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Role of perioperative antibiotic treatment in parotid gland surgery

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Abstract

Background—The value of routine prophylactic antibiotic treatment in parotid gland surgery remains undetermined.

Methods—A retrospective analysis was conducted of all patients who underwent parotidectomy at a university-affiliated tertiary care center between 1992 and 2009. Patients with insufficient data, specifically regarding postoperative complications and antibiotic administration were excluded from the study cohort.

Results—A total of 593 patients underwent parotidectomy during the study period. After exclusion, 464 patients were eligible for the study. Perioperative antibiotic treatment was given to 206 patients (45%). There was no difference in wound infection rates between patients who received perioperative antibiotic therapy and those who did not ($p = .168$). Multivariate analysis showed that female sex, neck dissection, and drain output >50 cc/24 hours were predictive of postoperative wound infection.

Conclusion—Routine prophylactic antibiotic treatment has no role in parotid gland surgery. Perioperative antibiotic treatment is recommended for patients undergoing extensive parotid gland surgery with neck dissection.

Keywords

parotid gland; parotidectomy; wound infection; perioperative antibiotic treatment; drain

INTRODUCTION

The value of perioperative antibiotic prophylaxis is well established for clean-contaminated procedures. For clean surgery, prophylaxis traditionally has been reserved for prosthetic

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device implantation procedures.¹ However, evidence that postoperative infections from nonprosthetic clean procedures are highly underreported suggests that prophylaxis is also advisable, at least for some nonprosthetic procedures, such as breast surgery and herniorrhaphy.² Conversely, despite implementation of practical guidelines and continuing education programs, the percentage of inappropriate prophylactic antibiotic usage remains high.³

Antibiotic prophylaxis in clean-contaminated head and neck surgery is mandatory. The efficacy of perioperative antibiotic administration during major head and neck surgery in which the wound is contaminated by saliva has been clearly established. However, the use of perioperative prophylactic antibiotics in uncontaminated head and neck surgery remains controversial.⁴ Johnson and Wagner⁵ demonstrated the nonefficacy of antibiotics administered in patients undergoing parotidectomy, thyroidectomy, or submandibular gland excision when no infection exists before surgery. Slattey et al⁶ found that perioperative antibiotic prophylaxis for 24 hours is sufficient to prevent wound infections in clean, uncontaminated neck dissections. A recent meta-analysis concluded that the general prevailing attitude that antibiotic prophylaxis should be assumed to be ineffective unless its effectiveness has been experimentally proven beyond doubt for the specific type of surgery perhaps should be revised.⁷

The parotid salivary gland secretes saliva into the oral cavity through the parotid (Stensen's) duct in reaction to parasympathetic stimulation. Some head and neck surgeons believe that during parotidectomy a direct connection between the oral cavity and the surgical field is formed with possible retrograde flow of saliva from the contaminated oral cavity into the clean wound. Hence, they advocate the use of prophylactic perioperative antibiotic treatment in parotid gland surgery.

This speculation was the driving force for conducting this study in effort to provide solid data that may prevent unnecessary antibiotic treatment.

The purpose of the present study was to assess the value of perioperative prophylactic antibiotic treatment in parotid gland surgery and to try to identify factors predictive of postoperative wound infection after parotidectomy.

MATERIALS AND METHODS

Collection of data

Medical charts of patients who underwent parotidectomy at a university-affiliated tertiary care medical center between 1992 and 2009 were reviewed, with reference to age, sex, presenting symptoms, comorbidities, pathology, surgical and other therapeutic means, postoperative complications and follow-up data, including postoperative wound infection, drainage amount, route and length of antibiotics administration, and length and type of surgery.

Patients were excluded if they had documented parotid infection before surgery or had previously undergone parotid surgery, if there was missing information about wound infection, or missing information about the receipt of antibiotics.

Antibiotic treatment

At the department of otolaryngology/head and neck surgery 6 attending surgeons performed parotid surgery and each had personal preferences regarding prophylactic perioperative antibiotic treatment. Some attending surgeons gave prophylactic antibiotic in every case, whereas others never did. This practically divides the patients into 2 groups in an arbitrary fashion. When antibiotic treatment was given, it was given intravenously, the first dose in the operating room and then every 8 hours for a period of 24 to 48 hours. The antibiotic agents used were either Cefazolin 1 g or Clindamycin 600 mg in patients who were allergic to Penicillin (Table 1). All patients were prepped and draped for surgery in the same fashion using Povidone-iodine, 10%, topical solution.^{8,9}

Evaluation of the surgical wound and determination of wound infection was done using the Practice Guidelines for the Diagnosis and Management of Skin and Soft Tissue Infections, published in 2014 by the Infectious Disease Society of America.¹⁰

Surgical site infection was defined as local edema, erythema, and tenderness, started no less than 48 hours postoperatively.

