American Journal of Otolaryngology–Head and Neck Medicine and Surgery 38 (2017) 204–207

Contents lists available at ScienceDirect

American Journal of Otolaryngology–Head and Neck Medicine and Surgery

journal homepage: www.elsevier.com/locate/amjoto

Extended use of perioperative antibiotics in head and neck microvascular reconstruction☆

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ARTICLE INFO

Article history:
Received 16 November 2016

Keywords:
Microvascular
Free tissue transfer
Antibiotic prophylaxis
Head and neck

ABSTRACT

Purpose: Many head and neck surgical procedures are considered clean-contaminated wounds and antibiotic prophylaxis is recommended. Despite prophylaxis, the incidence of surgical site infections remains significant – especially in the setting of free tissue transfer. The antibiotic course is often of a longer duration after free tissue transfer than the recommended 24 hour post-operatively. Currently, there is no consensus on appropriate antibiotic regimen or duration at this time. This study investigates the outcomes of a 7-day perioperative antibiotic regimen after microvascular reconstruction of the head and neck at our institution.

Materials and methods: A retrospective review was performed of 72 patients undergoing microvascular free tissue at our institution between 09/2011 and 03/2014. The antibiotic regimen, post-operative surgical (including surgical site infections) and medical complications were noted. Our rates of complications and adverse events were compared to all surgical patients, as well as all inpatients hospital-wide with use of the University Health System Consortium database.

Results: Seventy-two subjects met inclusion criteria for this study. The majority of subjects received cefazolin/metronidazole (69.4%). Subjects with beta-lactam allergy received clindamycin (12.5%). The remainder received an alternative regimen (18.1%). All received at least 7 days of antibiotics. The rate of hospital acquired *C. difficile* diarrhea was 0.57% hospital-wide, 1.13% in Otolaryngology patients, and 1.4% in this study. There were no instances of a multi-drug resistant infection or any adverse reactions to the administration of antibiotics. When compared with other antibiotic regimens, clindamycin was associated with a significantly increased rate of either medical or surgical infections (OR 14.38, $p = 0.02$) and longer hospital stay (average = 18 days, $p < 0.05$).

Conclusion: The use of a 7-day prophylactic antibiotic regimen is not associated with an increased risk of antibiotic-associated infections, multi-drug resistant infections, or antibiotic-associated complications. The use of clindamycin is associated with increased risk of medical and surgical infections post-operatively and should be avoided in the prophylactic perioperative phase after free tissue transfer of the head and neck.

1. Introduction

Free tissue transfer has become the gold standard in reconstructing complex defects of the head and neck. While early success rates for free tissue transfer were below present day levels, a better understanding of tissue handling and surgical techniques have increased success rates to >95% [1–3]. Despite advances in this field of reconstruction, perioperative protocols, such as perioperative antibiotic prophylaxis for free tissue transfer, have lacked a significant amount of evidenced-based input and vary widely among institutions [4,5].

Many head and neck procedures, including free tissue transfer are considered clean-contaminated wounds as defined by the Centers for Disease Control and Prevention (CDC) [6]. It has been well established that the use of perioperative antibiotics reduces the incidence of surgical site infections (SSI) in clean-contaminated procedures, and antibiotic use is recommended in such head and neck cases by the most recent Clinical Practice Guidelines for Antimicrobial Prophylaxis in Surgery [6–11]. Patients undergoing free flap reconstruction of the head and neck have been shown to have infection rates in 20% to 50% of cases [10] and is associated with high morbidity, including potential flap loss, and mortality [12,13]. Because of the high cost of a failed reconstruction, strict postoperative regimens are followed to ensure a high success rate [14]. This often includes use of perioperative antibiotics for a longer duration than that of 24 h as is currently recommended for most clean-contaminated cases [7,11,15]. Due to a paucity of data in the literature

☆ Presented at Triological Society, Combined Otolaryngology Section Annual Meeting, Chicago, IL, May, 2016.

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http://dx.doi.org/10.1016/j.amjoto.2017.01.009
0196-0709/

to address this issue, there is no consensus on the type of antibiotic agent or duration of use.

At our institution, we employ a 7-day postoperative antibiotic regimen for all microvascular reconstructions involving the head and neck. However, the differing opinions among microvascular surgeons has led some to question of the necessity of an extended regimen, noting the possible risk of antibiotic-associated complications such as drug reactions, antibiotic-associated infections and the emergence of antibiotic resistant organisms [2,7,16,17]. The aim of this study is to help ascertain whether a 7-day postoperative course of antibiotics has an increased risk of antibiotic-associated complications when compared to our institution's UHC data for surgical patients.

2. Material and methods

This study's protocol was reviewed and approved by the Boston University School of Medicine Institutional Review Board (*protocol# H-32826*). A retrospective chart-review was performed on subjects (age ≥ 18 years) undergoing microvascular head and neck reconstruction at our institution between September 2011 and March 2014. Data was recorded and included patient age, sex, procedure length, performance status score, hospital stay, tumor/reconstruction location, stage of malignancy, donor site location, infections, complications, and antibiotic regimen and duration. This was collected and maintained on an Excel (Microsoft Corp., Redmond, WA, USA) data spreadsheet. Reconstructions that utilized alternative methods, such as local or regional flaps, as well as subjects under the age of 18 were excluded from this study. All cases were considered contaminated/wound class III.

