Effect of Preoperative Hemoglobin level on the occurrence of secondary post-tonsillectomy bleeding.

Thesis Submitted for partial fulfillment of master degree in Otorhinolaryngology

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Abstract

Tonsillectomy is one of the commonest otolaryngological procedures performed .Multiple reports have demonstrated the safety of ambulatory (outpatient) pediatric Tonsillectomy, however Post-tonsillectomy hemorrhage remains the most serious complication of tonsillectomy. Review of literature suggests that preoperative anaemia is independently associated with an increased risk of postoperative morbidity.

In this work, we analyzed different parameters including patient's age, gender, type of surgery "Tonsillectomy or Adenotonsillectomy", technique "Cold dissection or Bipolar", evidence of tonsillar bed infection and pre-operative hemoglobin level in two groups of patients indicated for tonsillectomy. One group of 80 patients didn't suffer from post-tonsillectomy bleeding as a control group; the other of 20 patients having secondary post-tonsillectomy bleeding. According to our statistical analysis and data, no significant difference between the two groups regarding the occurrence of secondary post-tonsillectomy in the following parameters: patient's age, gender, type of surgery "Tonsillectomy or Adenotonsillectomy" and preoperative hemoglobin level.

However there was higher incidence of secondary post tonsillectomy bleeding in patients operated by bipolar scissors. Also evidence of tonsillar bed infection raises the possibility of secondary post-tonsillectomy bleeding occurrence.

Key words: Hemoglobin – Hemorrhage – tonsillectomy – Complications

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List of Abbreviations

Abbreviation	Word
AAO-HNS	American Academy of Otolaryngology Head and Neck Surgery
AD	After Death (of Christ)
APC	Argon Plasma Coagulation.
ASOT	Anti-Streptolysin O titer.
CDL	Contact diode laser.
CNS	Central Nervous System
CO_2 Laser	Carbon dioxide Laser.
ECA	External Carotid Artery
GABHS	Group A β hemolytic streptococcus.
HS	Harmonic Scalpel.
ICA	Internal Carotid Artery
KTP Laser	Potassium Titanyl Phosphate Laser.
MIT	Microdebrider intracapsular tonsillectomy.
OHS	Obstructive hypopnea syndrome.
OSAS	Obstructive sleep apnea syndrome.
P value	Predictive value.
S.D	Standard deviation.
SRBD	Sleep-related breathing disorder.
UARS	Upper airway resistance syndrome.
VPI	Velopharyngeal insufficiency.
WHO	World Health Organization
YAG Laser	Yttrium Aluminum Garnet Laser.

Tonsillectomy is among the oldest and most commonly performed procedures in the pediatric population. Approximately 530,000 outpatient pediatric adenotonsillectomies are performed annually in United States hospitals ***(Cullen et al., 2006).***

In the early twentieth century, tonsillectomy was the most popular procedure for treating various respiratory and systemic diseases with its popularity reaching a peak approximately 65 years ago. It began to decline with the advent of antibiotics. In the 1960s and 1970s, one to two million tonsillectomies, adenoidectomies, or combined procedures were performed annually in the United States ***(Kornblut, 1987).***

Currently, these operations are performed at what appears to be about half the rate of those forty years ago. However, neither the indications for tonsillectomy nor the complications associated with the procedure have changed much ***(Erickson et al., 2009).***

Multiple reports within the last two decades have demonstrated the safety of ambulatory (outpatient), pediatric Tonsillectomy**.** However Post-tonsillectomy hemorrhage remains the most serious complication of tonsillectomy which may require re- hospitalization ***(Lalakea et al., 1999).***

The postoperative bleeding is most likely to occur , within the first 24 hours after surgery "primary hemorrhage" and within 6-10 days after surgery "secondary hemorrhage", when the scabs come off. It is estimated that 0.2-2.2% of patients experienced hemorrhage within the first 24 hours and 0.1-3.7% of patients experienced postoperative bleeding 6-10 days after surgery leading to re-admission to the hospital ***(Randall and Hoffer, 1998).***

To reduce the incidence of both intra-operative and postoperative bleeding, besides good surgical skills, most otolaryngologists perform preoperative investigations such as Coagulation profile, Complete blood count including hemoglobin level, preoperative grouping and cross-matching of blood ***(Wieland et al., 2009).***

Preoperative low hemoglobin level is associated with increased morbidity and mortality in patients undergoing surgery ***(Karkouti et al., 2008).***

This study is going to assess the effect of preoperative hemoglobin level on the occurrence of secondary post-tonsillectomy bleeding. Also we analyzed the relation of different parameters; including patient's age, gender, type of surgery "Tonsillectomy or Adenotonsillectomy", technique "Cold dissection or Bipolar "and evidence of tonsillar bed infection to the incidence of secondary post-tonsillectomy bleeding.

