Incidence of Surgical Site Infections after Transcervical Thyroidectomy in Patients Given Antibiotics versus those without Antibiotics in a Government Hospital in the Philippines

Arsenio Claro A. Cabungcal, MD,[1]* Jeric L. Arbizo, MD[1]* and Ana Melissa F. Hilvano-Cabungcal, MD[2]

[1]*Department of Otolaryngology, Head and Neck Surgery, College of Medicine and Philippine General Hospital, University of the Philippines Manila*
[2]*Division of Urology, Department of Surgery, College of Medicine and Philippine General Hospital, University of the Philippines Manila*

ABSTRACT

Background and Objectives. Surgical site infection (SSI) makes up the largest single group of postoperative infective complications. For surgeries classified as clean surgeries of the head and neck, such as a thyroidectomy, the routine administration of antimicrobial prophylaxis is not recommended. Despite this, extended usage of antibiotics is common in developing countries. This study evaluated the need for antibiotics in elective transcervical thyroidectomy for the prevention of SSI in a tertiary government hospital in a developing country.

Methods. This is a retrospective cohort study that included patients who have undergone elective transcervical thyroidectomy at the Department of Otolaryngology - Head and Neck Surgery (ORL-HNS) of the University of the Philippines - Philippine General (UP-PGH) Hospital from August 1, 2020 to June 30, 2022. Data collection was conducted through review of both in-patient and out-patient records.

Results. The data of 58 patients were analyzed. The mean (±SD) age was 42.5±14.5 years, with approximately 2:27 male to female ratio. Of the 58 patients, 26 were given postoperative antibiotics while 32 did not receive postoperative antibiotics. None of the 58 were noted to have SSI on the 3rd postoperative day. Only 54 patients completed the 7-day follow-up of the study and their data were further analyzed. One patient had SSI. There was no significant difference between the presence and absence of postoperative antibiotics in relation to SSI (p-value>0.05).

Conclusion. This study shows that in patients undergoing transcervical thyroidectomies, there is no significant difference in the occurrence of SSI among patients who received and did not receive postoperative antibiotics. Therefore, there is no need to administer postoperative antibiotics, as long as a sterile surgical technique is ensured.

Keywords: surgical site infection, prophylaxis, thyroidectomy

* *Dr. Cabungcal and Dr. Arbizo share first authorship for this manuscript.*

eISSN 2094-9278 (Online)
Published: April 15, 2024
https://doi.org/10.47895/amp.vi0.7534

Corresponding author: Arsenio Claro A. Cabungcal, MD
Department of Otolaryngology, Head and Neck Surgery
College of Medicine and Philippine General Hospital
University of the Philippines Manila
Taft Avenue, Ermita, Manila 1000, Philippines
Email: aacabungcal@up.edu.ph
ORCiD: https://orcid.org/0000-0002-0451-9489

INTRODUCTION

Surgical site infection (SSI) is an infection that occurs within 30 days after an operative procedure. It involves only the skin or subcutaneous tissue of the incision, and at least one of the following: 1) purulent drainage, with or without laboratory confirmation, 2) organism(s) isolated from an aseptically obtained culture of fluid or tissue from the superficial incision, 3) at least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness or heat, and the superficial incision is deliberately opened by surgeon, unless the incision is culture-negative, and 4) diagnosis of superficial incisional SSI by the surgeon or attending physician. These infections make up the largest single group of postoperative infective complications of

surgery. It is usually polymicrobial and is treated with appropriate drainage and a multi-antibiotic regimen.[1]

