Long-Term Results of Morbidity After Parotid Gland Surgery in Benign Disease

Michael Koch, MD; Johannes Zenk, MD; Heinrich Iro, MD

Objectives/Hypothesis: To determine the incidence of major and minor complications and their impact on patients' comfort after parotid surgery in benign disease.

Study Design: Retrospective.

Methods: Four hundred ninety-two patients were included. Total parotidectomy (TP) was performed in 65.8%, superficial parotidectomy (SP) in 27.2%, and partial superficial parotidectomy (PSP) in 7.0%. Patients were interviewed using a self-designed questionnaire. Incidence of complications was evaluated depending on the extent of surgery and intensity of complaints. To ascertain the impact of morbidity on their daily lives, patients were asked to estimate it according to a visual analog scale.

Results: Frey's syndrome occurred in 63.4%, and temporary facial nerve palsy in 32.7% of all cases. Both rates were significantly reduced after PSP. Permanent facial nerve paresis was observed in 2.3% of the cases, but in no case after PSP. Perception of patients and their scores reflected these results. Scores regarding Frey's syndrome and facial nerve paresis showed a significant positive correlation with extent of surgery. The recurrence rate was 2.2%; no recurrences were noted after PSP. Scores of perceived general condition indicated an excellent state.

Conclusions: The incidence of complications was reduced after PSP compared to SP or TP. Patient scores, which represent their perception of these complications, reflected these data and may be an additional instrument to measure outcome. These data suggest that less invasive operative techniques should be considered in case of a benign disease.

From the Department of Otorhinolaryngology–Head and Neck Surgery, Friedrich-Alexander University of Erlangen-Nuremberg, Erlangen, Germany.

Send correspondence to Professor Heinrich Iro, MD, Department of Otorhinolaryngology–Head and Neck Surgery, Friedrich-Alexander University Erlangen-Nuremberg, Waldstrasse 1, 91054 Erlangen, Germany.
E-mail: heinrich.iro@uk-erlangen.de

Key Words: Parotid gland, benign disease, morbidity, surgery, complications.

Level of Evidence: 2a.

INTRODUCTION

Parotid gland surgery nowadays is established as standard therapy throughout the world. Superficial parotidectomy (SP) or total parotidectomy (TP) are recognized as a standard procedure for removal of benign parotid gland tumors. Main topics, especially with regard to the treatment of benign tumors, are morbidity and the adequate extent of surgery. Recommendation of SP or TP as the operative procedure of choice for benign tumors is widespread.[1–4] Because of better outcome, reduced complication rates, and preservation of the gland function, partial superficial parotidectomy (PSP)[5–8] and extracapsular dissection (ED)[9–11] has been favored by some centers in recent years.

A great number of reports deal with morbidity after parotid gland surgery, presenting short-term and also long-term after treatment of benign tumors.[2–4,6,8,12,13]

Major complications, which can be diagnosed or measured by physicians, were the focus of numerous publications. These included facial nerve paresis,[3,4,7,12,14–18] Frey's syndrome,[3,6,12,17–20] salivary fistula,[1,6,21,22] disturbed wound healing,[3,6,13] and tumor recurrence.[3,4,9,10,13] Some authors advised taking into account the impact of minor complications, and in recent publications those minor complications, such as loss of sensitivity of the great auricular nerve,[8,18,23,24] pain,[17,18,25] and change of cosmetic appearance,[1,10,17,18] were emphasized.

Data from the literature demonstrates that after PSP or ED the frequency of complications was reduced compared to the standard procedures.[1–6,8–11] These data suggest that the amount of resected gland tissue seems to be one of the main risk factors for development of complications.

Only a few authors published data that describe how the patients perceive their complications or the adverse effects and how they judge their results after parotid gland surgery. To categorize the perceptions of the patients, various standardized or self-made questionnaires were used[1,12,17,18,23,25] Scores, especially visual analog scores (VAS), were used for semiquantitative

estimation of the impact of complications after parotidectomy on the quality of life or global health.[1,12,17,18,23–26] Some reports focused on single major or minor complications, including facial nerve paresis,[17,27] Frey's syndrome,[17] sensory deficit of the great auricular nerve (GAN),[23,24,26,28] pain,[17,25] and perception of the scar and the cosmetic appearance.[10,17,25,29]

This retrospective study and patients' interview aimed at comparing the three different types of parotid gland surgery (PSP, SP, TP) performed in our department regarding their morbidity (major and minor complications). Clinical data on the frequency of the complications and on the perception of the patients regarding their treatment results were compared.

