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Risk of post-operative hemorrhage after adenoidectomy and tonsillectomy: Value of the preoperative determination of partial thromboplastin time and prothrombin time

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ABSTRACT

Introduction: Tonsillectomy and adenoidectomy (T& A) are the most common pediatric surgical procedures performed world-wide. Bleeding remains the most common complication of these procedures with 1–5.7% prevalence.
Methods: We recruited 1269 patients who were scheduled for either tonsillectomy, adenoidectomy or both. All patients had preoperative CBC, PT, and aPTT ordered. According to the results, patients were labelled as either “abnormal group” or “normal group”.
Results: 35 patients had abnormal lab results 18 of these patients were diagnosed with coagulation disorders on further laboratory testing.9 of these patients had no pertinent history of bleeding. Even though an association is noted between abnormal lab tests and preoperative history of risk of bleeding, the correlation did not have high sensitivity (28.6%).
Conclusion: This study provides evidence that preoperative history can give some information on patients with abnormal coagulation profile but may underestimate the prevalence of such diseases. In addition, patients with abnormal coagulation profile have more risk of postoperative bleeding even after adequate medical treatment perioperative. Thus, identifying these patients will help the clinician in providing the best surgical management with the least morbidity and mortality.

1. Introduction

Tonsillectomy and adenoidectomy (T& A) are the most common pediatric surgical procedures performed world-wide [1]. Bleeding remains to be the most common complication of these procedures with 1% and 5.7% reported rate of primary and secondary hemorrhage respectively [1–4]. Recent studies have attributed post-surgical bleeding to different techniques used, patient age as well as residents' learning curve [5,6]. Post-surgical bleed occurs as primary (24 h) or secondary (24 h) hemorrhage. Primary bleeding is considered to be related to surgical technique, secondary bleeding is considered not to be related to surgical technique, with a constant prevalence in the past. Secondary bleeding happens rarely and is predominantly observed within the first 10 postoperative days [7]. The American Academy of Otolaryngology Head and Neck Surgery (AAO-HNS) current opinion restricts hematologic evaluation (PT,PTT) to patients with positive medical and family history of bleeding disorder, or unreliable history [8]. Wieland et al. recently studied the current practice of pre-operative screening among otolaryngology physicians and concluded that despite awareness of the AAO-HNS 1999 consensus statement, many physicians do not abide by its recommendations [9].

The objective of this study is to look at the sensitivity and specificity of medical and family history in the diagnosis of coagulopathies in the pediatric age group undergoing T&A and the importance of PT and aPTT in detecting coagulopathy pre-operatively.

2. Material and methods

The study was conducted on 1269 patients who presented to a tertiary care center for tonsillectomy using monopolar cautery, adenoidectomy using blunt *trans*-oral blade resection or both. After IRB approval at AUBMC, a retrospective review of the senior's author charts

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was done with data collection of patients who underwent tonsillectomy, adenoidectomy or both from January 2003 until March 2013. The data collected included age, gender, reason for admission, in addition to history of bleeding or excessive bruising, family history of bleeding, medication used and history of previous surgical interventions. All patients had CBC, PT and aPTT as laboratory testing at preoperative visit. A value of INR larger than 1.3 was considered as positive and an aPTT larger than 40 was considered as positive. Patients with elevated INR or aPTT were labelled as “Abnormal Group”, the rest of the patients were included into the “Normal Group”.

Positive results were followed up with further workup including repeat INR and aPTT, Vonwillebren factor (vWF), factors 7, 8 and 9. After diagnosis was made, targeted treatment (Desmopressin, factor 7, Haemate and tranexamic acid) was given to the respective patients in order to treat the haematological deficiency and then perform surgery. If bleeding occurred postoperatively, it was documented.

Comparison between the Abnormal Group and the Normal Group was done using *t*-test for continuous variables and χ^2 test for categorical variables. Multivariate binary logistic regression was used to determine the preoperative history's effect on determination of elevated INR or aPTT. A p value of < 0.05 was required for statistical significance. Analyses were performed using SPSS version 23 (IBM Inc., Somers, NY, USA).

3. Results

During the study period, 1269 patients were included for retrospectively analysis. Ages ranged from 1 to 22 (average 4.47 ± 2.5 years); 731 (57.6%) were males and 538 (42.4%) were females. The majority of patients (1194, representing 94.1%) are native-born Lebanese. 47.2% (599) of patients presented for tonsillectomy as well as adenoidectomy, 562 (44.3%) presented for adenoidectomy alone, only 108 (8.5%) presented for tonsillectomy alone.