Statistical analysis

Bivariate analysis with chi-square statistic was used to calculate the association between patient characteristics and the receipt of antibiotics as well as between patient characteristics and the presence of postoperative wound infection. Multivariable logistic regression was used to calculate the predictors of postoperative wound infection. All available characteristics were used in this multivariable model. The *p* values .05 were considered significant. Analyses were conducted using Stata Statistical Software release 12.1 (Stata, College Station, TX).

The institutional review board approved this study.

RESULTS

A total of 593 patients underwent parotidectomy during the study period.

After exclusion, 464 patients were eligible for the study. Mean age was 54 ± 17 years. There were 246 men (53%) and 218 women. Perioperative antibiotic treatment was given to 206 patients (45%). Factors found to be associated with antibiotic treatment were length of surgery, neck dissection, malignancy, tumor spillage, skin infiltration by tumor, and drain amount >50 cc (Table 2). After surgery, 99 patients had developed wound infections. There was no difference in wound infection rates between patients who received perioperative antibiotic therapy and those who did not (see Figure 1). Predictors for wound infection were female sex, neck dissection, and drain output of >50 cc over 24 hours (Table 3).

DISCUSSION

In the present study, we found no benefit for routine prophylactic perioperative antibiotic treatment in patients undergoing parotid gland surgery. Having said that, some factors may increase the risk for wound infection after parotidectomy, and so antibiotic treatment should be considered in these patients.

First, we looked into factors that were associated with administration of prophylactic antibiotic treatment and found that most of these factors are related to the extent of surgery (length >120 minutes, neck dissection) or extent of disease (malignancy, skin involvement, and tumor spillage). Another factor that is not directly related to either but is reasonably associated with the extent of surgery is drain output.

Second, we sought for factors that were predictive of postoperative wound infection and found that factors related to the extent of surgery, such as neck dissection and high drain output, were predictive of wound infection. Interestingly, another factor that was found to be predictive of wound infection was female sex, but we could not find any scientific explanation for that. We strongly feel that patients with higher drain output probably had a more extensive surgery (ie, neck dissection) and, hence, were at a higher risk for postoperative wound infection. Obviously, drain output may not be used for prophylaxis planning and is merely a co-factor that should be anticipated after a more extensive parotid gland surgery.

Only a handful of studies addressed the subject of postoperative wound infection and antibiotic prophylaxis in head and neck surgery but none of them discussed parotid gland surgery as a separate entity.

Simo and French¹¹ found that prophylactic antibiotic use in clean-contaminated major oncological head and neck surgery is mandatory to reduce the risk of infection. In clean major oncological head and neck surgery, their use is also advisable, but there is no evidence that clean surgery for benign disease offers any advantage.

Ogihara et al¹² concluded that in order to minimize postoperative wound infection, clinicians managing the patients with head and neck tumors should have a thorough understanding of the risk factors leading to postoperative infections, such as blood loss, previous chemotherapy, and clean-contaminated surgery. Lee et al¹³ pretended to predict high-risk patients for surgical wound infection after major head and neck surgery. They recommended preventative measures or close monitoring in these patients in order to reduce the likelihood of postoperative wound infection.

Certainly, some surgical procedures for high-grade malignant parotid tumors may qualify as clean major oncological head and neck surgery that entails neck dissection and composite soft tissue resection. Conversely, benign and even low-grade parotid malignancies may not require extensive surgery and, hence, the risk for postoperative wound infection in these procedures is relatively low.

Furthermore, we know that surgeons tend to follow their own dogmatic behaviors, which are rarely evidence-based. For instance, infectious complications after endocrine cervical operations are rare and the use of preoperative antibiotics varies widely. An international survey of endocrine surgeons who looked into prescribing behaviors in thyroid and parathyroid surgery found that they seem to be dogmatic in that 90% of surgeons give preoperative antibiotics almost always or almost never.¹⁴ No doubt that this study would add solid data advocating against injudicious perioperative antibiotic treatment. In addition we may rely on factors that predict the risk for wound infection and either closely monitor or even treat with prophylactic antibiotics. When appropriate, short antibiotic regimes of 4 doses per 24 hours are as effective as prolonged courses regardless of the complexity of the procedure. These patients who are at high-risk for developing postoperative wound infection should be given short regimes, as there is no evidence that prolonged courses are of more benefit.¹⁵ As we all know, methicillin-resistant *Staphylococcus Aureus* infection can have devastating consequences for patients undergoing any kind of head and neck surgery. Uncontrolled and unnecessary antibiotic treatment may lead to the development of this resistant strains.¹⁶ We strongly recommend that protocols of prevention and treatment should be in place in all institutions treating patients with head and neck cancer. Close collaboration among surgical, microbiology, and infection-control teams is absolutely essential. Finally, in the absence of randomized control trials looking into the issue of post-parotid gland surgery wound infection, high volume retrospective analysis may serve as the best second choice. To the best of our knowledge, this is the largest cohort of patients who underwent parotidectomy addressing the subject of postoperative wound infection.