MATERIALS AND METHODS

Patients

Between 1990 and 2002, parotid gland surgery was performed because of benign parotid gland disease in a total of 710 patients. Of the patients, 69.3% were included in our study. Charts of those patients were reviewed and all participated in the interview (492/710). From the excluded patients 7.7% had died (55/710) and 23.0% did not respond or were lost to follow-up (163/710). Of the remaining patients, 54.5% (268/492) were male and 45.5% (224/492) female. The mean age was 50.7 (range, 3–84) years. The mean follow-up period was 76.7 months (median 73; range, 15–155 months). Before the treatment was performed informed consent was received from all patients and the study was approved by the review board of the Friedrich-Alexander University of Erlangen-Nuremberg.

Data Sources

Data were collected from the clinical charts and if necessary from the referring physician.

Patient Questionnaire and Scoring of Complaints

All patients were interviewed using a self-designed questionnaire, which included several parameters of early and late postoperative morbidity (Table I). Patients had to state whether complications occurred (qualitative: yes/no) and how long the complaints lasted (duration in months). Patients also had to estimate their perception of discomfort regarding their complications or adverse effects according to an analog scale, which ranged from 0 to 10 (0, no complaints; 1, minimal; and 10, maximal level of discomfort). Scores from 1 to 3 were classified and grouped as minor, those of 4 to 7 as medium, and scores from 8 to 10 as high level of discomfort.

Treatment Modalities/Surgical Procedures

TP was performed in 65.8% (324/492), SP in 27.5% (134/492), and PSP in 7% of the cases (34/492). Preoperative diagnosis was established clinically by palpation and especially by ultrasound. Facial nerve monitoring with bipolar needle electrodes was used in every case as standard procedure (Neurosign 100; Inomed, Teningen, Germany) during the surgery.

Facial nerve function was assessed clinically and with electromyography according to the House-Brackmann classification preoperatively and 1, 3, 6, and 12 months postoperatively. Six patients with preexisting facial nerve paresis were excluded. Five patients developed facial nerve paresis after prior surgery in another hospital (two treated by SP and three by TP). One had a neurinoma of the main trunk of the facial nerve. TP, nerve resection, and reconstruction were carried out (resulting in permanent facial nerve paresis House IV). This case was excluded because it did not reflect the risk of facial nerve paresis in typical parotid surgery.

Frey's syndrome was assessed clinically. No additional operative procedures were performed to prevent Frey's syndrome.

TABLE I.
Parameters of Patients Questionnaire.

Parameter	
Pain	VAS 1–10
Cosmetic deficit	VAS 1–10
Salivary fistula	Duration
Delayed wound heeling	Duration, VAS 1–10
Sensory deficit of the auricle	VAS 1–10
Frey's syndrome	VAS 1–10
Facial nerve paralysis	Duration, VAS 1–10

VAS = visual analog scores.

Statistical Analysis

For statistical analysis SPSS version 16.0 (SPSS Inc., Chicago, IL) was used. Variables were checked for homogeneity of variances by the Kolmogorov-Smirnov test. Categorical variables were analyzed using the χ^2 test and Fisher exact test. Continuous variables were compared with the Mann-Whitney U test. Spearman rank correlation coefficient was used to analyze bivariate correlation of variables. If necessary, partial correlation to control possible interfering variables was also performed. The level of significance was 5% ($P \leq .05$).

RESULTS

Histology

Pleomorphic adenoma was the most frequent tumor (47.8%), followed by Warthin's tumor (27.8%), other benign tumors (11.6%), inflammatory diseases (5.1%), lymph nodes (4.1%), and cystic lesions (3.7%).

Distribution of diagnoses in cases that had been treated by PSP showed no significant differences: inflammation 5.9% (2/34), lymph node 11.8% (4/34), monomorphic adenoma 11.8% (4/34), Warthin's tumor 14.7% (5/34), and pleomorphic adenoma 55.9% (19/34).

Postoperative pain of medium intensity (scores 4–7) was reported by 34.3% and with high intensity (scores 8–10) by 3% of all patients. Mean score value was 3.0; lowest values were reported after PSP. Compared with PSP, mean values after SP were significantly higher ($P = .001$) (Table II).

Salivary fistula (defined as salivary flow lasting more than 1 week) was observed with an overall rate of 9.1% (45/492). The incidence was lowest after PSP with 5.9%, but no significant differences were detected after comparing it with different surgical groups. Inflammatory processes or inflamed lymph nodes were diagnosed in 14.2% after PSP compared to 9.5% in all patients. The average duration of salivocutaneous flow was 2.3

TABLE II.
Incidence and Scores of Parameters in Relation to Extent of Surgery (PSP, SP, TP).