Thyroidectomy is a clean surgical procedure where there is a low risk of wound infection prior to the surgery, there is no break in the sterile technique during the surgery, and the respiratory, alimentary, and genitourinary tracts are not entered.[2,3] For clean surgeries of the head and neck, such as a thyroidectomy, the American Society of Health System Pharmacists (ASHSP), Infectious Disease Society of America (IDSA), Surgical Infection Society (SIS), and Society for Healthcare Epidemiology of America (SHEA) do not recommend the routine administration of antimicrobial prophylaxis in their 2013 practice guidelines.[4] Similarly, the Centers for Disease Control and Prevention (CDC) strongly recommends not to administer additional prophylactic antimicrobial agent doses after the closure of surgical incisions in clean procedures.[5] Despite these recommendations, extended usage of antibiotics is common in developing countries and has been found to be as high as 97.4%.[6] Such overuse and misuse of antimicrobials is the known main driver of antimicrobial resistance (AMR), a recognized threat to global public health. One of the key points of the Global Action Plan on AMR is optimizing the use of antimicrobial medicines in human and animal health. This entails antimicrobial stewardship (AMS) with careful, responsible, and evidence-based use of antimicrobials. Overall, it aims to optimize the use of antimicrobials, save healthcare costs, reduce AMR and healthcare-associated infections, and ultimately improve patient outcomes. In the World Health Organization's (WHO) Antimicrobial Stewardship Programmes in Healthcare Facilities in Low- and Middle-Income Countries (LMIC) Toolkit, one of the recommendations is to monitor the percentage of in-patient surgical procedures with appropriate timing and duration of surgical antibiotic prophylaxis.[7] Thus, adherence to evidence-based guidelines in antibiotic prophylaxis should be enforced.

The Department of Otolaryngology - Head and Neck Surgery (ORL-HNS) of the University of the Philippines - Philippine General Hospital (UP-PGH), a tertiary government hospital, still has no uniform standard regarding the use of antibiotics in patients undergoing thyroidectomy. It has been the usual practice at the Department to give a one-week course of postoperative oral antibiotics to patients undergoing transcervical thyroidectomy to prevent surgical site infection. However, this practice is not congruent with the international guidelines for clean surgeries. In line with this, and to promote rational antibiotic use to prevent AMR, the Department advised surgeons against the use of antibiotics in thyroidectomies in December of 2021.

OBJECTIVES

General Objective

To determine the need for antibiotics in elective transcervical thyroidectomies for the prevention of surgical site infections in a tertiary government hospital in a developing country.

Specific Objectives

1. To determine the demographic, clinical profile and perioperative data of patients who have undergone transcervical thyroidectomies both for those who were given antibiotics and those who were not given antibiotics perioperatively, namely:
   a. age
   b. gender
   c. comorbidities
   d. preoperative WBC
   e. histopathology
   f. type of thyroid operation done
   g. length of operation
   h. presence or absence of penrose drain
2. To determine the incidence rates of SSI among patients who were given antibiotics and among those who did not receive antibiotics

MATERIALS AND METHODS

This is a retrospective cohort study of patients who have undergone elective transcervical thyroidectomy at the Department of ORL-HNS of the UP-PGH from August 1, 2020 to June 30, 2022.

This study was limited to service patients of the department who underwent transcervical thyroidectomy (i.e., total, subtotal, near total, lobectomy with isthmusectomy, lobectomy) for both benign and malignant diseases who were admitted at the charity wards of the PGH. Patients excluded in the study are the following: patients who had thyroid reoperations, those who underwent procedures other than thyroidectomy (e.g., neck dissection, parathyroidectomy, tracheostomy), those who underwent extensive thyroidectomies (e.g., sternotomy for intrathoracic extension), patients with pre-existing infections and/or already taking antibiotics prior to the thyroidectomy, immunocompromised patients, those on steroids, and those with abnormal preoperative white blood cell count (reference value of 4,000-11,000/mL)[8] and elevated preoperative neutrophil-lymphocyte ratio (cutoff value of 2.44).[9] Ethical approval was obtained from the University of the Philippines Manila Review and Ethics Board (UPMREB 2022-0410-01).

Data collection was conducted through review of both in-patient and out-patient records. It is a common practice in the Department to follow-up post-thyroidectomy patients between 7-14 days after the surgery for removal of sutures. No further follow-up was instructed for those who had unremarkable wound healing, no evidence of surgical site infection, no signs of hypocalcemia, and no hoarseness, bleeding, or other possible complications related to the surgery. Patients who had evidence of surgical site infections may have had prolonged follow-up until the resolution of

infection. In general, patients were consistently seen on third and seventh postoperative days.

