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Review of 1078 tonsillectomy: Retrospective cohort study

1078 tonsillektominin gözden geçirilmesi: Retrospektif kohort çalışma

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Abstract

Aim: Tonsillectomy is one of the most frequently performed otolaryngologic surgical procedures. We represented our 5 years of experience in tonsillectomy and intended to compare our results with the current literature. We aimed to discuss our tonsillectomy outcomes, mainly giving emphasis on our post tonsillectomy infections and their possible relation with tonsillar pillar suturation, local anesthesia infiltration, comorbidities and presence of Actinomyces colonies in tonsil specimens.

Methods: This study was carried out retrospectively, in 1078 patients who underwent tonsillectomy operation in between December 2011 and December 2016. The demographic data of the patients, indications for tonsillectomy, suturation if applied, local anesthesia infiltration and its timing, histopathologic findings, co-morbid diseases, postoperative complications and re-hospitalizations were recorded. The association of suturation, infiltration of local anesthesia and it's timing (pre-incisional, post-dissectional), the histopathologic presentation of Actinomyces bacteria in tonsillar specimens and the presence of accompanying systemic disorders with post- tonsillectomy infections were statistically analyzed.

Results: Postoperative infection was seen in 5 (0.5%) patients. Among the suturation group, only 1 (0.5%) patient had infection (p=1). In the infection group 4 (80%) patients had post dissectional local anesthesia infiltration (p=0.574). None of the patients treated with preincisional local anesthesia infiltration, had postoperative infection (p=0.574). In 3 (0.3%) patients, Actinomyces was determined. None of these cases had post-tonsillectomy infections. 142 (13.2%) patients had various co-morbidities associated. Among them, 1 (0.7%) patient had postoperative infection (p=0.507).

Conclusion: According to our results, there is no statistically significant association between suturation of tonsillar pillars, local anesthesia infiltration, comorbidities and presence of Actinomyces and post tonsillectomy infections.

Keywords: Tonsillectomy, Tonsillectomy hemorrhage, Postoperative infection, Suturation, Local anesthesia, Actinomyces

Öz

Amaç: Tonsillektomi, en sık uygulanan otorinolarinolojik cerrahilerden biridir. Bu çalışmada, 5 yıllık tonsillektomi deneyimlerimiz sunulmuştur. Klinik sonuçlarımızın, güncel literatür ile karşılaştırılması; özellikle tonsillektomi sonrası gelişen enfeksiyonlar ile bu enfeksiyonların, tonsil pilika sütürasyonu, lokal anestezi uygulaması, komorbidite ve tonsil spesimenlerinde Aktinomiçes varlığı ile olan ilişkisi üzerinde durulması amaçlanmıştır.

Yöntemler: Aralık 2011 ve Aralık 2016 yılları arasında opere olmuş 1078 hasta retrospektif olarak değerlendirilmiştir. Hastaların demografik bilgileri, cerrahi endikasyonlar, tonsillar pilika sütürasyonu yapılan hastalar, lokal anestezi uygulandı ise zamanlaması, tonsil dokusunun histopatolojik değerlendirme sonuçları, eşlik eden sistemik patolojiler, post operatif komplikasyonlar ve rehospitalizasyon gereken durumlar belirlenmiştir. Tonsillektomi enfeksiyonları ile lokal anestezi uygulanması, sütürasyon, komorbid hastalıklar ve Aktinomiçes varlığı arasında ilişki araştırılmış, sonuçlar istatistiksel olarak değerlendirilmiştir.