Parameter	Incidence,* Correlation (Spearman)	Incidence,* M-W *U* test,† Fisher Exact Test‡	Score,* Correlation (Spearman)	Score,* M-W *U* Test,† Fisher Exact Test‡	Duration,* Correlation	Duration,* M-W *U* test,† Fisher Exact Test‡
Pain	NS	NS	$P = .05$	TP vs. SP, $P = .001$;† other NS	—	—
Cosmetic appearance	NS	NS	NS	NS	—	—
Sensory deficit of the auricle	NS	NS	NS	NS	$P = .05$	TP vs. SP, $P = .001$† PSP vs. SP, $P = .02$;† other NS
Salivary fistula	NS	NS	—	—	NS	TP vs. SP, $P = .049$, other NS
Delayed wound healing	NS	NS	NS	NS	—	—
Frey's syndrome	$P = .01$	TP vs. SP, $P = .005$;‡ SP vs. PSP, $P = .02$; TP vs. PSP, $P = .0001$	$P = .01$	TP vs. SP, $P = .018$;† SP vs. PSP, $P = .016$; TP vs. PSP, $P = .0001$	—	—
Postoperative facial nerve paresis (n = 486)	$P = .01$	TP vs. SP, $P = .012$;‡ SP vs. PSP, $P = .038$; TP vs. PSP, $P = .0001$;	$P = .01$	TP vs. SP, $P = .04$;† SP vs. PSP, $P = .02$; TP vs. PSP, $P = .001$	$P = .01$	TP vs. SP, $P = .003$;† SP vs. PSP, $P = .016$; TP vs. PSP, $P = .0001$
Permanent facial nerve paresis	NS	NS	—	—	—	—
Recurrence	NS	NS	—	—	—	—

*Incidence, scores, and duration: correlation with the different types of surgery and test of significant differences comparing the different types of surgery.
†Mann-Whitney *U* test.
‡Fisher exact test.
TP = total parotidectomy; SP = superficial parotidectomy; PSP = partial superficial parotidectomy; NS = nonsignificant.

weeks (n = 31; range, 1–7) after TP (near total or total parotidectomy), 4.6 weeks (n = 12; range, 1–11) after SP, and 4.0 weeks (n = 2; 2 and 6 weeks) after PSP. Salivary flow lasted significantly longer after SP compared to TP ($P < .05$) (Table II).

Wound healing was not disturbed in 90.7% of our patients; mean score was 0.3. Medium-grade and high-grade scores were reported in 3.4% and 0.2% of all cases, respectively. The mean score for patients who developed salivary fistula was 1.1. No significant differences between the different types of surgery could be detected.

Overall incidence of a sensory deficit of the auricle was 58.8% (289/492), highest after SP (63.4%) and lowest after PSP (50%). Mean value of scores in those patients who complained about this complication was 4.3. Differences between different surgical groups were not significant regarding incidence and scores. The exact area of sensory deficit was not measured. Duration of sensory deficit was significant longer after SP when compared with TP ($P = .001$) or PSP ($P = .02$) (Table II).

Frey's syndrome developed with an overall incidence of 63.4% (310/492), highest after TP with 69.7% (226/324) and lowest after PSP with 32.3% (11/34) (Fig. 1). Correlation of incidence with extent of the operation was significantly positive ($P = .01$). Significant differences were detectable among all different surgical groups if compared (Table II). Scores reflected these results (Fig. 2). Mean score value of involved patients was 4.1; values also showed a significant correlation between extent of the operation and significant differences among all types of surgery (Table II).

The overall rate of postoperative facial nerve paresis was 32.7% (n = 159). The mean House-Brackmann index in case of early postoperative nerve paresis was 3 (range, 2–6) with a mean duration of 13.3 weeks (range, 1–52). Incidence was lowest after PSP and showed a significant negative correlation with the extent of the operation ($P = .01$) (Fig. 3, Table II). The mean score was 3.6 (range, 1–10) and paralleled the results regarding the incidence showing a significant positive correlation between the value of the score and extent of the operation (Fig. 4, Table II). A significant positive correlation was also observed between duration of facial nerve paresis and extent of the operation ($P = .01$), between scores and House-Brackmann index (0.96, $P = .01$), and between scores and duration of facial nerve paresis (0.96, $P = .01$) (Table II). Age had no influence (partial correlation including age, $P = .01$).

The overall rate of permanent facial nerve paresis was 2.3% (n = 11). Patients had a mean House-Brackmann index of 2.3 (range, 2–3). Permanent paresis occurred most often after TP and in no case after PSP (Fig. 3). Mean score was 6.2 (range, 3–10). No significant correlation or differences among surgical groups were recognizable (Table II).