The primary outcome parameter of the analysis was the occurrence of SSI. This was identified through a review of patient records, identifying patients with the above-mentioned characteristics as stated by the NHSN definition of SSI. Other data gathered included age, sex, preoperative white blood cell count, comorbidities, operation done, length of operation time, histological diagnosis, presence of drain, antibiotics given with dosage and duration, postoperative complications (related to the operation), and culture sensitivity result if with SSI.

Descriptive statistics was used to summarize the demographic and clinical profile of the patients included in the study. Frequency and proportion were used for categorical variables, while mean and standard deviation were used for scalar variables. Two-sample t-test, chi-square test, and Fisher's exact test were used to analyze the significant differences among the demographic and clinical data distributed among the patients given antibiotics, and patients not given antibiotics. Fisher's exact test was used to analyze the differences in the demographic and clinical profile of the patients relative to the presence and absence of postoperative infection. The level of significance was set at 0.05 threshold for significance.

Missing data were neither replaced nor estimated during the analysis. All data analysis was performed using STATA 12.

RESULTS

Demographic and clinical profile of the patients

Total of 71 patients underwent thyroidectomy and were initially included. However, 11 patients were excluded since they underwent procedures other than thyroidectomy on the same sitting. Additionally, 2 patients were excluded due to elevated WBC, resulting in a final count of 58 patients included in this study (Figure 1).

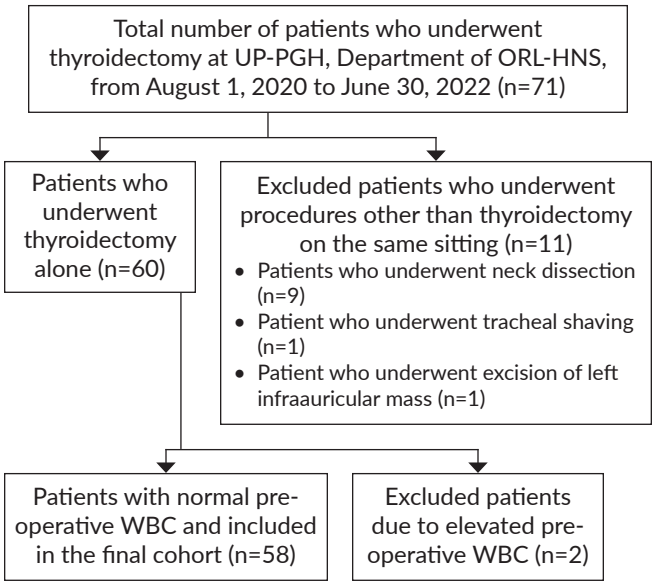

Figure 1. Flowchart representing inclusion and exclusion of patients arriving at the final cohort.

Twenty-six patients (44.8%) were given postoperative antibiotics and 32 patients (55.1%) were not given post-operative antibiotics. The mean (±SD) age was 42.5 ± 14.5 years, with approximately 2:27 male to female ratio. Most patients had no comorbidities (58.6%), and the majority underwent total thyroidectomy (84.5%). Average length of operation was at 231.5 minutes, and a Penrose drain was used on the majority (94.8%). Thirty-five patients (60.3%) had a final histopathologic diagnosis of a malignant thyroid tumor. Table 1 shows the demographic and clinical profile of patients included in this study, grouped among those given antibiotics

Table 1. Demographic and Clinical Profile of Patients Grouped among those Given Antibiotics and those not Given Antibiotics

	Mean ± SD; Frequency (%)		
	Antibiotics given (n=26)	Antibiotics not given (n=32)	*p*-value
Age	44.77 ± 14.69	40.69 ± 14.37	0.292[1]
Sex			0.316[3]
Male	3 (75.00)	1 (25.00)	
Female	23 (42.59)	31 (57.41)	
Comorbidities			0.684[2]
Yes	10 (41.67)	14 (58.33)	
Hypertension	6	8	
Diabetes mellitus	3	2	
Pulmonary tuberculosis	2	1	
Dyslipidemia	1	1	
Obesity	1	1	
Chronic Hep B infection	0	2	
Cholelithiasis	1	1	
Bronchial asthma	1	1	
Dyspepsia	0	1	
Laryngopharyngeal reflux	0	1	
Myoma	1	0	
None	16 (47.06)	18 (52.94)	
Pre-op diagnosis			0.280[2]
Benign	17 (40.48)	25 (59.52)	
Malignant	9 (56.25)	7 (43.75)	
Operation done			
Total	23 (46.94)	26 (53.06)	
Partial	2 (28.57)	5 (71.43)	0.720[3]
Completion	1 (50.00)	1 (50.00)	
Drain			
Penrose	23 (41.82)	32 (58.18)	0.084[3]
JP drain	3 (100)	0 (0)	
Histopathologic diagnosis			
Benign	8 (34.78)	15 (65.22)	0.212[2]
Malignant	18 (51.43)	17 (48.57)	
***Length of OR** (min)*	225.27 ± 97.97	236.53 ± 94.45	0.659[1]