Bulgular: Postoperatif enfeksiyon 5 (%0,5) hastada görülmüştür. Sütürasyon uygulanan 1 (%0,5) hastada enfeksiyon saptanmıştır (p=1). Enfeksiyon görülen 4 (%80) hastada disseksiyon sonrası lokal anestezi uygulanmıştır (p=0,574). İnsizyon öncesi lokal anestezi uygulanan hastaların hiçbirinde postoperatif enfeksiyon gelişmemiştir (p=0,574). Üç (%0,3) hastada Aktinomiçes saptanmıştır. Bu hastalarda tonsillektomi sonrası enfeksiyon gelişmemiştir. 142 (%13,2) hastada eşlik eden komorbiditeler mevcuttur. Bu grupta 1 (%0,7) hastada postoperatif enfeksiyon gelişmiştir (p=0,507). **Sonuç:** Bulgularımıza göre, tonsillektomi sonrası enfeksiyonlar ile, tonsiller pilikalarnın sütürasyonu, lokal anestezi uygulanması, komorbidite ve Aktinomiçes varlığı arasında istatistiksel olarak anlamlı bir ilişki tespit edilmemiştir.

Anahtar kelimeler: Tonsillektomi, Tonsillektomi kanaması, Postoperatif enfeksiyon, Sütürasyon, Lokal anestezi, Aktinomiçes

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Introduction

Tonsillectomy, with or without adenoidectomy is one of the most commonly performed surgical procedures, both in pediatric and adult patients. Cornelius Celsus performed the first dissection nearly 2000 years ago. Only in United States more than 530 000 procedures in childhood were reported in 2006 [1]. The most common indications for tonsillectomy are recurrent/chronical tonsil infections and sleep disordered breathing (SDB) [1,2].

Though it has been commonly performed for many years, complications are still encountered. The elective feature of the procedure and the surgical area in question, forces many scientists to search novel techniques, medications and devices to avoid the complications [3-5]. Besides giving the results of our 5 years' experience in tonsillectomy, we also aimed to investigate in detail, the post tonsillectomy infections (poorly mentioned in the literature so far) in our cohort and outline their relation with major factors, such as suturation of tonsillar pillars, local anesthesia infiltration, presence of Actinomyces in tonsil specimens and systemic co-morbidities.

Materials and methods

This research was designed as a retrospective cohort study. It was carried out in 1086 patients, who underwent tonsillectomy operation in our hospital between December 2011 and December 2016. This study was approved by the Institutional Review Board (Project no: KA17/117). The demographic data of the patients, indications for tonsillectomy, suturation if applied, local anesthesia infiltration and its timing, histopathologic findings, co-morbid diseases, postoperative complications and re-hospitalizations were recorded.

Patients with insufficient medical records, presence of malignancies in any site of the body, all the surgical techniques except conventional cold knife, patients over 70 years and hemorrhage in other surgical sites were excluded from the study. As a result 1078 patients were enrolled.

The association of suturation, infiltration of local anesthesia and it's timing (pre-incisional, post-dissectional), the histopathologic presentation of Actinomyces bacteria in tonsillar specimens and the presence of accompanying systemic disorders with post- tonsillectomy infections were statistically analyzed.

Statistical analysis

Statistical evaluation was performed with SPSS 22.0 (IBM Corporation, Armonk, New York, United States.) The relevance of the data's normal distribution was analyzed with Shapiro-Wilk test. The variance homogeneity was analyzed with Levene's test. The comparison of independent two groups according to quantitative data was achieved by Independent-Sample T test in accordance with Bootstrap results. Categorical variables were compared with Pearson Chi-Square and Fisher Exact tests using Monte Carlo Simulation technique. Quantitative variables were shown with \pm standard deviation and median range (maximum-minimum). Categorical variables were shown as n (%). Variables were analyzed with 95% accuracy and p values less than 0.05 were considered as statistically significant.

Results

Among the patients, 628 (58.3%) were male, 450 (41.7%) were female. 925 (85.8%) patients were <18 years, 153 (14.2%) were >18 years (Table 1, 2). The primary indication for surgery was chronic/recurrent tonsillitis in 683 (53.6%), obstruction of the upper airway in 394 (36.5%) and spontaneous tonsillar hemorrhage in one (0.1%) patient. 235 (21.8%) cases undergone solely tonsillectomy, 599 (55.6%) patients had tonsillectomy and adenoidectomy (TA), 227 (21.1%) patients had tonsillectomy, adenoidectomy and ventilation tube application (TAT), 17 (1.6%) patients had tonsillectomy and ventilation tube application (TT).