Of all of the patients, 79.3% were not fully satisfied with their cosmetic appearance after parotid gland surgery. This high percentage was equal in the different surgical groups with no correlation between scores and type of operation. Mean score value in all patients was 3.0, and 3.7 in those who were not satisfied with their cosmetic appearance, indicating a relatively low mean

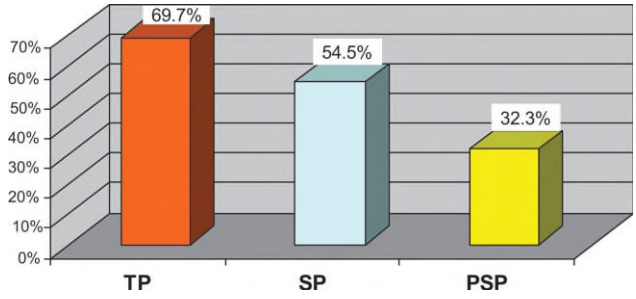

Fig. 1. Incidence of Frey's syndrome in relation to extent of surgery. TP = total or near total parotidectomy; SP = superficial parotidectomy; PSP = partial superficial parotidectomy. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

level of discomfort. Cosmetic appearance was not significantly influenced by temporary ($P = .08$) or permanent facial nerve paresis ($P = .66$).

Perception of the general condition was judged with values between 1 and 3 in 94.3% of all patients; only 1.2% felt significantly disturbed (values 8–10). Mean score value was 1.3, which indicates excellent condition. No significant differences could be detected among the different surgical groups. Scores showed a significant negative correlation to the scores for facial nerve paresis (temporary, $P = .01$; permanent, $P = .05$), Frey's syndrome ($P = .01$), sensory deficit of the auricle ($P = .01$), and cosmetic appearance ($P = .01$), but no significant correlation to pain, duration of salivary fistula, and disturbed wound healing.

Revision surgery had to be performed in 14 cases (2.8%). Diagnosis was a recurrent benign tumor in 13 cases (overall incidence of 2.2%, 13/492) after a mean time of 5.9 years after the operation (median 6; range, 1–13 years). In one case histology was again an inflamed lymph node after SP (0.2%, 1/492). Diagnosis in recurrent tumors was cyst and monomorphic adenoma (one patient each, both after SP), pleomorphic adenoma (five cases, three after SP and two after TP), Warthin's tumor (six patients, one after SP and five after near total TP).

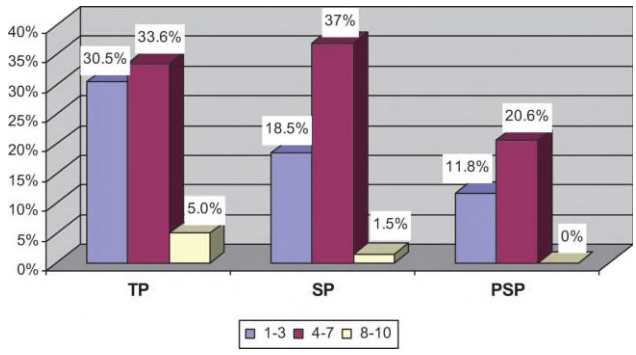

Fig. 2. Patient scores regarding Frey's syndrome in relation to extent of surgery. TP = total or near total parotidectomy; SP = superficial parotidectomy; PSP = partial superficial parotidectomy. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

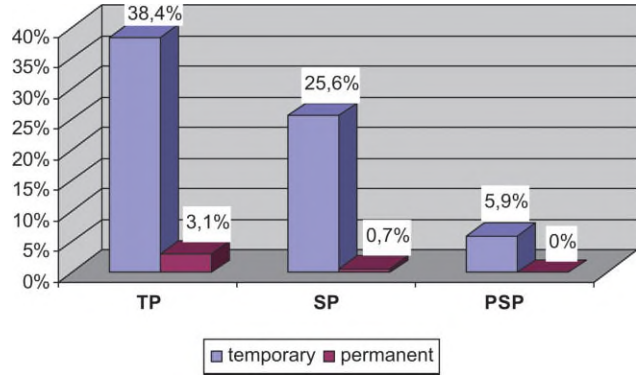

Fig. 3. Incidence of temporary and permanent facial nerve paresis in relation to extent of surgery. TP = total or near total parotidectomy; SP = superficial parotidectomy; PSP = partial superficial parotidectomy. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

The incidence was 2.2% subsequent to TP after a mean of 5.5 years and 4.5% subsequent to SP after a mean of 6.3 years. After PSP no recurrences were observed. Mean follow-up time after TP was 84.6 months (range, 15–155), after SP 63.2 (range, 15–148), and after PSP 54.7 months (range, 16–131). Follow-up time after TP was significantly longer compared to SP and PSP ($P = .001$ each), but no significant difference between SP and PSP could be shown (Table II).

