Usage of antimicrobials in patients having intricate clean-contaminated head and neck surgeries.

Running Title: Antibiotic after complicated clean contaminated head and neck surgeries

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ABSTRACT

Objective: The goal of this study is to characterize, the infectious complications and to identify the risk variables most frequently linked, after head and neck surgeries.

Methodology: 47 patients who underwent major clean-contaminated head and neck surgery between 2019 and 2022 at the cervicomaxillofacial Surgery Department (Saint-Pierre Hospital) were the subject of a prospective cohort analysis. Two groups of patients were created: group I received a postoperative antibiotic regimen for just 24 hours; group II received a longer postoperative antibiotic course lasting more than 24 hours. Amoxicillin and clavulanate were given intravenously 30 to 60 minutes before making the incision as antibacterial precautions. Following surgery, the antibiotic course was maintained. Univariate analysis was used to assess the predictive importance of the antibiotic regimen on postoperative outcomes, including clinical symptoms of infection and biological indicators like the white blood cell count and C-reactive protein levels was evaluated using univariate analysis.

Results: 18 patients experienced SSIs. Antibiotics were used to treat each of these grade 2 illnesses. Only a history of hypothyroidism appears to be a predictor of SSI after univariate analysis (P = 0.038). When we compared the patients who received antibiotics for 24 h or more, there was no discernible difference in terms of onset and hospital stay. Additionally, neither group had a different rate of germs that were multidrug resistant.

Conclusion: Our findings imply that using postoperative antibiotics for more than 24 hours has no positive effects on SSI.

Key words: Cervico-maxillofacial Surgery, clean contaminated surgery, antimicrobials, Surgical Site Infection.

Introduction:

Upper aerodigestive tract oncology surgery is sometimes a difficult multi-step treatment that involves significant tumor resections, substantial bilateral neck dissections, and mainly vascularized tissue rebuilding.[1-3] Surgery necessitates rupturing the mucosal lining of the upper digestive system, which increases the surgical site's bacterial infection.[4] The risk of infections has been reported to range from 4% to 46%. These major consequences can cause fistula formation, poor tissue reconstruction, and delayed wound healing, which all increase morbidity and mortality and lengthen hospital stays and medical expenses.[5-14] Additionally, surgical site infection (SSI) has the negative impact of delaying adjuvant therapy, which negatively affects the patient's prognosis.

To assess the risk of infectious complications, it is necessary to take into account a number of high-risk factors based on the stage of the cancer, the size of the tumor, nutritional status, comorbid conditions, the type of surgery, and the amount of reconstruction.[1-3] Nowadays, first- or second-generation beta-lactamases are typically used as the first line of preventive antibiotic therapy to treat Gram-positive and some Gram-negative organisms (Escherichia coli, Klebsiella, and Proteus).[13] This antibiotic regimen was linked to the highest rate of SSI prevention, according to the Vander Poorten et al. comprehensive review and meta-analysis.[5]

According to the scientists, a course of antibiotic therapy lasting more than 48 hours did not significantly prevent wound infections. This is in reference to the length of the treatment described in the literature.[13-15] There is currently no agreement on the length of an antibiotic course, though.

Patients receiving flap repair in the past had prolonged antibiotic prophylaxis that included intravenous amoxicillin 1 g and clavulanate 200 mg, four times per day. New national guidelines for surgical antibiotic prophylaxis in Belgium were issued in 2017, and they suggested prophylaxis for no more than 24 hours.16 In 2019, our department and the hospital's antibiotic stewardship team conducted a literature review, which changed the protocol and reduced the length of the antibiotic prophylaxis from 5 days to a maximum of 24 hours.

We conducted a prospective analysis of intensive care patients who had undergone oncological surgery of the upper aerodigestive tract to evaluate the impact of our new approach on SSI and the antibiotic-related side effects because major complex oncological head and neck surgery with flap reconstruction can be complicated by severe SSI, including flap necrosis. The goal of this study is to characterize the infectious complications and to identify the risk variables most frequently linked with them given that the

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findings did not reach a consensus.

Methodology:

47 patients who underwent major clean-contaminated head and neck surgery between 2020 and 2022 at the Cervicomaxillofacial Surgery Department (Liaquat university of medical and health sciences Jamshoro) were the subject of a prospective cohort analysis. Two groups of patients were created: group I received a postoperative antibiotic regimen for just 24 hours; group II received a longer postoperative antibiotic course lasting more than 24 hours. Amoxicillin and clavulanate were given intravenously 30 to 60 minutes before making the incision as antibacterial precautions. Following surgery, the antibiotic course was maintained. Questionnaire was made and given to the patients who were fulfilling the inclusion criteria. Consent was also taken from the patients. Univariate analysis was used to assess the predictive importance of the antibiotic regimen on postoperative outcomes, including clinical symptoms of infection and biological indicators like the white blood cell count and C-reactive protein levels was evaluated using univariate analysis.

