Superficial Parotidectomy: Impact of Postoperative Drainage

Charlotte Fog Nielsen, RN¹, Charlotte Bjerg Sand Riis, MSc¹, Anne Louise Bach Christensen, MD¹, Frank Mirz, MD¹, Kasper Basse Reinholdt, MD¹, Therese Ovesen, MD, DMSc¹, and Alexander Wieck Fjaeldstad, MD, PhD¹

Abstract

Background: Use of suction drain after superficial parotidectomy (SP) is based on national consensus considered best practice, but there is no evidence on the effect of the treatment. The aim of the present study is to evaluate the effectiveness of drainage after SP by evaluating the rate of complications after SP in relation to the (ie, duration) of drainage and tumor size.

Methods: Retrospective analysis was performed involving data from all consecutive patients undergoing SP at the Ear, Nose, and Throat department, Regional Hospital West Jutland, Denmark, between January 1, 2011, and December 31, 2017. Demographics including comorbidity, medication, tumor size, postoperative secretion through the drainage, as well as complications (hematoma, seroma, infection, fistulas, Frey syndrome, facial nerve palsy) were registered. Patients with secretion below 25 mL were compared to patients with secretion above 25 mL, that is, drainage less than 24 hours versus longer than 24 hours.

Results: Two hundred five consecutive patients undergoing SP were enrolled. The overall risk of postoperative infection was 16.2%. Ten of 33 patients with infection were also diagnosed with an hematoma or seroma. The risk of infection increased with secretion above 25 mL (27.2%) compared to patients with less than 25 mL (13.1%; P = .0318). The same accounts for the risk of seromas/hematomas (P = .0055). We found no evidence that demographics or comorbidity correlated to the secretion in the drainage, but there is a tendency toward male gender having a higher risk off secretion above 25 mL (odds ratio 1.39).

Conclusion: Overall, the risk of complications after SP increased with secretion beyond 25 mL (ie, drainage for more than 24 hours). This applied in particular to infections and seromas/hematomas demanding treatment. The use of routine drainage after SP is questionable, and a randomized trial is warranted to unravel the necessity of postoperative drainage.

Keywords
benign parotid gland tumors, suction drain, postoperative infection, postoperative complication, seromas, hematomas

Introduction

Salivary gland neoplasms account for approximately 3% to 10% of all head and neck tumors of which 70% to 80% are benign.¹⁻³ The most common benign subtypes are pleomorphic adenoma (PA) with 65%, followed by adenolymphoma (Warthin tumor) with 25%.³ Left in situ, there is a time proportional risk of malignant transformation of PA’s (1.6%–7.5%).⁴ As a consequence, and to ensure benign pathology, adequate treatment of benign parotid gland tumors involves ultrasound scan, fine needle aspiration followed by surgical removal. In majority of cases, the tumors are located to the superficial lobe of the parotid gland, hence superficial parotidectomy (SP) is the technique of choice.⁵⁻⁷ Insertion of suction drain in surgical wounds in the head and neck region is recommended on the basis of national consensus but with no evidence to confirm the prophylactic effect. Also, empirically, the drain is removed the day after surgery if the amount of secretion is less than 25 mL. The patients remain hospitalized until the drain is removed. The underlying philosophy is that drainage avoids complications such as hematomas and seromas, albeit previous
studies found that approximately 2.4% of patients developed hematomas and 4.2% developed seromas despite drainage. Furthermore, the drain itself increases the risk of postoperative infection because of an open access to the underlying tissue (1%-13%), as well as the risk of developing salivary fistula (2%-10%). In addition to hematomas, seromas, salivary fistula, and infection, other complications are associated with SP. The risk of temporary facial nerve palsy has been reported between 18% and 65% after SP, whereas rates of permanent nerve weakness were between 0% and 19%. Another commonly reported complication following SP are Frey syndrome (1%-25%). From a cost-benefit point of view, surgery without drainage seems attractive as the patients can be discharged after a few hours, but of course only if it is without a higher risk of postoperative complications.

The empirical use of drainage raises 2 questions: Is it reasonable to set the limit for removal of the drain at 25 mL? Is drainage necessary at all? Is there a correlation between tumor size, drainage volume, and complications?