DISCUSSION

Surgery of the parotid gland is a widespread procedure, and for benign tumors surgical resection is the therapy of choice. Up to today superficial parotidectomy and total parotidectomy have been considered standard procedures.[1–4] These standard operations are associated with a considerable frequency of complications and other side effects. TP is favored by some authors because of a lower risk of tumor recurrence, SP by others because of lower rates of complications and comparable recurrence rates.[3,4] Due to the satisfying results after treatment of benign parotid gland diseases, there is a recent trend toward minimally invasive surgical procedures. Important

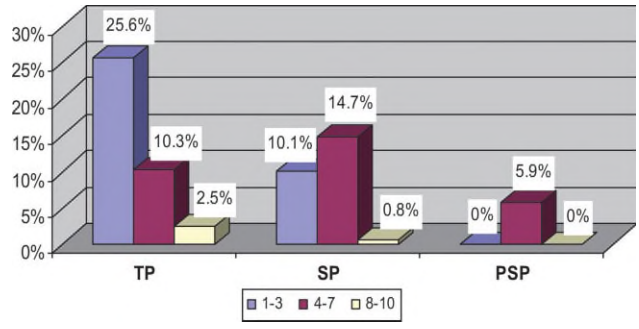

Fig. 4. Patient scores regarding facial nerve paresis in relation to extent of surgery. TP = total or near total parotidectomy; SP = superficial parotidectomy; PSP = partial superficial parotidectomy. [Color figure can be viewed in the online issue, which is available at www.interscience.wiley.com.]

arguments in all publications were the markedly reduced complication rates compared with the standard procedures. PSP or ED has been described as reducing morbidity and operation time without compromising the recurrence rates. Especially pleomorphic adenoma, but also Warthin's tumor, was treated successfully by PSP or ED without compromising the recurrence rates.[5–12]

Morbidity after parotid gland surgery was discussed in plenty of reports, but focused on the major short- and long-term complications.[2–6,8,9,12,13] Recent reports emphasized minor complications, such as sensory deficit of the great auricular nerve, pain, and cosmetic results. Furthermore, reports that assessed the impact of complications after parotid surgery on daily activity or quality of life have been published in recent years. This seems to reflect the growing interest in how the patients perceive their morbidity.[1,17,18,24–26] Because no standard questionnaire regarding the sequelae after parotid gland surgery has been developed to date, different or otherwise developed and in part standardized questionnaires, such as the University of Washington Quality of Life questionnaire (modified), the Facial Disability Index (FDI) and the SF-36 Health Survey, [1,17,27] or self-made questionnaires that focused on selected major and minor complaints [12,23,2] were used.[18,25–28] Patients' interest in those questionnaires is reflected by the reported completion rate, which ranged from 50% to 94% and is comparable to that in our study, which was 69.3%. An analog scale was used in our interviews to estimate the level of complaints in our patients. VAS proved to be suited for estimating the impact of salivary gland surgery on the quality of life,[23,24] scar formation,[10] and pain.[25] Ryan et al. showed that patient scores correlated well with clinical findings and objective testing.[23] Kahn et al. correlated patients' perception of facial nerve paresis (Facial Clinimetric Evaluation Scale [FaCE Scale]) with VAS and the House-Brackmann Index.[27]

The aim of our study was to assess the incidence of (minor and major) complications after parotid gland surgery of varied extent in benign parotid gland diseases and the perception of patients regarding these complications.

Perception of pain is individual and variable, and only a few patients are handicapped in the long term.[12] Nitzan et al. reported that 30% of their patients suffered pain, but scores were low and impact on quality of life not significant.[17] Scores according to VAS were reported to be lower than those after tonsillectomy, and no correlation with tumor size was recognizable.[25] Our data point in the same direction. The mean score was 3, and only 3% of the patients reported to be seriously disturbed by their pain (no patient after PSP). Beyond that no impact on global condition could be detected.

Salivary fistula was reported in the literature to occur with an overall rate of 1% to 14% after SP or TP, and the incidence was higher in the case of subacute or chronic inflammation and postoperative suppurative infection.[2,7,21] Overall quality of life was reported not to be significantly reduced by this complication.[17] But because of possible socially embarrassing situations there is a need for treatment, and various therapies have been advocated to prevent or to treat postparotidectomy fistulas.[22] After PSP, in most publications rates were equal or even lower.[9,11] Upton et al. and Witt et al., however, reported a tendency to higher incidences due to the amount of the remaining functional tissue.[6,22] In our study the lowest frequency was observed after PSP, but the duration was higher after PSP and significantly higher after SP compared to TP (Table II). This may reflect both the remaining gland tissue and the bare area of the gland after surgery. We also observed a higher incidence in inflammatory diseases, which supports the results published by Wax et al.[21] Patient scores with respect to disturbed wound healing did not correlate with the extent of surgery, which parallels results published by Nitzan et al.[17]