Table 1: Age and sex distribution in the study group

Age	Mean \pm SD	Max	Min	p	<18 n (%)	18 \leq n (%)	p
Female	10.09 \pm 10.57	59.0	2.0	0.156	380 (41.1)	70 (45.8)	0.289
Male	9.20 \pm 9.74	70.0	2.0		545 (58.9)	83 (54.2)	
Total	9.57 \pm 10.10	70.0	2.0		925 (100.0)	153 (100.0)	

Independent T test, Pearson Chi-Square Test, SD: Standard Deviation

Table 2: Demographic data of the participants

	n	%
Sex		
Female	450	41.7%
Male	628	58.3%
Age		
<18	925	85.8%
18 \leq	153	14.2%
Indication for surgery		
Chronic/recurrent infection	683	63.4%
Sleep disordered breathing	394	36.5%
Tonsillar hemorrhage	1	0.1%
Hemorrhage		
None	1054	97.8%
Present	24	2.2%
Infection		
None	1073	99.5%
Present	5	.5%
Suturation		
None	874	81.1%
Present	204	18.9%
Local anesthesia infiltration		
None	313	29.1%
Preincisional	141	13.1%
Post dissectional	623	57.8%
Co-morbidity		
None	930	86.3%
Present	148	13.7%
Surgical procedure		
Tonsillectomy	235	21.8%
Tonsillectomy + Adenoidectomy	599	55.6%
Tonsillectomy + Adenoidectomy + V Tube application	227	21.1%
Tonsillectomy +V Tube application	17	1.6%
Mean \pm SD.		Median (Max.-Min.)
Day of onset of hemorrhage	4.9 \pm 2.99	6 (10-0)

SD: Standard Deviation

Hemorrhage was observed in 24 (2.2%) patients. Twenty two (91.6%) of them had secondary hemorrhage. Five (20.8%) patients underwent secondary surgery due to hemorrhage. Postoperative infection was seen in 5 (0.5%) patients. Pneumonia in one, acute lymphadenitis in one, acute bronchitis in one, Varicella Zoster infection in one, and non-specific upper respiratory system infection (URSI) in one patient was noted.

Re-hospitalization due to complications was recorded in 23 (2.1%) patients. Twenty patients (86.9%) were re-hospitalized due to hemorrhage. Among the patients with post tonsillectomy infections, one patient (4.34%) with acute lymphadenitis was re-hospitalized for 6 days. One patient (4.34%) was re-hospitalized due to dehydration, and another patient (4.34%) due to pain and poor oral uptake.

In 874 (81.1%) patients, tonsillar pillar suturation was not performed, while in 204 (18.9%) patients suturation was done. Among them, 199 (97.5%) patients did not have postoperative hemorrhage (p=0.793) (Table 3). Only one (0.5%) patient had infection (p=1) (Table 4).

Table 3: The hemorrhage rates compared as regards to suturation and local anesthesia infiltration

	Hemorrhage						P
	Absent		Present				
	n	Row n %	Column n %	n	Row n %	Column n %	
Suturation							
Absent	855	97.8%	81.1%	19	2.2%	79.2%	0.793
Present	199	97.5%	18.9%	5	2.5%	20.8%	
Local anesthesia							
None	311	99.4%	29.5%	2	0.6%	8.7%	0.075
Preincisional	138	97.9%	13.1%	3	2.1%	13.0%	
Post dissectional	605	97.1%	57.4%	18	2.9%	78.3%	

Pearson Chi-Square Test, Fisher Exact Test

To 313 (29.1%) patients, local anesthesia was not applied. Of the patients having local anesthesia infiltration, 141 (13.1%) had preincisional, 623 (%57.8) had post dissectional infiltration. Among the infection group 4 (80%) patients had post dissectional local anesthesia infiltration (p=0.574). One patient had pneumonia, one patient had acute lymphadenitis, one patient had acute bronchitis and one patient had non-specific URSI. None of the patients treated with preincisional local anesthesia infiltration, had postoperative infection (p=0.574) (Table 3). In non-infiltration group, only one (0.3%) patient had postoperative infection (Table 4).