The null hypothesis of the present study was that removal of drains with less than 25 mL secretion (less than 24 hours) was associated with the same risk of complications as in cases with more than 25 mL (longer than 24 hours).

The aim of the present study is to evaluate the effectiveness of drainage after SP by evaluating the rate of complications after SP in relation to the (ie, duration) of drainage and tumor size.

The primary outcome was to determine the rate of complications in terms of postoperative infection, hematomas, seromas, fistula, Frey syndrome, and facial palsy, and to compare patients with less than 25 mL secretion with those above 25 mL. The secondary outcome was to identify risk factors associated with less/more than 25 mL (24 hours). Furthermore, to investigate the correlation between tumor size and drainage volume.

**Patients and Methods**

The study was approved by the local administration of the department, and followed the general recommendations of discretion to personal data as well as the Helsinki declaration.

**Data Selection**

Demographic data, comorbidity, and complication data were collected from the electronic patient database including specific clinical investigations.

**Surgical Procedure**

Preoperatively, ultrasound was performed in all cases to confirm unifocal disease as well as fine needle aspiration to ensure benign cytology. The surgical procedure (SP) was performed by 3 experienced head and neck surgeons by the following technique: As the majority of the parotid gland is located lateral to the facial nerve, SP is the adequate treatment of most benign tumors. Occasionally, the tumor is located in the deep lobe of the gland. In such cases, SP is the initial step in removal of the tumor. After local anesthesia with carbocaine with adrenaline (1%), a skin incision was made starting in the preauricular skin crease from above the tragus going inferiorly underneath the earlobe, inferiorly to the mastoid tip directed to an upper neck skin crease, 2 to 3 cm below and parallel to the mandible. Anterior and posterior skin flaps were raised. The anterior flap was raised to the masseter muscle exerting caution to the superficially running facial branches at the anterior border of the gland. At the posterior border, the gland was freed off the cartilaginous ear canal, the mastoid tip and the sternocleidomastoid muscle. After visualization of the main trunk, blunt dissection parallel and superficial to the nerve was performed. The tumor and surrounding gland tissue were removed. Occasionally the nerve (main trunk or branches) was in close contact with the tumor capsule. In such cases, a partial enucleation of the tumor was performed in order to preserve the facial nerve function.

**Postoperative Management**

After meticulous hemostasis, an active suction drainage was placed in the operative cavity. The nerve was protected by an absorbable hemostatic mesh (Surgicel, Ethicon). The skin was closed in 2 layers, using absorbable interrupted subcutaneous sutures and interrupted nylon sutures for the external skin. Patients with suction drain stayed at the hospital overnight for observation. The day after the operation, the drain was removed if less than 25 mL secretion was observed, the wound covered with a light absorbing band and the patient was discharged. Skin sutures were removed 6 to 7 days postoperatively in the outpatient clinic. No prophylactic antibiotics (PAB) were administered as there was no national consensus at the time of writing.

**Statistical Analyses**

All data were analyzed with JMP 13 for Mac (SAS Institute Inc). Drainage-groups with an output of >/<25 mL were compared using logistic regressions analysis of the risk of complications. Odds ratios and confidence intervals were calculated. Two-sided t test was used to compare continuous variables between groups (age and tumor size). P values <.05 were considered significant.

**Results**

From January 2011 to December 2016 a total of 226 patients underwent SP at the Ear, Nose, and Throat (ENT) department Holstebro, Hospital unit West, Denmark. Twenty-one patients did not meet the inclusion criteria, either because of age or malignancy, leaving 205 patients for inclusion.
Table 1. Demographics by Group (mL in Drain).

| Variable                | Total (n = 205) | Drain ≤ 25 mL (n = 160) | Drain > 25 mL (n = 45) | P value |
|-------------------------|-----------------|--------------------------|------------------------|---------|
| Age (mean)              | 56.4            | 55.5                     | 59.8                   | .0759   |
| Gender (male/female)    | 102/103         | 70/90                    | 32/13                  | .0013   |
| Smoker                  | 87              | 66                       | 21                     | .6090   |
| Increased alcohol intake| 23              | 16                       | 7                      | .2936   |
| Diabetes                | 16              | 10                       | 6                      | .1248   |
| AK treatment            | 32              | 27                       | 5                      | .4860   |
| Hypertensive treatment  | 63              | 49                       | 14                     | .8539   |

Abbreviation: AK, anticoagulant therapy.