Almost all patients described a sensory deficit of the area supplied by the GAN after parotidectomy in the early postoperative phase, but findings decrease markedly in the long term. Up to 90% of the patients were reported to describe a functional deficit in daily life, but in nearly all patients no significant interference with activities was recognizable.[8,12,18,23,24,26,28] After sacrificing the GAN, 57% reported one or more symptoms, 10% of them were bothered a moderate or tremendous amount, and 27% were concerned about their symptoms.[26] Nitzan et al. published average scores of moderate intensity for this parameter that were not of significant importance regarding the overall quality of life.[17] Scores in the report of Baek et al. also indicated a low grade of discomfort after 5 years.[18] On the other hand, postoperative evaluation showed that both VAS scores for quality of life and/or sensory deficit were significantly better in patients in which the GAN was preserved.[24] Strategies to relieve complaints after sacrificing the GAN exist in pre- and postoperative counseling.[26,28] A more promising approach represents the modified surgical techniques to preserve the GAN, which is reported to be possible in up to 70% in any kind of parotid gland surgery and is performed whenever possible in PSP or ED.[9,8,11,24,28] Incidence of a long-term sensory deficit of the auricle in our patients was 58.8% and lowest after PSP.

The reported incidence of Frey's syndrome in the literature varies from 2% to 80%, depending on how the diagnosis was established. Treatment is necessary in about 10% to 15%.[2,3,12] Nitzan et al. reported that 57% of patients complained about Frey's syndrome, but it had no significant impact on quality of life.[17] Nevertheless, many patients perceive Frey's syndrome as a socially disturbing sequela. Evidence that patients request a therapy is provided by many reports that deal with various methods to treat or prevent this complication.[30] One of the most recognized risk factors for development of Frey's syndrome is the amount of gland tissue removed. Reports of lower rates after PSP or ED point in the same direction.[5,6,8,9,11] Results in our patients are in line with these findings. The lowest incidence was observed after PSP, and a significant positive correlation between extent of removed tissue and incidence of Frey's syndrome was found. Patient scores reflected the clinical results and also correlated significantly with extent of

gland tissue removed (Fig. 1, Fig. 2, Table II). Similar results were obtained by Baek et al. In a questionnaire 5 years after surgery, patients stated that Frey's syndrome was the most significant sequelae, and their scores correlated to the extend of the operation.[18]

The incidence of temporary or early postoperative facial nerve paresis was reported in the literature in 18% to 65% of cases and incidence of permanent paresis in 0% to 19%. It is associated with significant morbidity, disturbed daily activity, and impaired cosmetic appearance.[3,7,12,15,16] Nitzan et al. emphasized that although quality of life was not significantly reduced after parotidectomy, the importance of this domain for overall quality of life was the greatest of all examined parameters. Patients were supposed to be able to perceive their postoperative function of the facial nerve somewhat more critically than their physicians.[17] Khan et al. developed the FaCE Scale, and validated it for facial nerve paresis. It includes problems of patients regarding their own facial function. A significant correlation with VAS items and with the House-Brackmann Index could be shown.[27] The importance of facial nerve paresis is reflected by the number of publications that discuss causes of facial nerve paresis and strategies to reduce its incidence. In particular, the extent of tissue resection was correlated with a higher risk of facial nerve paresis. Comparison with conventional surgery showed that after limited parotid gland resection, rates of facial nerve paresis were substantially lower.[4–12,15,16] Facial nerve monitoring, which should be standard in every operative procedure of the parotid gland, has proved to be a very useful tool to prevent damage to the facial nerve.[15,16] Our results point in the same direction. After PSP, the incidence of temporary facial nerve paresis was significantly reduced, and no case of permanent facial nerve paresis occurred (Fig. 3 and Fig. 4). Scores of patient discomfort showed a positive correlation with the House-Brackmann Index ($P = .01$) comparable to the results reported by Kahn et al.[27]

