

Impact of Prolonged Operative Time on Complications Following Benign Parotidectomy



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Abstract

Background: Prolonged operative time (POT) is linked with an increased risk of postoperative complications in several specialties. The objective of this study was to identify risk factors for POT in patients undergoing superficial (SP) and total parotidectomy (TP) for benign tumors and to report how POT impacts postoperative outcomes.

Methods: Patients who underwent SP or TP (Current Procedural Terminology codes 42415 and 42420, respectively) were queried via the American College of Surgeons - National Surgical Quality Improvement Program (ACS-NSQIP) for years 2005 – 2018. Outcomes analyzed include patient demographics, comorbidities, inpatient status, postoperative complications, length of admission, readmissions and reoperation were extracted. Univariate and multivariate analyses were performed to compare post-operative outcomes.

Results: A total of 9341 SP and 703 TP patients were identified. Longer than average operative duration in SP was associated with increased odds of deep skin & soft tissue infection (OR: 4.097, p<0.001), organ space SSI (OR:3.462, p=0.014), wound disruption (OR:4.184, p=0.003), pneumonia (OR:3.829, p=0.008), cerebrovascular accident (OR:8.588, p=0.007), bleeding requiring transfusion (OR:38.112, p<0.001), DVT (OR:4.432, p=0.034), sepsis (OR:7.472, p=0.012), readmission (OR:2.024, p<0.001), unplanned readmission (OR:2.041, p<0.001), reoperation (OR:1.612, p=0.014), postoperatively. POT in both SP and TP groups were associated with increased length of stay (OR:4.451 & 8.591, p<0.001, respectively).

Conclusions: POT in parotidectomy for benign parotid tumors is independently associated with increased length of stay. Moreover, POT in SP is associated with several other adverse outcomes such as unplanned readmission, surgical complications, and bleeding requiring transfusion. Understanding the factors that lead to longer operative times can improve postoperative planning, safety, and earlier detection of complications.

Introduction

- Approximately 5 in every 100,000 people are diagnosed with salivary gland neoplasm, majority of which tend to be benign in origin.¹
- Parotidectomy is a common surgical intervention performed for both benign and malignant neoplasms, with 75-80% of the cases being benign and from a primary parotid source.^{2,3}
- The mainstay treatment currently for benign parotid tumors is a superficial parotidectomy. In malignant neoplasms that cause preoperative facial paralysis and invade the facial nerve, a total/radical parotidectomy is indicated.²
- Prior literature shows that reduced operative time in less extensive procedures decreases postoperative complications.⁴
- Complications of this overall procedure entail facial nerve injury, hemorrhage, infection, keloid formation, gustatory sweating, and recurrence in tumor growth.⁵
- The objective of this study was to compare the 30-day complication rates and postoperative functional outcomes in patients who underwent SP or TP based on operative time.

Methods and Materials

In this retrospective cohort study, the 2005 to 2018 ACS-NSQIP database was queried for all adult patients who underwent SP (CPT = 42415) and TP (CPT = 42410). Preoperative patient characteristics included were demographics and comorbidities.

The primary outcome of this study was the incidence of postoperative complications (medical or surgical), and how these complications were related to prolonged operative time. Patients were stratified by prolonged operative time, with prolonged operative time defined as operative time greater than the mean. Pearson's chi-square test (χ^2) was used for associations between categorical variables; differences between means of continuous variables were analyzed using t-tests. Subsequent multivariate logistic regression models were fit to identify the association between reconstructive method and 30-day complications and outcomes presented as odds ratios (ORs) and 95% confidence intervals (CIs). The regression analyses were adjusted for demographics and statistically significant comorbidities. Statistical significance was defined as P<0.05. Analyses were performed using SPSS version 25.

Results

Out of 10,044 patients identified, 9,341 underwent SP and 703 underwent TP. Of the cohort, 2807 (30.1%) who had a SP and 485 (69.0%) patients who had a TP had prolonged operative time.