Table 2. Complications and Tumor Size by Group (mL in Drain).

| Complication                        | Patients | Patients with ≤ 25 mL in drain (n = 160) | Patients with > 25 mL in drain (n = 45) | P value |
|-------------------------------------|----------|-------------------------------------------|----------------------------------------|---------|
| Infection requiring treatment       | 16.2% (n = 33) | 13.1% (n = 21)                          | 27.2% (n = 12)                        | .0318   |
| Requiring treatment accumulation (all) | 7.3% (n = 15) | 4.4% (n = 7)                          | 17.8% (n = 8)                         | .0057   |
| Hematoma                            | 1.5% (n = 3)  | 1.3% (n = 2)                           | 2.2% (n = 1)                          |         |
| Seroma                              | 5.8% (n = 12) | 3.1% (n = 5)                           | 15.6% (n = 7)                         |         |
| Fistula (all)                       | 7.8% (n = 16) | 6.3% (n = 10)                          | 13.3% (n = 6)                         | .1248   |
| Wound                               | 6.8% (n = 14) | 5.0% (n = 8)                           | 13.3% (n = 6)                         |         |
| Drain site                          | 1.0% (n = 2)  | 1.3% (n = 2)                           | 0.0% (n = 0)                          |         |
| Frey syndrome                       | 2.9% (n = 6)  | 1.9% (n = 3)                           | 6.7% (n = 3)                          | .1212   |
| Temporary facial nerve palsy        | 13.7% (n = 28) | 11.9% (n = 19)                     | 20.0% (n = 9)                         | .2168   |
| Tumor size (cm³) (mean, 95% CI)     | 39.5 (33.8-45.3) (n = 199) | 34.5 (29.2-39.8) (n = 157)   | 58.8 (40.6-77.1) (n = 42)            | .0131   |

Patient Demographics and Diagnoses

The gender ratio was 103 women:102 men, and the average age was 56 years (18-88 years). The histological subtypes were primarily PA (51.7%) and Warthin tumor (37.5%) the last 10.8% was different histological subtypes. In 199 cases, it was possible to identify tumor size.

Comparison of patient demographics is listed in Table 1 in relation to amount of secretion. Secretion below 25 mL the first postoperative morning was found in 160 (78.7%) patients. The most common complication was wound infection (16.2%), which was treated with systemic antibiotics alone (Table 2). Infection was considered when a sign of redness, swelling, localized warmth, fever, or pain was noted. After removal of the drain, 1.5% developed seromas and 5.8% hematomas. The diagnosis of seroma or hematoma was based on ultrasound scan. The treatment was aspiration from the cavity and subsequently follow-up in the outpatient clinic. Salivary fistulas developed in 7.8% of the patients, but rarely at the drain site. None of the salivary fistulas were permanent. Frey syndrome was diagnosed among 2.9% of patients. Postoperative facial nerve function remained intact in most cases, except in 13.7%, who had temporary facial palsy. All regained normal facial function within 6 months. Significantly higher incidences of postoperative infections ($\chi^2 = 4.609, P = .0318$) and development of hematomas and seromas were seen among patients with more than 25 mL secretion ($\chi^2 = 7.704, P = .0055$). Especially, it is notable that 28.1% of the patients who developed infections also presented with seromas or hematomas. In line with these findings, the remaining types of complications tended to occur among patients with more than 25 mL secretion, though not significantly. In order to identify the risk of developing postoperative complications, odds ratio and 95% confidence intervals (CI) were calculated as shown in Table 3.

Male gender ($P < .001$) and tumor size ($P = .0131$) were associated with a statistically significant higher incidence of more than 25 mL secretion whereas age, smoking status, comorbidity, and medication were nonsignificantly related to amount of secretion. A cutoff for tumor size was identified at 40 cm³ (1.8-292.5 cm³). There were statistically significant correlations with tumor size and development of fistula (0.0210) and seromas and hematomas (0.0137; Table 4).