Statistical tests used: 1: two-sample t-test; 2: chi-square test; 3: Fisher's exact test

and those not given antibiotics. All of the demographic and clinical data exhibited no significant difference among the two groups.

Demographic and clinical factors associated with post-operative infection

None of the patients had surgical site infection on the third postoperative day; hence, no analysis was done to show association of demographic and clinical factors with infection three days post operation.

Differences in the demographic and clinical factors relative to the presence or absence of postoperative infection seven days after surgery were investigated. Comparison of characteristics of the group that developed SSI and without SSI on the 7th post-operative day was done using Fisher's exact test. Four (4) of the 58 patients failed to follow-up on post-operative day 7 and were therefore not included in the further analysis of the data. The exclusion of these four patients on the statistical analysis did not affect the result since no analysis was done on the 3rd post-operative day. Because of this, comparison of statistical outcomes between the 3rd and 7th post-operative day is not possible.

Only one patient had an SSI, which presented as purulent discharge from the surgical incision. No significant breach of sterility was noted during the operative procedure, and the surgical wound was cleaned daily as prevention for development of SSI. No culture studies were done for the discharge. The patient did not receive systemic postoperative antibiotics upon diagnosis of SSI and was advised to continue routine daily wound care. There was a note of resolution of SSI on reassessment 14 days post operation. There was no significant difference found between the presence and absence of postoperative antibiotics in relation to SSI (p-value>0.05; Table 2). All other demographic and clinical factors were also not statistically significant.

Table 2. Demographic and Clinical Factors Associated with Postoperative Infection 7 days after Surgery

	Mean ± SD; Frequency (%)		*p*-value*
	With postoperative infection (n=1)	Without postoperative infection (n=53)	
Sex			
Male	0 (0.0)	4 (100)	1.000
Female	1 (2.0)	49 (98.0)	
Comorbidities			
Yes	0 (0.0)	21 (100)	1.000
None	1 (3.0)	32 (97.0)	
Pre-op diagnosis			
Benign	1 (2.6)	38 (97.4)	1.000
Malignant	0 (0.0)	15 (100)	
Operation done			
Total	1 (2.2)	44 (97.8)	1.000
Partial	0 (0.0)	7 (100)	
Completion	0 (0.0)	2 (100)	
Antibiotics given			
Yes	0 (0.0)	23 (100)	1.000
No	1 (3.2)	30 (96.8)	
Drain			
Penrose	1 (2.0)	50 (98.0)	1.000
JP drain	0 (0.0)	3 (100)	
Histopathologic diagnosis			
Benign	0 (0.0)	21 (100)	1.000
Malignant	1 (3.0)	32 (97.0)	

**Statistical tests used: Fisher's exact test*

DISCUSSION

Surgical site infection (SSI) is an infection that occurs within 30 days after surgery in the part of the body where the procedure took place. It is a serious complication that can involve tissues under the skin, organs, or implanted material. SSIs occur in 0.36% of patients postoperatively[10] and is one of the most common and most costly healthcare-associated infections.[11]

