data and the literature, we are of the opinion that tumor-distant parotid sections need not to be resected in initial surgeries for pleomorphic adenoma because of facial nerve safety reasons that are of primary importance for outcome and QOL together with discussed patient sequelae.

CONCLUSION

The outcome of parotid resection in benign disease has little impact on general and symptom-specific QOL. However, hypoesthesia or dysesthesia, Frey's syndrome, and cosmetic discontent commonly exist and may affect symptom-specific QOL and general QOL. Correlation with the extent of surgery and statistically significant differences in patient evaluation for aesthetic outcome, sensory impairment, and Frey's syndrome between various types of limited parotid surgery (enucleation, extracapsular dissection, partial superficial parotidectomy) and superficial parotidectomy could be shown. Consequently, adequate parotid resection technique has to be chosen to achieve the least disturbing outcome for the patient.

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