2.1. Definitions

2.1.1. Infections: medical versus surgical

Medical infections were defined as those that were not direct sequelae from the surgical procedure but occurred within 30 days of surgery. These included pneumonia, urinary tract infection, and antibiotic-associated diarrhea (*Clostridium difficile*). SSI within the reconstructed or donor site were defined according to the CDC criterion as those which occur within 30 days of an operative procedure and include at least one of the following: purulent drainage, organism positive culture, or deliberate incisional opening, and at least one sign of infection including pain, swelling, erythema or heat [6]. In this study, these included donor or recipient site cellulitis and abscesses, necrotizing fasciitis or myositis, and tracheobronchitis.

2.1.2. Complications: medical versus surgical

Complications (non-infectious) were also divided into medical and surgical groups, and were defined as occurring within 30 days of the operative procedure. Medical complications included *chronic* deep vein thrombosis/pulmonary embolism as demonstrated on imaging studies, alcohol withdrawal, acute myocardial infarction, atrial fibrillation, and death. Surgical complications included *acute* deep vein thrombosis/pulmonary embolism, pharyngocutaneous fistula, hematoma, and partial or total flap necrosis.

2.2. Hospital-wide data collection

The University Health System Consortium database was used to obtain service specific data regarding the Otolaryngology specialty at Boston Medical Center (BMC), as well as hospital-wide data including surgical and medical patients. Factors examined included postoperative infection rates, antibiotic-associated infection rates, and overall infection rates. The time-period included September 2011 through March 2014 to reflect the same time period for which our patient data was collected. Publication of this data was granted approval by UHC and BMC (UHC Clinical Data Base/Resource Manager™ used by permission of UHC).

2.3. Statistical analysis

The primary analysis sought to examine the rates of complications in patients who underwent free-flap surgery and was then compared to hospital wide rates of infection, both at the departmental level and across all surgical specialties as a whole. A secondary analysis sought to examine the use of a various perioperative antibiotics and the 30-day infection rate in the post-surgical setting. In all cases, continuous variables and categorical variables were evaluated with a Kruskal-Wallis test or a χ^2 test or Fischer exact test, respectively. All p-values were two-sided and p-values < 0.05 were considered statistically significant. All statistical analyses were performed using StataSE 12.0 (StataCorp, College Station, TX).

3. Results

3.1. Patient demographics

A total of 72 subjects met inclusion criteria for this study and included 44 males (61%) and 28 females (39%) with a median age of 59 years (range = 18–86 years). The location of reconstructed sites included oral cavity (n = 54, 75%), oropharynx (n = 9, 12.5%), hypopharynx or larynx (n = 7, 9.7%) and 2 subjects (2.8%) had defects outside of the

Table 1
Demographic characteristics.
Continuous variables average (±standard deviation); categorical frequency (percent).

Patient characteristics	Total (n = 72)	Cefazolin & metronidazole (n = 50)	Clindamycin (n = 9)	Other (n = 13)	p-Value
Age	58.3 (14.3)	56.1 (15.1)	61.8 (12.8)	64.2 (9.7)	0.15
Sex					0.93
Male	44 (61.1)	31 (62)	5 (55.6)	8 (61.5)	
Female	28 (38.9)	19 (38)	4 (44.4)	5 (38.5)	
Procedure length (minutes)	610.8 (103.8)	618.6 (106.0)	603.2 (95.2)	585.9 (104.5)	0.45
ASA score	2.68 (0.62)	2.6 (0.6)	2.4 (0.5)	3 (0.7)	0.18
Hospital stay (days)	12 (5.2)	10.9 (3.2)	**18.0 (8.6)***	11.8 (6.5)	**0.02***
Reconstruction location					
Oral cavity	54 (75.0)	36 (72.0)	7 (77.8)	11 (84.6)	0.06
Oropharynx	9 (12.5)	7 (14.0)	2 (22.2)	0 (0.0)	
Hypopharynx or larynx	7 (9.7)	7 (14.0)	0 (0.0)	0 (0.0)	
Outside upper digestive tract	2 (2.8)	0 (0.0)	0 (0.0)	2 (15.4)	
Pathology					0.78
Benign	11 (15.3)	7 (14)	1 (11.1)	3 (23.01)	
1–3	13 (18.1)	8 (16)	2 (22.2)	3 (23.01)	
≥4	48 (66.7)	35 (70)	6 (66.7)	7 (53.9)	
Flap location					0.69
FFF	25 (34.7)	17 (34)	5 (55.6)	3 (23.1)	
RFFF	34 (47.2)	24 (48)	3 (33.3)	7 (53.8)	
ALTFF	13 (18.1)	9 (18)	1 (11.1)	3 (23.1)	
Infections					
Any	28 (38.9)	16 (32.0)	9 (100)	3 (23.1)	<0.005
Medical	20 (27.8)	13 (26.0)	4 (44.4)	3 (23.08)	0.48
Surgical	10 (13.9)	4 (8.0)	5 (55.6)	1 (7.7)	<0.005
Complications					
Medical	8 (11.1)	4 (8.0)	1 (11.1)	3 (23.1)	0.25
Surgical	16 (22.2)	8 (16.0)	3 (33.3)	5 (38.5)	0.13
Antibiotic	1 (1.4)	1 (2.0)	0 (0.0)	0 (0.0)	1.00

Bold and asterisk denotes findings of clinical significance. This should include infections (any and surgical).