Inclusion Criteria:

Either Gender

Age 35 years to 65 years

Those who were willing to participate

Exclusion Criteria:

Those who were not willing

Results:

One Among 47 participants enrolled were having extensive upper aerodigestive tract cancer and subsequently underwent surgery. Average age of patients was 63 years, ranged from 20 to 89 years. Male (36,76.6%) outnumbered female (11, 23.4%). Thirty-five patients (74.5%) disclosed their smoking history. The larynx and/or hypopharynx (n=15) and the oral cavity (n=21) accounted for the bulk of tumor locations. Most patients (81%) present at advance stage with stage III-IV head and neck malignancies at the time presentation. In 4 cases, the body mass index (BMI) was over 30, in 3 cases it was between 25 and 30, in 19 cases it was between 18.5 and 25, and in 9 cases it was less than 18.5. Physical status scored as per American Society of Anesthesiologist (ASA); 51.1% patients scored 3, which was the of ASA scores were 3, which was the most common score.

Table No 1: Showing duration of antibiotis and surgical site infection.

Type of Reconstruction	
Primary closure	8 (17%)
Pedicle flap	28 (59.6%)
Free flap	11 (23.4%)
Duration of Post Op antibiotics	
1 day	32 (68%)
>1day	15 (32%)
Surgical site infection	
Yes	18 (38.3%)
No	29 (61.7%)

Co-morbid conditions including diabetes mellitus and/or hypothyroidism were present in 11 patients. Preoperative investigation showed that 6 patients have hypoalbuminemia. Four patients had received radiation therapy, and two patients received chemotherapy as part of their prior therapies. A surgical course of treatment was decided upon after five of them experienced oncological recurrence. About the surgical procedure, in 28 cases pedicled flap used for reconstruction, and 11 cases free flaps, in 8 cases primary closure found possible. Forty patients had neck dissection. Squamous cell carcinoma was the pathological diagnosis in 97% of the cases.

Discussion:

A common postoperative complication following head and neck surgery is SSI. Between 3% and 41% of individuals having head and neck surgery experience SSIs.[1,2] According to our data, SSI occurred in 38% of patients who underwent severe difficult oncological head and neck surgery. SSIs can range in severity from minor, necessitating only local wound care and antibiotics, to severe, necessitating procedures and potentially fatal outcomes.[3] In our investigation, the majority of infective consequences were rated as grade II by Clavien and Dido, necessitating just antibiotic treatment.

Age, nutritional state, and diabetes are the patient characteristics that the CDC considers to be risk factors for SSI.[17] The univariate analysis in this study did not support the earlier reports. Furthermore, there was no correlation between SSI incidence and ASA score. Additionally, our study did not identify BMI or smoking as risk factors. However, SSI occurs more frequently in hypothyroid people. Other studies that have been published in the literature have noted this.[8-20] The incidence of SSI was not correlated with tumor size in terms of the tumor itself. Additionally, it didn't appear that the N status was a predictor of SSI. Kohli et al.6 showed a significant difference between the incidence of SSI and the size of the tumor resection in contrast to our findings, even though this was unaffected by the N status. In our analysis, a higher risk of infection complications was not linked to the type of surgery, the tracheotomy, the type of reconstruction, or the length of the operation. Because Kohli et al.[6] found the reverse in their investigation, our findings differ from those that have been published for the usage of flaps. By including the National Nosocomial Infection Surveillance System, a useful tool for anticipating postoperative infections, Kohli et al.[6] proved the strong relationship between the operating time and the rate of infection with regard to the operating time.

No meaningful correlation between a prior experience of radiation and SSI was discovered by our research. It has been shown that radiotherapy can have negative consequences on many illnesses, especially when radiation dosages are higher than 60 Gy.[2] The irradiated patients in our group did, however, have a greater rate of postoperative infection, though it did not achieve statistical significance. Since only four patients received radiotherapy before to this study, this outcome needs to be evaluated with care. Preoperative radiation does not appear to raise the risk of SSI, though.[2-4] There is evidence from several research that preoperative radiation and the emergence of SSI are positively correlated.[21,22] Extrapolating risk factors and antimicrobial advice, however, is difficult because the majority of published evidence regarding SSI development in patients with head and neck cancer has mixed different surgical procedures with several surgical categories. In our in-

vestigation, the source of the wound infection was multimicrobial. Escherichia coli, Streptococcus viridans, and Enterobacter cloacae were the three most prevalent species. In certain cases, the bacteria detected in other reports were nosocomial infection pathogens such methicillin-resistant Staphylococcus aureus (MRSA), Pseudomonas aeruginosa, Klebsiella pneumonia, or other intestinal bacteria.[5,6] Staphylococcus aureus-related SSI rates were low.[23] According to Fiedler et al.'s research, around 30% of patients undergoing head and neck surgery are preoperatively colonized with Staphylococcus aureus, with MRSA being the minority type. The authors promoted the use of preoperative topical antibiotic decontamination as a result; however, this had no impact on the SSI incidence.