Cosmetic results after parotid gland resection are discussed in the recent literature.[7,9,11,25,29,30] Nitzan et al. reported that, when asked in a questionnaire, 70% of the patients stated they felt disturbed by a change of their appearance after SP or TP, 60% because of scarring and 58% due to a local depression. However, a significant impact of these parameters on the overall quality of life could not be detected.[17] Marshall et al. published that their patients recognized an altered shape of the skin in 26.9%, shortly after the operation, but only 3.1% stated long-term-problems.[12] Impaired cosmetic appearance after conventional parotid gland surgery was also stated by physicians who were asked to judge patients using a VAS from 0 to 10.[29] Altogether, the literature shows that there is a need for therapy, and numerous modifications of the surgical technique were described to improve cosmetic results.[30] In particular, the amount of gland tissue removed seems to be associated with depression of the facial contour. Roh et al. reported that patient scores regarding their scar and cosmetic appearance were significantly better after performing PSP compared to SP or TP.[10] There are no reports that emphasized that patients, after less invasive surgery like PSP or ED, felt that reconstruction was necessary.[7–9,11] In our study nearly 80% of the patients were not fully satisfied with their cosmetic result, but mean scores were not severe. It is noteworthy that no significant correlation between perception of cosmetic appearance and incidence of facial nerve paresis of could be detected.

The mean score value of 1.3 in all patients regarding their perceived general condition indicates no significant impact of any parotid surgery on this parameter. This was in line with other previous studies, which failed to show any significant impact of parotidectomy on patients' quality of life or global health status.[1,17,27] But if only those patients who sustained complications were considered, their scores showed significant positive correlations with the scores of facial nerve paresis, Frey's syndrome, sensory deficit of the auricle, and cosmetic appearance ($P = .01$ each). This significant correlation points to a potential impact and need for prophylaxis or therapy.

In the literature, recurrence rates after SP or TP vary between 0% and 12% depending on extent of surgery and tumor histology. One of the most used arguments to reject PSP as a standard method in benign tumors, especially in the case of pleomorphic adenoma, was the suspected higher recurrence rate due to reduced control of the tumor intraoperatively.[1–4,13] But in recent years there has been growing evidence that PSP or ED are suited for surgery in benign parotid gland tumors. Reports indicated a reduced morbidity without any negative influence on recurrence rates. These are reported to be between 0% and 8% in representative retrospective or comparative prospective studies.[5–11] Although results are encouraging, long-term experience has rarely been published to date.[5–7,9] Recurrences of benign tumors in our patients developed with an overall incidence of 2.2% and occurred after a mean time of nearly 6 years after surgery. After PSP, no recurrence was observed after a mean follow-up time of about 4.5 years. Thus, our results confirm the results of the literature that PSP or ED are not associated with a higher risk of recurrence.

CONCLUSION

Surgical resection is the therapy of choice for benign tumors of the parotid gland, but it is associated with morbidity or adverse effects (minor and major complications) in a relatively high percentage of patients. Perception of the patients regarding their major and minor complications has now become an increasingly important topic in the recent literature. A positive correlation between extent of surgery and incidence of minor and major complications was recognizable in our patients. PSP had the lowest complication rates regarding all single parameters in our study, and the incidence of facial nerve paresis and Frey's syndrome was significantly reduced.

Our results showed a positive correlation between incidence and severity of complications indicated by the clinical data and the scores made by our patients when asked how they perceived them. This correlation was significant for facial nerve paresis and Frey's syndrome. The data support the hypothesis that patients' perception

should not be underestimated. If confirmed by further studies and standardized, scores derived from questionnaires may influence the treatment in benign diseases.

Recurrence rates were not influenced by the extent of surgery.

Minimally invasive surgery, such as PSP, should be included in the spectrum of parotid gland surgery in benign tumors, but it should be performed only by experienced surgeons after careful case selection.[2,8]