Table 1. Comparison of Demographics

	SP	P-Value	TP	P-Value
Gender, n (%)		<0.001		0.008
Female	4792 (51.3)		231 (32.9)	
Male	4549 (48.7)		472 (67.1)	
Age (years), n (%)		<0.001		0.100
< 61	5092 (54.5)		612 (87.1)	
61 +	4249 (45.5)		91 (12.9)	
Race, n (%)		<0.001		<0.001
White	6643 (71.1)		476 (67.7)	
Black	627 (6.7)		32 (4.6)	
Other	2071 (22.2)		195 (27.8)	
ASA Classification, n (%)		<0.001		0.003
ASA Class 1 or 2	5898 (63.1)		315 (44.8)	
ASA Class 3 or 4	3443 (36.9)		388 (55.2)	

Table 2. Univariate Comparison of Postop Complications with Prolonged Op Time

	SP (%)	P-Value	TP (%)	P-Value
Overall Surgical	90 (42.7)	<0.001	38 (76.0)	0.266
Superficial SSI	43 (30.9)	0.819	17 (70.8)	0.843
Deep SSI	16 (61.5)	<0.001	*	0.561
Organ Space SSI	10 (58.8)	0.010	*	0.502
Wound Disruption	13 (65.0)	<0.001	10 (90.9)	0.113
Bleeding (Transfusion)	20 (95.2)	<0.001	15 (83.3)	0.183
Overall Medical	214 (32.1)	0.224	42 (76.4)	0.218
Pneumonia	12 (66.7)	<0.001	*	0.931
Reintubation	6 (54.5)	0.076	*	0.561
Vent > 48 hours	*	0.127	*	0.931
Urinary Tract Infection	8 (38.1)	0.421	*	0.245
Deep Vein Thrombosis	7 (70.0)	0.006	*	0.502
Sepsis	8 (80.0)	<0.001	*	0.245
Procedure Related				
Hospital Stay, days	1.31 +/- 0.062 (vs 0.74 +/- 0.069)	0.025	3.44 days +/- 0.268 (vs 1.76 +/- 0.239)	0.018
Unplanned Readmission	60 (47.6)	<0.001	20 (83.3)	0.122
Reoperation	48 (41.4)	0.007	26 (76.5)	0.334

*N < 5

Table 3. Trends of Complications based on Prolonged Operative Time

Complications	Odds Ratio	95% Confidence Interval		P-Value
		Upper	Lower	
SP	1.986	1.491	2.644	<0.001
Overall Surgical	1.986	1.491	2.644	<0.001
Deep SSI	4.097	1.806	9.294	<0.001
Organ Space SSI	3.462	1.282	9.347	0.014
Wound Disruption	4.184	1.626	10.766	0.003
Bleeding (Needs Transfusion)	38.112	5.058	287.167	<0.001
Pneumonia				
Deep Vein Thrombosis	4.432	1.117	17.591	0.034
Sepsis	7.472	1.57	35.563	0.012
Unplanned Readmission	2.041	1.423	2.927	<0.001
Reoperation	1.612	1.099	2.362	0.014
Prolonged Hospital Stay	4.451	3.896	5.085	<0.001
TP				
Prolonged Hospital Stay	8.591	5.613	13.15	<0.001

Discussion

Our analysis of a national database demonstrated that prolonged operative time in benign parotidectomy is associated with increased length of hospital stay and additional postoperative complications for SP.

Significant differences in outcomes for prolonged operative time in SP and TP:

- Increased hospital stay (OR:4.451 [] & 8.591 [] , p<0.001, respectively)

Significant differences in outcomes for prolonged operative time in SP:

- Bleeding (OR: 38.112 [1.388-2.506], P<0.001)
- Readmission (OR: 2.024 [1.373-2.399], P<0.001)
- Reoperation (OR: 1.612 [1.373-2.399], P=0.014)

Surgical options have undergone many changes in the last 20 years including a transition from superficial and total parotidectomy to extracapsular dissection and partial superficial parotidectomy (PSP).^{6,7} Prior literature shows that reduced operative time and simpler procedures lead to a lower risk of facial nerve injury. Few studies have revealed mean operative time to be shorter in PSP vs SP procedures with reduced bleeding and postoperative complications.⁴ Further research needs to be conducted to elucidate the generalizability of such findings and whether this overall affects complication rates.

Conclusions

In this study, the rates of unplanned readmission, length of hospital stay, reoperation and surgical site infection were shown to increased in patient with prolonged operative time for SP. As such, future studies that detail methods to safely decrease operative time can greatly improve postoperative outcomes.

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