Table 4: Infection rates and their relation with local anesthesia and suturation

	Infection						P
	Absent		Present				
	n	Row %	Column N %	n	Row N %	Column N %	
Local anesthesia							
None	312	99.7%	29.1%	1	0.3%	20.0%	0.574
Preincisional	141	100.0%	13.2%	0	0.0%	0.0%	
Post dissectional	619	99.4%	57.7%	4	0.6%	80.0%	
Suturation							
Absent	870	99.5%	81.1%	4	0.5%	80.0%	1
Present	203	99.5%	18.9%	1	0.5%	20.0%	

Pearson Chi-Square Test, Fisher Exact Test

According to the histopathological evaluations, 1068 (99.3%) patients had chronic inflammation of the tonsil specimens. In three (0.3%) patients, Actinomyces was histopathologically determined. Two (0.2%) had chronic active inflammation characterized by erosion and cyrptitis, one (0.1%) had granulomatous inflammation, one (0.1%) had non-caseating granulomatous inflammation and one (0.1%) of them had foreign body reaction of tonsil specimens.

Cases with positive Actinomyces, did not have post tonsillectomy infections, however results were statistically insignificant. Of the study group, 142 (13.2%) patients had various co-morbidities. The most commonly encountered pathologies were asthma and hearth diseases (congenital and acquired hearth diseases) (Table 5). Among the cases with co-morbidities, postoperative infection was seen in 1 (0.7%) patient (p=0.507). He was a four years old boy with asthma who had acute non-specific URSI and required inpatient treatment (Table 6).

Four of the patients with post tonsillectomy infections had only 1 independent variable (they were treated only by local anesthesia, or suturation, and they don't have co-morbidities).

Only one patient, a 4 years old male child, had two variables, including local anesthesia infiltration and asthma.