Thirty five patients (2.8%) had either prolonged INR or aPTT and these were classified as Abnormal Group. And the rest 1234 patients (97.2%) had values within normal limits of PT and aPTT and were classified as Normal Group. When comparing abnormal group versus normal group, no significant statistical difference was noted regarding gender distribution, age, and reason for admission (adenotonsillar hypertrophy, recurrent tonsillitis or adenoid hypertrophy). However, significant statistical difference was seen when comparing these two groups regarding preoperative data collected to rule out bleeding tendencies, among which is family history of bleeding, easy bruising and personal history of bleeding. The latter was found to be more prevalent in patients with abnormal tests. History of previous surgeries where bleeding occurred and intake of medication which are known to have bleeding as a side effect were not significantly different between both groups (Table 1).

Using a multivariate binary logistic regression preoperative history including personal bleeding history, family history of bleeding, easy bruising, intake of medication causing bleeding and previous surgical history where bleeding occurred was utilized to perform the area under Receiver Operating Characteristic (ROC) curve as a measure of model predictive power of having abnormal laboratory values of INR and aPTT, where the value of area under the curve is 0.664 with a significant p value of 0.001. This model shows the benefit of having a preoperative evaluation including a specificity 98.2%. However, sensitivity is 28.6% which is not high enough to include all cases within the abnormal group. (Fig. 1).

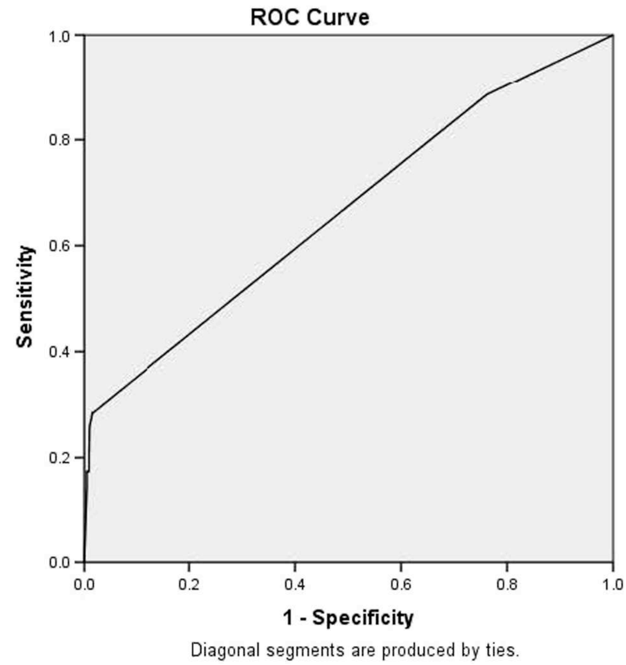

Fig. 1. Multivariate binary logistic regression of preoperative history and postoperative bleeding tendency.

Table 1
Normal and Abnormal group demographics *P < 0.05.

	Normal Pt/Ptt	Abnormal Pt/Ptt
Count	1234	35
Age	4.49 ± 2.54 years	3.83 ± 1.83 years
Gender Male	714 (57.9%)	17 (48.6%)
Adenotonsilar Hypertrophy	541 (43.8%)	19 (54.3%)
Recurrent Tonsillitis	238 (19.3%)	7 (20.0%)
Adenoid Hypertrophy	590 (47.8%)	14 (40.0%)
Family History of Bleeding*	6 (0.5%)	6 (17.1%)
Easy Bruisability*	2 (0.2%)	1 (2.9%)
History of Bleeding*	4 (0.3%)	2 (5.7%)
Surgical History	300 (24.3%)	7 (20%)
Possible Medication Side effect	12 (1.0%)	1 (2.9%)

Among the 35 Patients with abnormal results, seven patients had repeat results which were normal and seven patients lost to follow up for diagnostic results. Thirteen out of the thirty five patients had vWF dysfunction and three had lupus anticoagulant positive. The remaining five patients with abnormal results were distributed equally between factor 7, 8, 9, Depakene use, and liver disease.

Patients with abnormal results and known diagnosis were given targeted treatment to decrease bleeding. Seventeen patients did not undergo the operation for various reasons. Four out of the 1252 patients who underwent the operation had bleeding postoperatively. 2 of these 4 patients were from the normal group and 2 from the abnormal group. The patients that bled comprised 0.16% and 9.5% of their respective group. 1 out of the 4 patients had preoperative history suggestive of possible bleeding tendency (positive family history of bleeding). 1 of these patients had same day bleeding; the rest had bleeding after 6–7 days from the operation.