BIBLIOGRAPHY

1. Beutner D, Wittekindt C, Dinh S, Huttenbrink KB, Guntinas-Lichius O. Impact of lateral parotidectomy for benign tumors on quality of life. *Acta Otolaryngol* 2006;126: 1091–1095.
2. Guntinas-Lichius O, Klussmann JP, Wittekindt C, Stennert E. Parotidectomy for benign parotid disease at a university teaching hospital: outcome of 963 operations. *Laryngoscope* 2006;116:534–540.
3. Laccourreye H, Laccourreye O, Cauchois R, Jouffre V, Menard M, Brasnu D. Total conservative parotidectomy for primary benign pleomorphic adenoma of the parotid gland: a 25-year experience with 229 patients. *Laryngoscope* 1994;104:1487–1494.
4. Zernial O, Springer IN, Warnke P, Harle F, Risick C, Wiltfang J. Long-term recurrence rate of pleomorphic adenoma and postoperative facial nerve paresis (in parotid surgery). *J Craniomaxillofac Surg* 2007;35:189–192.
5. O'Brien CJ. Current management of benign parotid tumors—the role of limited superficial parotidectomy. *Head Neck* 2003;25:946–952.
6. Upton DC, McNamar JP, Connor NP, Harari PM, Hartig GK. Parotidectomy: ten-year review of 237 cases at a single institution. *Otolaryngol Head Neck Surg* 2007;136:788–792.
7. Witt RL. Facial nerve function after partial superficial parotidectomy: an 11-year review (1987–1997). *Otolaryngol Head Neck Surg* 1999;121:210–213.
8. Witt RL. Minimally invasive surgery for parotid pleomorphic adenoma. *Ear Nose Throat J* 2005;84:308, 310–301.
9. McGurk M, Thomas BL, Renehan AG. Extracapsular dissection for clinically benign parotid lumps: reduced morbidity without oncological compromise. *Br J Cancer* 2003;89:1610–1613.
10. Roh JL, Kim HS, Park CI. Randomized clinical trial comparing partial parotidectomy versus superficial or total parotidectomy. *Br J Surg* 2007;94:1081–1087.
11. Smith SL, Komisar A. Limited parotidectomy: the role of extracapsular dissection in parotid gland neoplasms. *Laryngoscope* 2007;117:1163–1167.
12. Marshall AH, Quraishi SM, Bradley PJ. Patients' perspectives on the short- and long-term outcomes following surgery for benign parotid neoplasms. *J Laryngol Otol* 2003; 117:624–629.
13. Guntinas-Lichius O, Kick C, Klussmann JP, Jungehuelsing M, Stennert E. Pleomorphic adenoma of the parotid gland: a 13-year experience of consequent management by lateral or total parotidectomy. *Eur Arch Otorhinolaryngol* 2004;261:143–146.
14. Bron LP, O'Brien CJ. Facial nerve function after parotidectomy. *Arch Otolaryngol Head Neck Surg* 1997;123: 1091–1096.
15. Gaillard C, Perie S, Susini B, St. Guily JL. Facial nerve dysfunction after parotidectomy: the role of local factors. *Laryngoscope* 2005;115:287–291.
16. Dulguerov P, Marchal F, Lehmann W. Postparotidectomy facial nerve paralysis: possible etiologic factors and results with routine facial nerve monitoring. *Laryngoscope* 1999; 109:754–762.
17. Nitzan D, Kronenberg J, Horowitz Z, et al. Quality of life following parotidectomy for malignant and benign disease. *Plast Reconstr Surg* 2004;114:1060–1067.
18. Baek CH, Chung MK, Jeong HS, et al. Questionnaire evaluation of sequelae over 5 years after parotidectomy for benign diseases. *J Plast Reconstr Aesthet Surg* 2009;62: 633–638.
19. de Bree R, van der Waal I, Leemans CR. Management of Frey syndrome. *Head Neck* 2007;29:773–778.
20. Laskawi R, Drobik C, Schonebeck C. Up-to-date report of botulinum toxin type A treatment in patients with gustatory sweating (Frey's syndrome). *Laryngoscope* 1998;108: 381–384.
21. Wax M, Tarshis L. Post-parotidectomy fistula. *J Otolaryngol* 1991;20:10–13.
22. Witt RL. The incidence and management of siaolocele after parotidectomy. *Otolaryngol Head Neck Surg* 2009;140:871–874.
23. Ryan WR, Fee WE Jr. Great auricular nerve morbidity after nerve sacrifice during parotidectomy. *Arch Otolaryngol Head Neck Surg* 2006;132:642–649.
24. Yokoshima K, Nakamizo M, Ozu C, et al. Significance of preserving the posterior branch of the great auricular nerve in parotidectomy. *J Nippon Med Sch* 2004;71: 323–327.
25. Foghsgaard S, Foghsgaard J, Homoe P. Early post-operative morbidity after superficial parotidectomy: a prospective study concerning pain and resumption of normal activity. *Clin Otolaryngol* 2007;32:54–57.
26. Patel N, Har-El G, Rosenfeld R. Quality of life after great auricular nerve sacrifice during parotidectomy. *Arch Otolaryngol Head Neck Surg* 2001;127:884–888.
27. Kahn JB, Gliklich RE, Boyev KP, Stewart MG, Metson RB, McKenna MJ. Validation of a patient-graded instrument for facial nerve paralysis: the FaCE scale. *Laryngoscope* 2001;111:387–398.
28. Christensen NR, Jacobsen SD. Parotidectomy. Preserving the posterior branch of the great auricular nerve. *J Laryngol Otol* 1997;111:556–559.
29. Fee WE Jr, Tran LE. Functional outcome after total parotidectomy reconstruction. *Laryngoscope* 2004;114: 223–226.
30. Curry JM, King N, Reiter D, Fisher K, Heffelfinger RN, Pribitkin EA. Meta-analysis of surgical techniques for preventing parotidectomy sequelae. *Arch Facial Plast Surg* 2009;11:327–331.