Antibiotics are commonly used in surgical departments, and a common indication is surgical prophylaxis for the prevention of SSI. Clean operative wounds are elective, non-emergency, non-traumatic, primarily closed, have no acute inflammation, and with no entry to respiratory, gastrointestinal, biliary, and genitourinary tracts. They carry a low risk of SSI of about 2-5%.[2,12] Multiple studies have shown that antibiotic treatment has no added benefit in preventing SSIs. A multi-center randomized, double-blind controlled trial concluded that prophylactic antibiotic treatment has no added benefit in the prevention of SSI in thyroidectomy.[2] In another prospective randomized controlled clinical trial, the rate of SSI in patients given antibiotics compared to those not given antibiotics were 0.09% and 0.28%, respectively.[13] In the local setting, Tubera et al. assessed the need for antibiotic prophylaxis in patients undergoing clean, elective surgical procedures, specifically thyroidectomy, herniorrhaphy, and vein stripping. Based on their study, antibiotic prophylaxis may be omitted in these surgical procedures as long as proper asepsis and surgical techniques pertaining to sterility are observed.[14]

The use of postoperative antibiotics is not the standard of care for patients undergoing thyroidectomies. Despite this, extended usage of antibiotics is common in developing countries and was found to be as high as 97.4% in a study by Saleem et al. in 2019.[6] Iftikhar et al. conducted a randomized controlled trial in 2019, comparing patients given Amoxicillin + Clavulanic Acid as postoperative antibiotics to those without antimicrobial prophylaxis. No significant difference was found in the incidence of SSI between the two populations. According to the same study, the difference in practices in developing countries is often attributed to substandard sterilization techniques, non-adherence to infection control guidelines, and less importance given to aseptic techniques.[15] It is possibly due to these factors that in the Philippines, postoperative antibiotics like Amoxicillin + Clavulanic Acid, Cefuroxime, and other oral antibiotics are

frequently used after thyroid surgeries to prevent possible SSIs, despite no proven benefit for their use in clean surgeries. Notably in a local study conducted at the Philippine General Hospital (PGH), published in 2021, that surveyed the use of antibiotics before and after the implementation and dissemination of the PGH surgical antibiotic use guideline, for thyroid surgeries, it was shown that there was no change in compliance to non-use of antibiotics, 0% for both pre and post implementation surveys.[16]

Based on the criteria for defining SSIs from the National Healthcare Safety Network Guidelines for Surgical Site Infection Events[1], the rate of SSI for this study is 1.9% (one patient), noted on the seventh postoperative day. This patient had a purulent discharge from the surgical site, which resolved after treatment with topical silver sulfadiazine. They were not given any oral antibiotics, and the infection resolved by the 14th day post operation. The rate of SSI in this study is comparable with those in published literature, which ranges between 0-2%.[13–18]

In this study, no statistically significant difference was found in the rates of SSI between patients given postoperative antibiotics and those that were not. This is consistent with the increasing clinical evidence suggesting that antibiotics are not necessary to prevent postoperative wound infection.[6,12,15,17,19] As such, this study adds support to the evidence behind the recommendations of the American Society of Health System Pharmacists (ASHSP), the Infectious Disease Society of America (IDSA), the Surgical Infection Society (SIS), and the Society for Healthcare Epidemiology of America (SHEA) in their 2013 practice guidelines, which do not recommend the routine administration of antimicrobial prophylaxis.[4] Moreover, this study also aligns with the CDC's strong recommendation to not administer additional prophylactic antimicrobial agent doses after closure of surgical incision in clean procedures.[5] However, great attention should be given to improve sterile surgical technique especially during clean surgical procedures.

The findings in this study is of particular importance since it was conducted in a tertiary government hospital in a developing country, where the prevailing practice is oftentimes non-adherence to international guidelines in the use of antimicrobials in clean surgeries due to substandard sterilization techniques, non-adherence to infection control guidelines, and less importance given to aseptic techniques.[15] Based on this study, healthcare practitioners in low- to middle-income countries can and should still adhere to evidence-based guidelines, particularly on antimicrobial use, and implement programs that strongly support antimicrobial stewardship.

The study is limited by its small sample size. It is recommended that more local studies be done to form the basis for national treatment guidelines. These will give way to one of the core elements in AMS programs in LMIC, which is for governments to endorse up-to-date clinical guidelines that include AMS principles.[7]

CONCLUSION

This study shows that in patients undergoing transcervical thyroidectomies, there is no significant difference in the occurrence of SSI among patients who received and did not receive postoperative antibiotics. Therefore, there is no need to administer postoperative antibiotics, as long as a sterile surgical technique is ensured.

Statement of Authorship

All authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

None.

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