Table 5: The incidence of systemic co-morbidities

Systemic Disease	n	%	Systemic Disease	n	%
Absent	930	86.8%	Epilepsy, asthma	1	0.1%
Asthma	22	2.1%	Factor 7 deficiency, epilepsy	1	0.1%
Epilepsy	9	0.8%	Factor 7 & 12 deficiency	1	0.1%
Down Syndrome	7	0.7%	FMF carrier	1	0.1%
PFAPA	7	0.7%	G6PD deficiency	1	0.1%
Hypothyroidism	5	0.5%	Goldenhar Syndrome	1	0.1%
VSD	5	0.5%	Hodgkin Lymphoma	1	0.1%
Hypertension	4	0.4%	Hepatitis B infection	1	0.1%
Operated VSD	4	0.4%	Hepatitis C infection	1	0.1%
ASD	3	0.3%	Hypercholesterolemia	1	0.1%
Liver Transplantation	3	0.3%	Hyperthyroidism	1	0.1%
Autism	3	0.3%	Hypertrophic Cardiomyopathy	1	0.1%
Diabetes Mellitus	2	0.2%	Idiopathic thrombocytopenic purpura (ITP)	1	0.1%
Factor 5 & 8 deficiency	2	0.2%	Cardiac failure	1	0.1%
Tetralogy of Fallot	2	0.2%	Congenital hypothyroidism	1	0.1%
FMF	2	0.2%	Men 1 Syndrome	1	0.1%
Renal Transplantation	2	0.2%	Mental Retardation	1	0.1%
Cerebral Palsy (CP)	2	0.2%	Mucopolysaccharidosis	1	0.1%
ADEM	1	0.1%	Mitral valve prolapses (MVP)	1	0.1%
Aortic stenosis	1	0.1%	MVP, Mitral valve insufficiency (MVI)	1	0.1%
Acute rheumatoid fever (ARF)	1	0.1%	MVI	1	0.1%
ARF, MVI, MVP	1	0.1%	Myocarditis (twice)	1	0.1%
ARF.MVI	1	0.1%	Nephrectomy, Pacemaker application, Hypertension	1	0.1%
Transposition of great arteries (TGA)	1	0.1%	Nephrotic syndrome	1	0.1%
ASD, Pulmonary hypertension	1	0.1%	Obesity	1	0.1%
ASD,VSD	2	0.2%	Operated chronic otitis media (tympanoplasty)	1	0.1%
Asthma, Graves Syndrome	1	0.1%	Autism, epilepsy	1	0.1%
Asthma, Hypertension	1	0.1%	Ovarian Carcinoma, Hypothyroidism	1	0.1%
Asthma, Renal Pelvic obstruction (RPO)	1	0.1%	Patent foramen ovale (PFO)	1	0.1%
Asthma, epilepsy	1	0.1%	Allergy	1	0.1%
Atrial valve insufficiency (AVI)	1	0.1%	Situs in versus	1	0.1%
CP, epilepsy	1	0.1%	Systemic Lupus Erythematosus (SLE)	1	0.1%
Depression	1	0.1%	Thalassemia carrier	1	0.1%
Di George Syndrome	1	0.1%	TGA, Mitral - tricuspid valve insufficiency	1	0.1%
Down Syndrome, AVSD	2	0.2%	TGA, AVSD	1	0.1%
Down Syndrome, Hypothyroidism	1	0.1%	Tourette Syndrome	1	0.1%
Cleft lip-palate repair	1	0.1%	Pulmonary stenosis	1	0.1%

Table 6: The statistical analysis of the relation between co-morbidity and postoperative infection

	Systemic Diseases						p
	Absent		Present				
	n	Row N %	Column N %	n	Row N %	Column N %	
Infection							
None	932	86.9%	99.6%	141	13.1%	99.3%	0.507
Present	4	80%	0.4%	1	20%	0.7%	

Fisher Exact Test

Discussion

There was a male predominance in our study group which is consistent with the literature [6]. Similarly, the most common indications for tonsillectomy were chronic recurrent infections and upper airway obstruction causing SDB [2]. Seshamani and colleagues [3] observed 3.56% and 6.17% of hemorrhage rates within 7 and 14 days respectively. However in pediatric cases it ranges between 0.1% and 3.3%. Hemorrhage rate in this study was 2.2%, lower than Seshamani's reports.

Tonsillectomy is implemented under general anesthesia using endotracheal intubation. It is initiated with a mucosal incision overlying anterior tonsillar pillar and blunt dissection is hold along the tonsillar fossae in the peri-tonsillar plane, excising the tonsils with their capsules. Hemostasis is achieved by pressure packing, suture ligations, electrocautery devices and suturation of pillars. Consequently -if suturation of the pillars is

not performed-, an open wound is produced which exposes the tonsillar fossae to the oropharyngeal area. Following the injury, the tissue robustness and integrity should be constituted promptly in order to re-establish homeostatic mechanisms, prevent infection and minimize fluid loss [4]. Acute wound healing is composed of 4 phases known as hemostasis, inflammation, cellular proliferation and remodeling [4-5]. Following the surgery open tonsillar fossae is quickly covered with inflammatory mediators which initiate the proliferative phase 3-4 days after wound injury, leading to extracellular matrix (ECM) and granulation tissue formation. ECM, which is a scaffold for cellular adhesions and, migration is constituted by fibroblastic proliferation. Angiogenesis is crucial for reconstructing the new blood vessels to supply oxygen, blood constituents and nutrients to restore normoxia and promote fibroplasia [4]. After the formation, ECM undergoes a remodeling process and reaches a stable state 21 days after surgery. Any intervening factor disrupting this process may cause improper wound healing and infection.