Antibioprophylactic treatment has been demonstrated to be successful in preventing infection in head and neck cancer patients having surgery. Perioperative antibiotics are frequently utilized because they greatly lower the risk of SSI when compared to a placebo.[5-15] The dosage and duration of the prophylactic affect the postoperative SSI rate.23 The best option must offer protection against anaerobes, Gram-positive aerobes, and Gram-negative aerobes. A first-generation cephalosporin like cefazolin is typically the treatment of choice; ampicillin-sulbactam and amoxicillin-clavulanate are other viable options, regardless of whether flap restoration is required.[8-12] One gram of amoxicillin and 200 milligrams of clavulanate were administered intravenously four times a day, beginning 30 to 60 minutes before the incision and continuing throughout the research. Because the three most prevalent species in our investigation were Enterobacter cloacae, Escherichia coli, and Streptococcus viridians, which were susceptible to the recommended antibiotic therapy, our choice proved to be consistent. The difference in SSI rate between short- and long-term prophylaxis was assessed by numerous research. Numerous investigations revealed that there was no statistically significant difference between patients getting prophylaxis for more than 5 days and 1 day postoperatively in terms of the SSI rate.[11,21,23] Similar to this, one study was unable to show that giving prophylaxis to patients for three days instead of one would be advantageous.

Conclusion:

The findings of current study showed that after cervico-maxillofacial surgery, using antibiotics more than 24 hours has no positive impact over surgical site infection.

References:

1. Chiesa-Estomba CM, Calvo-Henriquez C, Gonçalves N, Lechien JR, Sistiaga-Suarez JA, Mayo-Yanez M et al.. Patterns of practice regarding surgical site infection prevention in head & neck surgery: an international survey. Acta Otorrinolaringol Esp (Engl Ed).2022;73 (4):225-34. doi: 10.1016/j.otoeng.2021.06.004. PMID 35908816
2. Tamagawa S, Iyo T, Kono M, Sugita G, Takeda S, Kumashiro N, et al. Impact of the practical guideline on appropriate usage of antimicrobial treatments for surgical site infections in reconstructive surgery of head and neck cancer. J Infect Chemother. 2022;28(3):401-5. doi: 10.1016/j.jiac.2021.11.017, PMID 34887177.
3. Lee DH, Kim SY, Nam SY, Choi SH, Choi JW, Roh JL. Risk factors of surgical site infection in patients undergoing major oncological surgery for head and neck cancer. Oral Oncol. 2011;47(6):528-31. doi: 10.1016/j.oraloncology.2011.04.002, PMID 21543250.
4. Gearing PF, Daly JF, Tang NSJ, Singh K, Ramakrishnan A. Risk factors for surgical site infection in free-flap reconstructive surgery for head and neck cancer: retrospective Australian cohort study. Head Neck. 2021;43 (11):3417-28. doi: 10.1002/hed.26837, PMID 34409671.
5. Vander Poorten V, Uyttebroek S, Robbins KT, Rodrigo JP, de Bree R, Laenen A, et al. Perioperative antibiotics in clean-contaminated head and neck surgery: A systematic review and meta-analysis. Adv Ther. 2020;37(4):1360-80. doi: 10.1007/s12325-020-01269-2, PMID 32141017.
6. Kohli P, Penumadu P, Shukkur N, Sivasanker M, Balasubramanian A, Ganapathy S. Perioperative antimicrobial prophylaxis in clean-contaminated head and neck squamous cell cancer surgeries: is less better? J Cancer Res Ther. 2022;18;Suppl:S170-6. doi: 10.4103/jcrt.JCRT_1654_20. PMID 36510960.
7. Fiedler LS, Herbst M, Pereira H. Clindamycin use in head and neck surgery elevates the rate of infections in tracheostomies. Eur Arch Otorhinolaryngol. 2022;279(7):3581-6. doi: 10.1007/s00405-022-07349-z, PMID 35333962.
8. Mitchell RM, Mendez E, Schmitt NC, Bhrany AD, Futran ND. Antibiotic prophylaxis in patients undergoing head and neck free flap reconstruction. JAMA Otolaryngol Head Neck Surg. 2015;141(12):1096-103. doi: 10.1001/jamaoto.2015.0513, PMID 25905902.
9. Khariwala SS, Le B, Pierce BHG, Vogel RI, Chipman JG. Antibiotic use after free tissue reconstruction of head and neck defects: short course vs. long course. Surg Infect (Larchmt). 2016;17(1):100-5. doi: 10.1089/sur.2015.131, PMID 26501794.
10. Mesolella M, Allosso S, M Di Lullo AM, Ricciardiello F, Motta G. Postoperative infectious complications in head and neck cancer surgery. Ann Ital Chir. 2022;93:637-47. PMID 36617276.
11. Mücke T, Loeffelbein DJ, Kolk A, Wagenpfeil S, Kanatas A, Wolff KD, et al. Comparison of outcome of microvascular bony head and neck reconstructions using the fibular free flap and the iliac crest flap. Br J Oral Maxillofac Surg. 2013;51(6):514-9. doi: 10.1016/j.bjoms.2013.01.007, PMID 23399107.
12. Cohen LE, Finnerty BM, Golas AR, Ketner JJ, Weinstein A, Boyko T, et al. Perioperative antibiotics in the setting of oropharyngeal reconstruction: less is more. Ann Plast Surg. 2016;76(6):663-7. doi: 10.1097/SAP.0000000000000291, PMID 25144417.
13. Wagner JL, Kenney RM, Vazquez JA, Ghanem TA, Davis SL. Surgical prophylaxis with Gram-negative activity for reduction of surgical site infections after microvascular reconstruction for head and neck cancer. Head Neck. 2016;38(10):1449-54. doi: 10.1002/hed.24178, PMID 27458902.
14. Cannon RB, Houlton JJ, Mendez E, Futran ND. Methods to reduce postoperative surgical site infections after head and neck oncology surgery. Lancet Oncol. 2017;18(7):e405-13. doi: 10.1016/S1470-2045(17)30375-3, PMID 28677576.
15. Pool C, Kass J, Spivack J, Nahumi N, Khan M, Babus L, et al. Increased surgical site infection rates following clindamycin use in head and neck free tissue transfer. Otolaryngol Head Neck Surg. 2016;154(2):272-8. doi: 10.1177/0194599815617129, PMID 26573570.
16. Adriaenssens J, Eyssen M, Jonckheer P, Vriesacker K,