Anatomy of Palatine Tonsils

Embryology of the tonsils

The second branchial pouch is visible in the fourth week of gestation and demonstrates canalization and branching in the eighth week. The tonsillar sinus is divided into a superior and inferior division by the *intratonsillar fold of Hammar* in the early second trimester. Lymphoid infiltration of the lamina propria occurs in the seventh month of intrauterine life. Primary follicles form late in gestation, but germinal center stimulation does not occur until shortly after birth. At birth, a vestigial tonsil is visible hidden between the tonsillar pillars. During the first year of life, there is rapid proliferation of lymphoid elements and formation of active germinal centers ***(Isaacson and Parikh, 2008)*** (Figures 1, 2, 3).

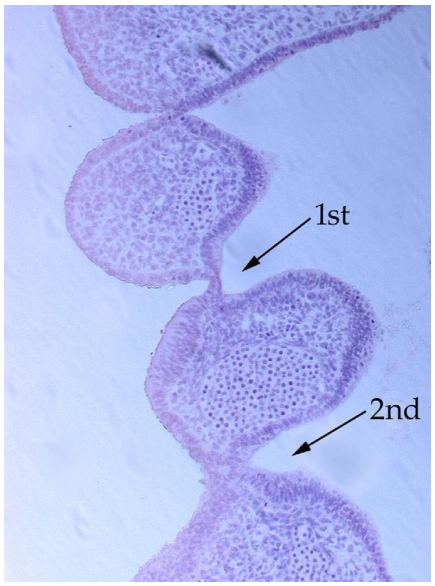

Figure 1: 28 days post-conception —formation of the second branchial pouch from the pharyngeal endoderm ***(Isaacson and Parikh, 2008).***

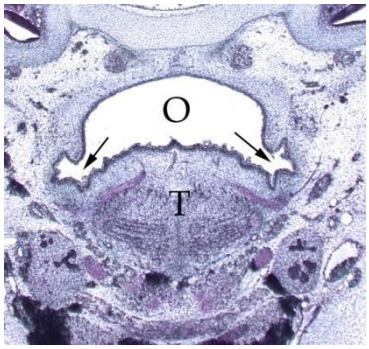

Figure 2: 56 days post-conception — early formation of the tonsillar fossa (arrows). O, Oropharynx; T, tongue ***(Isaacson and Parikh, 2008).***

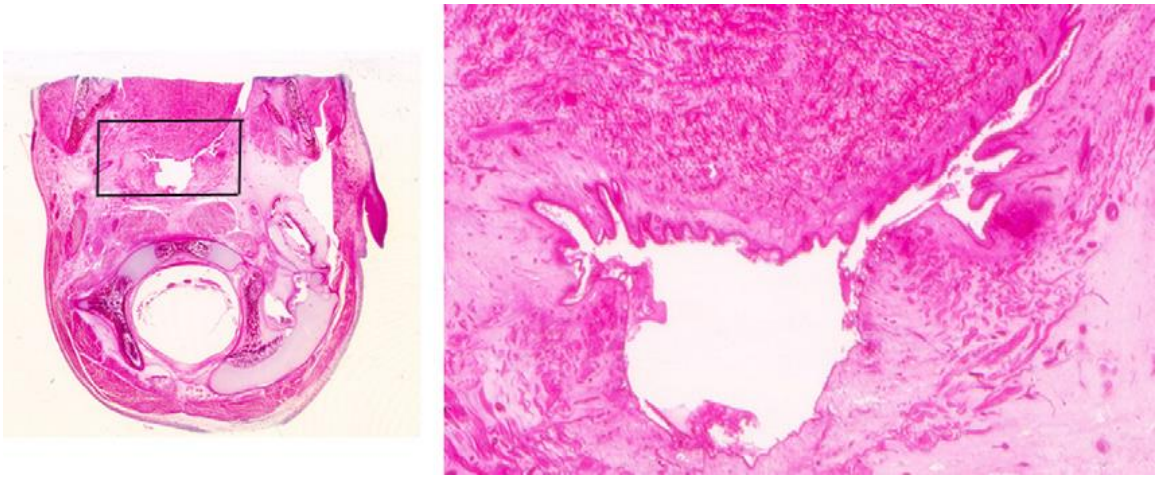

Figure 3: Eighteen-week fetus – axial section through oropharynx. Detail shows evagination and branching of the epithelium ***(Isaacson and Parikh, 2008).***

Surgical Anatomy of The Palatine Tonsils

The tonsil is an oval mass of subepithelial lymphoid tissue situated in the triangular tonsillar fossa between the diverging palatopharyngeal and palatoglossal folds. The medial surface of the tonsil is free and projects to variable extent into the oropharynx. In late fetal life, a triangular fold of mucous membrane extends back from the lower part of the palatoglossal fold to cover the antero-inferior part of the tonsil. In the childhood, this fold is usually invaded by lymphoid tissue and becomes incorporated into the tonsil. A semilunar fold of mucus membranes passes from the upper part of the palatopharyngeal arch towards the upper pole of the tonsil and separates it from the base of the uvula. The extent to which this fold is visible depends upon the prominence of the tonsil ***(Drake et al., 2010).***