Tonsillectomy is performed in a surgical field which is colonized by both saprophytic and pathogenic bacteria; hence it is associated with a risk of both local and systemic complications [5]. Local complications (1% of postoperative morbidity) are commonly related to surgical wound infections, whilst systemic complications which correspond to 0.2% of postoperative morbidity are associated with pneumonia, meningitis, sepsis etc. Precisely, our postoperative infection rate was 0.5%, and, in all cases systemic infections (pneumonia, bronchitis, URSI, Varicella Zoster infection and lymphadenitis) were observed.

The most commonly performed technique in our clinic is 'gold standard' cold knife tonsillectomy. Electrocautery is commonly preferred for hemostasis if necessary. According to Sinha et al. [6], steel scalpel has few disadvantages; 1) lack of hemostasis, undesired blood loss, 2) indistinct tissue planes, 3) increased operative time, 4) use of foreign material (ligature) in the wound causing infection risk, 5) possibility of accidental injury to the operative personnel, leading to intraoperative transmission of blood-borne diseases, 6) potential for tumor metastasis via lymphatic channels. Thus novel techniques have been investigated since the beginning of 20th century. However these techniques were analyzed especially for postoperative hemorrhage and pain. Infections are still a matter of debate. Additionally, electrocautery is also commonly associated with thermal tissue injury causing improper healing [6-10].

If suturation is preferred, the posterior tonsillar pillar is laid over the tonsillar fossa and clinched to the anterior tonsillar mucosa with 4-5/0 absorbable sutures. Genç et al. [11] reported in their randomized single blinded study, that the edema in the suturation side was significantly higher, but they found no correlation with suturation and deteriorated wound healing or development of infection. However they found a significant pain control after 3 days of the surgery. To reduce the risk of surgical site infections, small rather than large, suture bites are recommended. It is also suggested that the use of sutures with antimicrobial coating reduces the incidence of surgical site infections [12]. We, similarly, found no significant relation between suturation and post tonsillectomy infections in this current study.

Perioperative local anesthesia is a relatively new attempt to avoid postoperative pain and hemorrhage. In our clinic many surgeons prefer a preincisional local anesthesia infiltration, however only one senior surgeon applies a post dissectional infiltration, in order to avoid the masking effect of the vasoconstricting agent on the potential hemorrhagic loci. The local anesthetic agent of choice was a mixture of 2cc Jetocaine® (Adeka, Istanbul, Turkey) and 2cc Marcaine® (AstraZeneca, Istanbul, Turkey) buffered in a 4 cc physiologic saline for the surgeon performing post-dissectional infiltration; while 2cc Jetocaine® buffered in 2 cc physiologic saline was preferred by the rest of the surgeons in the clinic, who were performing pre-incisional infiltrations. Local anesthesia was introduced submucosally into upper, middle and lower parts of the anterior pillars, and into the middle and inferior parts of the posterior tonsillar pillars. Jetocaine® includes lidocaine and 1:100.000 epinephrine, while Marcaine® includes bupivacaine as the local anesthetic agent. Both agents are commonly preferred [13-15]. However a study by Ozkırıs et al. [16] suggested that there was no significant difference in postoperative hemorrhage rates of bupivacaine and lidocaine, but bupivacaine had significantly higher postoperative analgesia scores.

Numerous studies have been conducted so far, regarding the pain control effect of local anesthesia in tonsillectomy. Naja et al. reported significantly increased rates of pain control, oral uptake, jaw opening, surgeon and parent satisfaction following preincisional local anesthesia infiltration, compared to the controls [13].

Grainger J et al. [14] outlined the use of local anesthesia in post-tonsillectomy pain control. They also suggested that the use of topical local anesthetics have similar level of analgesia, and provides a safer method.

Adverse effects of local anesthesia in post tonsillectomy period was previously outlined in the literature, that, it can be associated with Horner's syndrome, facial nerve paralysis, atlanto-axial subluxation or osteomyelitis [14,17,18].