CONCLUSION

Routine prophylactic antibiotic treatment does not provide any benefit in preventing postoperative wound infection after parotid gland surgery. Perioperative antibiotic treatment is recommended for patients undergoing extensive parotid gland surgery with neck dissection in order to reduce the risk of postoperative wound infection. We suggest an algorithm for prophylactic antibiotic treatment in parotid gland surgery to help clinicians with decision-making and patient management (see Figure 2).

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FIGURE 1.
Comparison of postoperative surgical wound infection rates between patient who received prophylactic antibiotic treatment and those who did not.

FIGURE 2.
Algorithm for prophylactic antibiotic (AB) treatment in parotid gland surgery.

TABLE 1

Different preoperative prophylactic antibiotic protocols among the attending surgeons.

	Protocol 1	Protocol 2	Duration of antibiotic treatment	No. of attending surgeons
Prophylactic antibiotic	i.v. Cefazolin 1 g q8h	i.v. Clindamycin 600 mg q8h	48 h	2
Prophylactic antibiotic	IV Cefazolin 1 g q8h	i.v. Clindamycin 600 mg q8h	24 h	1
No prophylactic antibiotic	N/A	N/A	N/A	3

Abbreviation: N/A, not applicable.

TABLE 2

Patient characteristics and receipt of antibiotics.

Characteristics	No. of patients (column %)		p value
	Overall	Receipt of antibiotics (row %)	
Patients undergoing parotidectomy	464	206 (44.4)	
Age at diagnosis, y			
<55	228 (49.1)	92 (40.4)	
55	236 (50.9)	114 (48.3)	.085
Sex			
Male	246 (53)	106 (43.1)	
Female	218 (47)	100 (45.9)	.547
Comorbidities			
0	343 (73.9)	150 (43.7)	
1	121 (26.1)	56 (46.3)	.628
Diabetes			
No	411 (88.6)	181 (44)	
Yes	53 (11.4)	25 (47.2)	.666
Extent of surgery			
No neck dissection	401 (87.0)	159 (39.7)	
Neck dissection	60 (13.0)	47 (78.3)	.0001
Length of surgery			
30–120 min	274 (62.7)	108 (39.4)	
120 min	163 (37.3)	86 (52.8)	.007
Pathology			
Benign	376 (81.4)	151 (40.2)	
Malignant	86 (18.6)	55 (64.0)	.0001
Tumor spillage			
No	429 (92.7)	184 (42.9)	
Yes	34 (7.3)	21 (61.8)	.033
Skin infiltration			
No	444 (96.1)	189 (42.6)	
Yes	18 (3.9)	15 (83.3)	.001
Drain output, total			
<50 mL	90 (19.4)	29 (32.2)	
50 mL	374 (80.6)	177 (47.3)	.010

TABLE 3

Predictors of post-parotidectomy wound infection.

	No. of patients (%)				Adjusted OR (CI)	p value
	Overall	Infections	p value			
Patients undergoing parotidectomy	464	99 (21.3)				
Characteristics						
Age at diagnosis, y						
<55	228 (49.1)	41 (18)		1 (Reference)		
55	236 (50.9)	58 (24.6)	.083	1.00 (0.87–2.50)		.152
Sex						
Male	246 (53)	46 (18.7)		1 (Reference)		
Female	218 (47)	53 (24.3)	.141	1.64 (1.01–2.68)		.048
Comorbidities						
0	343 (73.9)	67 (19.5)		1 (Reference)		
1	121 (26.1)	32 (26.4)	.111	1.22 (0.61–2.46)		.574
Diabetes						
No	411 (88.6)	85 (20.7)		1 (Reference)		
Yes	53 (11.4)	14 (26.4)	.338	1.14 (0.48–2.72)		.766
Antibiotics						
No	258 (55.6)	49 (19)		1 (Reference)		
Yes	206 (44.4)	50 (24.3)	.168	1.17 (0.71–1.94)		.542
Extent of surgery						
No neck dissection	401 (87.0)	87 (21.7)		1 (Reference)		
Neck dissection	60 (13.0)	12 (20.0)	.765	0.29 (0.11–0.79)		.015
Length of surgery						
30–120 min	274 (62.7)	53 (19.3)		1 (Reference)		
120 min	163 (37.3)	39 (23.9)	.256	1.42 (0.84–2.39)		.194
Pathology						
Benign	376 (81.4)	76 (20.2)		1 (Reference)		
Malignant	86 (18.6)	23 (26.7)	.183	1.28 (0.64–2.56)		.494
Tumor spillage						

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	No. of patients (%)		p value	Adjusted OR (CI)	p value
	Overall	Infections			
No	429 (92.7)	91 (21.2)		1 (Reference)	
Yes	34 (7.3)	8 (23.5)	.751	0.84 (0.34–2.09)	.705
Skin infiltration					
No	444 (96.1)	92 (20.7)		1 (Reference)	.180
Yes	18 (3.9)	7 (38.9)	.066	2.34 (0.68–8.13)	
Drain output, total					
<50 mL	90 (19.4)	9 (10)		1 (Reference)	.013
50 mL	374 (80.6)	90 (24.1)	.003	2.61 (1.23–5.56)	