The upper pole of the tonsil may extend up into the soft palate and the lower pole may extend downwards beside the base of the tongue. At this point, the lymphoid tissue of the tonsil is continuous with the subepithelial lymphoid tissue on the base of the tongue **(the lingual tonsil)**. A sulcus usually separates the tonsil from the base of tongue ***(Wiatrak and Wooley, 1998).***

Waldeyer's Ring

The lingual tonsils anteriorly, the palatine tonsils laterally and the pharyngeal tonsils (adenoids) postersuperiorly form a ring of lymphoid tissue at the upper end of the pharynx known as *Waldeyer's tonsillar ring*. All the structures of Waldeyer's ring have a similar histology and presumably similar functions. The palatine Tonsils represent the largest accumulation of lymphoid tissues in Waldeyer's ring and, in contrast to the lingual and pharyngeal tonsils, constitute a compact body with a definite thin capsule on its deep surface. ***(Wiatrak and Woolley, 2005).***

The tonsillar crypts are blind tubules which arise from the epithelium on the surface of the tonsil and extend deeply into the tissues. The tonsillar capsule is a specialized portion of the pharyngobasilar fascia that covers the surface of the tonsil and extends into it to form septa that conduct the nerves and vessels, so the tonsil is not easily separated from its capsule, but the capsule is united largely

by loose connective tissue to the pharyngeal muscles. The tonsil can be easily dissected from its normal position by separating the capsule form the muscle through this loose connective tissue. The tonsillar fossa is composed of three muscles; the palatoglossus muscle which forms the anterior pillar, the palatopharyngeus muscle, which is the posterior pillar, and the superior constrictor muscle of the pharynx, which forms the largest part of the tonsillar bed ***(Moore et al., 2010)***.

The muscular wall is thin, and immediately against it on the outer wall of the pharynx is the glossopharyngeal nerve. This nerve can be easily injured if the tonsillar bed is violated, and the nerve could be temporarily affected by edema following tonsillectomy that produces both a transient loss of taste over the posterior third of the tongue and referred otalgia ***(Wiatrak and Woolley, 2005).***

The palatine tonsil, does not completely fill the interval between the two pillars, so that a small depression, the supratonsillar fossa, exists at the upper part of the interval. Further, the tonsil extends for a variable distance under cover of the glossopalatine arch, and is here covered by a reduplication of mucous membrane; the upper part of this fold reaches across the supratonsillar fossa, between the two arches, as a thin fold sometimes termed the *plica semilunaris*; the remainder of the fold is called the *plica triangularis*. Between the *plica triangularis* and the surface of the tonsil is a space known as the tonsillar sinus; in many cases, however, this sinus is obliterated by its walls becoming adherent ***(Gray, 1918).***

In the child, the tonsils are relatively larger than in the adult, and about one-third of the tonsil is imbedded. After puberty the imbedded portion diminishes considerably in size and the tonsil assumes a disk-like form, flattened from side to side; the shape; and size of the tonsil, however, vary considerably in different individuals**.** The medial surface of the tonsil is free except anteriorly, where it is covered by the *plica triangularis*; it presents about twelve to fifteen orifices leading into small crypts or recesses from which numerous follicles branch out into the tonsillar substance , Figure 4 ***(Gray, 1918).***

The sensory nerve supply to the tonsillar region is mainly by the tonsillar branch of the glossopharyngeal nerve. The upper part of the tonsil is supplied by

the lesser palatine nerves and branches of the maxillary division of the trigeminal nerve. Sympathetic fibres are derived from the superior cervical ganglion and reach the tonsil on the arteries supplying it ***(Wiatrak and Wooley, 1998).***

The main artery is the tonsillar branch of the facial artery, which enters the tonsil near its lower pole by piercing the superior constrictor. A further arterial supply reaches the tonsil from the lingual artery, by way of the dorsal lingual branches and the ascending palatine branch of the facial artery. The upper pole receives an additional supply from the descending palatine branch of the maxillary artery ***(Beasley, 1997).***

Venous drainage of the tonsil is to the paratonsillar vein and vessels also pass to the pharyngeal plexus of facial vein after piercing the superior constrictor and drainage is eventually into the common facial and internal jugular veins ***(Beasley, 1997).***

Lymphatic vessels from the tonsil pierce the buccopharyngeal fascia and pass to the upper deep cervical group of lymph nodes, in particular to the jugulodigastric group situated just below the posterior belly of digastric muscle. The tonsil has no afferent lymphatic vessels ***(Wiatrak and Wooley, 1998).***

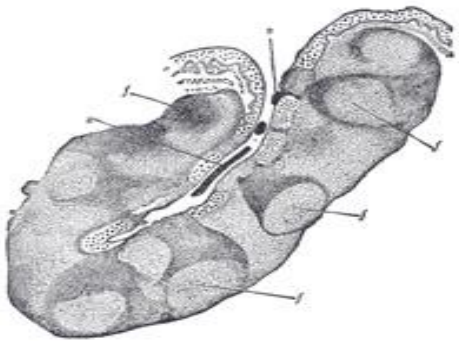

Figure 4: Section through one of the crypts of a tonsil ***(Gray, 1918).***