Table 3. Odds Ratio for Postoperative Complications.

| Variable               | Effect likelihood ratio, P (95% CI) | Odds ratio |
|------------------------|-------------------------------------|------------|
| >25 mL in drain        | 0.0846 (0.6730 to 0.3452)           | 1.88 (0.92-3.84) |
| Male gender            | 0.2881 (0.1405 to 0.4731)          | 1.39 (0.76-2.58) |
| Age                    | 0.9046 (0.0197 to 0.0222)          | 1.00 (1.00-1.02) |
| Increased alcohol intake| 0.5451 (0.6536 to 0.3452)          | 1.36 (0.50-3.70) |
| Diabetes               | 0.1482 (0.1779 to 1.1782)          | 2.72 (0.70-10.55) |
| BMI (overweight)       | 0.5281 (0.2063 to 0.4021)          | 1.22 (0.66-2.23) |

Abbreviation: BMI, body mass index.
Requiring treatment

Infection requiring treatment

Likewise, in a nationwide cohort study (The Danish Thyroid Surgery Database) from 2009, Godballe et al described a mean duration of postoperative drain of 4 to 5 days. They did not describe a limit secretion value for drainage or any postoperative infection, and it is unclear whether PAB were administered. Previous studies have investigated the effects of PAB in surgery of the head and neck region. These studies found that even though most head and neck procedures are clean, the infection rate was nevertheless improved by the use of PAB in a single dose pre- or perioperatively. The high infection rate in the current and previous studies indicates that the drainage in itself lacks the prophylactic effect that one could hope for. Therefore, a single use of PAB is an issue for further investigation.

We conducted a multivariate analysis as we wanted to distinguish between patients who needed a drain and those who did not need drainage due to the certain demographic characteristics. We found no evidence that gender, age, diabetes, body mass index, smoking, medications, or alcohol led to increased output in the drainage. Nonetheless, there seemed to be a tendency toward higher secretion correlated with higher fistula occurrence, though not significantly.

Seven-eight percent of the patients in our study had secretion less than 25 mL in the drain, and may as such be considered as overtreated. From an economic point of view, surgery without drainage seems attractive, as the patient can be discharged after a few hours compared to a minimum of one night hospitalization as current practice prescribes. Based on review of the literature, there is no consensus on the use or duration of drainage as postoperative treatment.

In this study, it was not investigated whether the patients’ nutritional status had an influence on their ability of wound healing, but it is common knowledge that the nutritional status and wound healing is closely related. However, delayed wound healing in SP, most often caused by wound infection, is well described in the literature. In earlier studies, there has not been formulated a connection between the duration of drainage/the amount of secretion and the risk of developing infection after SP. However, Salem et al described drain/no drain groups, but mentions tumor size as a statistical significant risk factor for postoperative secretion. In addition, our study did confirm a statistically significant association between tumor size and secretion above 25 mL. Overall, complications occurred more frequently after SP among patients with secretion beyond 25 mL (ie, drainage for more than 24 hours). In particular, the risk of infection and development of seromas or hematomas was significantly increased, although not unequivocally correlated to tumor size (Table 4).

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Limitations

As our study is retrospective and without a control group, a randomized trial is recommended to unravel the necessity of drainage in relation to SP. Furthermore, the role of PAB, tumor size, tumor location, and surgical lesion should be clarified.

Conclusion

Based on the present results, it could be questioned, whether use of drainage had been unnecessary among the 78% patients presenting with less than 25 mL secretion. Tumor size and male gender were both considered a statistically significant risk factor, but no further demographics were associated with complications. Our rates of complications are in line with previous findings. We have added to the literature that the risk of postoperative infection and development of seromas and hematomas correlate to amounts of secretion beyond 25 mL, that is, drainage for more than 24 hours and tumor size correlates with a higher secretion.

Declaration of Conflicting Interests

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ORCID iD

Charlotte Bjerg Sand Riis https://orcid.org/0000-0002-5464-7948
Kasper Basse Reinholt https://orcid.org/0000-0002-3494-278X

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