Fradis et al. [19] reported a case with deep cervical abscess following the infiltration of the tonsillar bed with bupivacaine in 1998. They suggested that the bupivacaine infiltration contributed to the penetration of bacteria in the tonsillar fossae through the deeper neck planes, leading to deep cervical abscess. According to our results, in 4 of the 5 patients with post tonsillectomy infections, post- dissectional local anesthesia infiltrations were performed.

Allareddy and colleagues [20] studied 141.599 hospitalized tonsillectomy patients and reported that comorbidity was an important independent predictor of complications in their cohort. There are several factors, known to increase surgical site infections (SSI) are, obesity, smoking, diabetes, chronic obstructive pulmonary disease (COPD) and immunodeficiency [12,21].

Thyroid hormone deficiency cause, derangements in cardiovascular, pulmonary, renal and central nervous system functions, and alters drug metabolism and predispose to surgical complications. Ekmektzoglú et al. [22] concluded in their report that both Diabetes Mellitus and hypothyroidism have negative impact on wound healing.

In this current study, the most commonly seen pathologies were asthma, congenital or acquired heart diseases, epilepsy and Down syndrome. However, we observed post-tonsillectomy infection in only one patient with co-morbidities.

Actinomyces are slow growing, gram positive non-acid fast, anaerobic, filamentous commensal bacteria. It has been histologically observed in tonsillar specimens since 1896. There is a great variability in the literature regarding the rates of Actinomyces detected in tonsillar tissues. The occurrence rate differs between 1.3% and 37% [23]. It seems to be related to the features of the study groups and differences in histopathological evaluation. This bacterium is commonly associated with tonsillar hypertrophy, and it is believed to be a saprophyte of the normal tonsil. They became invasive when they gain access to the subcutaneous tissue, through a mucosal lesion [24]. We found no correlation between postoperative infections and the presence of Actinomyces in tonsillar tissue. Results were insignificant due to very low prevalence of this bacterium in this cohort.

The limitations of this study were primarily due to its retrospective nature. It was observed that the infection rates were higher in the post dissectional local anesthesia infiltration group, however the results were insignificant. Our results were insufficient to hypothesize any pathogenetic mechanisms. Also there were no statistically significant contributions of systemic pathologies and the presence of Actinomyces in tonsil specimens in the development of post tonsillectomy infections.

In conclusion, tonsillectomy infections can be troublesome and worth investigating. In this study we presented our tonsillectomy outcomes; however we found no significant relation between post tonsillectomy infections and suturation, local anesthesia infiltration, positive Actinomyces in tonsillar tissue and co-morbidities. Further investigations are essential.