Sonnaert M. The Belgian Evidence-Based Practice Program: network governance to improve efficiency and effectiveness of evidence-based practice uptake. Int J Evid Based Healthc. 2019;17;Suppl 1:S68-71. doi: 10.1097/XEB.0000000000000183. PMID 31283587.
17. Balamohan SM, Sawhney R, Lang DM, Cherabuddi K, Varadarajan VV, Bernard SH, et al. Prophylactic antibiotics in head and neck free flap surgery: A novel protocol put to the test. Am J Otolaryngol. 2019;40 (6):102276. doi: 10.1016/j.amjoto.2019.102276, PMID 31447185.
18. Clavien PA, Barkun J, de Oliveira ML, Vauthey JN, Dindo D, Schulick RD, et al. The Clavien-Dindo classification of surgical complications: five-year experience. Ann Surg. 2009;250(2):187-96. doi: 10.1097/SLA.0b013e3181b13ca2, PMID 19638912.
19. Allegranzi B, Zayed B, Bischoff P, Kubilay NZ, de Jonge S, de Vries F, et al. New WHO recommendations on intraoperative and postoperative measures for surgical site infection prevention: an evidence-based global perspective. Lancet Infect Dis. 2016;16 (12):e288-303. doi: 10.1016/S1473-3099(16)30402-9, PMID 27816414.
20. Yang CH, Chew KY, Solomkin JS, Lin PY, Chiang YC, Kuo YR. Surgical site infections among high-risk patients in clean-contaminated head and neck reconstructive surgery: concordance with preoperative oral flora. Ann Plast Surg. 2013;71;Suppl 1:S55-60. doi: 10.1097/SAP.0000000000000046, PMID 24284742.
21. Kreutzer K, Storck K, Weitz J. Current evidence regarding prophylactic antibiotics in head and neck and maxillofacial surgery. BioMed Res Int. 2014;2014:879437. doi: 10.1155/2014/879437, PMID 25110703.
22. Iocca O, Copelli C, Ramieri G, Zocchi J, Savo M, Di Maio P. Antibiotic prophylaxis in head and neck cancer surgery: systematic review and Bayesian network meta-analysis. Head Neck. 2022;44(1):254-61. doi: 10.1002/hed.26908, PMID 34741354.
23. Haidar YM, Tripathi PB, Tjoa T, Walia S, Zhang L, Chen Y, et al. Antibiotic prophylaxis in clean-contaminated head and neck cases with microvascular free flap reconstruction: A systematic review and meta-analysis. Head Neck. 2018;40(2):417-27. doi: 10.1002/hed.24988, PMID 29083525.