References

- Colreavy MP, Nanan D, Benamer M, Donnelly M, Blaney AW, O'Dwyer TP, et al. Antibiotic prophylaxis post-tonsillectomy: is it of benefit? *Int J Pediatr Otorhinolaryngol.* 1999;50:15-22.
- Baugh RF, Archer SM, Mitchell RB, Rosenfeld RM, Amin R, Burns JJ, et al. American Academy of Otolaryngology-Head and Neck Surgery Foundation. Clinical practice guideline: tonsillectomy in children. *Otolaryngol Head Neck Surg.* 2011;144:S1-30.
- Seshamani M, Vogtmann E, Gatwood J, Gibson TB, Scanlon D. Prevalence of complications from adult tonsillectomy and impact on health care expenditures. *Otolaryngol Head Neck Surg.* 2014;150:574-81.
- Greaves NS, Ashcroft KJ, Baguneid M, Bayat A. Current understanding of molecular and cellular mechanisms in fibroplasia and angiogenesis during acute wound healing. *J Dermatol Sci.* 2013;72:206-17.
- Orłowski K, Lisowska G, Misiólek H, Paluch Z, Misiólek M. The Efficacy of Perioperative Antibiotic Therapy in Tonsillectomy Patients. *Adv Clin Exp Med.* 2016;25:493-503.
- Sinha UK, Gallagher LA. Effects of steel scalpel, ultrasonic scalpel, CO2 laser, and monopolar and bipolar electrosurgery on wound healing in guinea pig oral mucosa. *Laryngoscope.* 2003;113:228-36.
- Glover JL, Bendick PJ, Link WJ. The use of thermal knives in surgery: electrosurgery, lasers, plasma scalpel. *Curr Probl Surg.* 1978;15:1-78.
- Murthy SM, Goldschmidt RA, Rao LN, Ammirati M, Buchmann T, Scanlon EF. The influence of surgical trauma on experimental metastasis. *Cancer.* 1989;64(10):2035-44.
- Andrea M. Microsurgical bipolar cautery tonsillectomy. *Laryngoscope.* 1993;103:1177-8.
- Carew JF, Ward RF, LaBruna A, Torzilli PA, Schley WS. Effects of scalpel, electrocautery, and CO2 and KTP lasers on wound healing in rat tongues. *Laryngoscope.* 1998;108:373-80.
- Genç E, Hanci D, Ergin NT, Dal T. Can mucosal sealing reduce tonsillectomy pain? *Int J Pediatr Otorhinolaryngol.* 2006;70:725-30.
- Ploegmakers IB, Olde Damink SW, Breukink SO. Alternatives to antibiotics for prevention of surgical infection. *Br J Surg.* 2017;104:e24-e33.
- Naja MZ, El-Rajab M, Kabalan W, Ziade MF, Al-Tannir MA. Pre-incisional infiltration for pediatric tonsillectomy: a randomized double-blind clinical trial. *Int J Pediatr Otorhinolaryngol.* 2005;69:1333-41.
- Grainger J, Saravanappa N. Local anaesthetic for post-tonsillectomy pain: a systematic review and meta-analysis. *Clin Otolaryngol.* 2008;33:411-9.
- Kountakis SE. Effectiveness of perioperative bupivacaine infiltration in tonsillectomy patients. *Am J Otolaryngol.* 2002;23:76-80.
- Ozkiriş M, Kapusuz Z, Saydam L. Comparison of ropivacaine, bupivacaine and lidocaine in the management of post-tonsillectomy pain. *Int J Pediatr Otorhinolaryngol.* 2012;76:1831-4.
- Hobson JC, Malla JV, Kay NJ. Horner's syndrome following tonsillectomy. *J Laryngol Otol.* 2006;120:800-1.
- Shlizerman L, Ashkenazi D. Peripheral facial nerve paralysis after peritonsillar infiltration of bupivacaine: a case report. *Am J Otolaryngol.* 2005;26:406-7.
- Fradis M, Goldsher M, David JB, Podoshin L. Life-threatening deep cervical abscess after infiltration of the tonsillar bed for tonsillectomy. *Ear Nose Throat J.* 1998;77:418-21.
- Allareddy V, Martinez-Schlurmann N, Rampa S, Nalliah RP, Lidsky KB, Allareddy V, et al. Predictors of Complications of Tonsillectomy With or Without Adenoidectomy in Hospitalized Children and Adolescents in the United States, 2001-2010: A Population-Based Study. *Clin Pediatr (Phila).* 2016;55:593-602.
- Guo S, Dipietro LA. Factors affecting wound healing. *Dent Res.* 2010;89:219-29.
- Ekmektzoglou KA, Zografos GC. A concomitant review of the effects of diabetes mellitus and hypothyroidism in wound healing. *World J Gastroenterol.* 2006;12:2721-9.
- Bhargava D, Bhusnurmath B, Sundaram KR, Raman R, Al Okbi HM, Al Abri R, et al. Tonsillaractinomycosis: a clinicopathological study. *Acta Trop.* 2001;80:163-8.
- Hasan M, Kumar A. Actinomycosis and tonsillar disease. *BMJ Case Rep.* 2011;12: 2011.