4. Discussion

Zwack et al. discussed the importance of PT and aPTT in predicting bleeding outcome of pediatric population undergoing Adenoidectomy and tonsillectomy, they concluded that routine screening is not sensitive and probably not cost effective [10]. Krishna et al. through a meta-analysis of 3384 patients found that 3.3% of patients with normal coagulation examination and 8.7% of patients with abnormal coagulation studies had bleeding postop; however this difference was not statistically significant [11].

On the other hand, Tami et al. concluded that the high proportion of abnormal clotting studies in their group of bleeders contradicts the notion that these tests are of no preoperative value, regardless of how minor, and that these patients deserve a thorough hematologic evaluation prior to tonsillectomy [12]. Koshkareva et al. similarly concluded in 2012 that the incidence of bleeding was significantly higher in patients with abnormal preoperative hematologic screening (7.1%) with respect to those whose screening was normal (2.9%). In addition 10 of the 14 patients who were found to have a coagulopathy had no personal or family history of abnormal bleeding [13]. Kang et al. suggested that even patients with abnormal coagulation studies initially, and that return to normal upon retesting have a higher rate of postoperative bleeding, which was a 4-fold increase compared to patients with normal coagulation studies [4].

On the Background of this controversy, our study showed that through a preoperative evaluation of PT and aPTT, 35 patients had abnormal results.18 patients (51.4%) were newly diagnosed with coagulation disorders. Most importantly, 9 of these 18 patients (50%) had no preoperative history suggestive of previous personal or family history of bleeding. Family history of bleeding, personal history of bleeding and easy bruising when combined as a pre-test showed an ROC of 0.664. Even though the specificity is 98.2% the sensitivity is low 28.6%. The necessary preoperative history questionnaire allows the clinician to form some idea about the patient possible risk for increased bleeding. However, it does not have high sensitivity and thus some patients with abnormal coagulation profile can pass undetected and therefore not treated for their underlying disease, which might increase their risk for postoperative bleeding.

The number of patients needed to be examined was 35.7 in order to diagnose 1 abnormal result. The trauma of venipuncture especially since we are dealing with pediatric patients should be taken into consideration. However since this is a retrospective study we wanted to shed the light on the possibility of having an undiagnosed haematological disease. Surgeons who choose not to perform preoperative blood studies should carefully explain to the parents and have in mind the higher risk of postoperative bleeding especially since there is a low sensitivity in the preoperative questionnaire.

The financial cost of each CBC INR and aPTT is a total of 50 USD and the estimate of admission of each patient for postoperative hemorrhage is 3500 USD. So since the percentage of patients who bled are 0.3% and the usual number of patients that have bleeding according to literature is 1–5.7% thus the cost of admission will be estimated between 30,233 and 202,993 USD. The cost of all the laboratory tests is 61700 USD. Thus the financial burden can be acceptable and even favorable depending on the surgeons' usual risk.

In our series 4 (0.3%) patients had bleeding post op comparing to 1% and 5.7% reported rate of primary and secondary hemorrhage respectively in the literature [1–4,12]. 2 (0.2%) of these patients had normal Pt and PTT and 2 (9.5%) had abnormal studies. One of the patients that bled from the abnormal group of them had a distant relative with history of bleeding tendency and the other has no history pertinent to increased bleeding tendency. This shows more than 25 times higher risk of bleeding with abnormal coagulation profile even after correction. Thus identifying patients at higher risk allows the clinician to provide the best recommended treatment and be prepared for possible complications.

The low percent of postoperative bleeding in our series (0.3%) can be attributed to the use of etamsylate (10 mg/kg) 10 min before cutting time for all patients preoperatively. A study by Arora et al. suggests that mean blood loss in the Etamsylate-treated group was not significantly less than in the controls. The frequency of secondary hemorrhage was significantly less in children treated with Etamsylate ($P < 0.01$). No side effects were reported in either group [14].

In addition, the detection of the abnormal group and therefore providing the appropriate medicinal intervention according to the hematologic diagnosis, contributed to this decreased bleeding percentage.

5. Conclusion

This study provides new insight that though preoperative history is highly specificity regarding normality of coagulation studies it has a low sensitivity and may underestimate the prevalence of such diseases. In addition, patients with abnormal coagulation profile have more risk of postoperative bleeding even after adequate medical treatment perioperatively. Thus, identifying these patients will help the clinician in providing the best surgical management with the least morbidity and mortality while informing the parents about the increased risk of bleeding postoperatively. Surgeons who choose not to perform preoperative blood studies should carefully explain to the parents and have in mind the higher risk of postoperative bleeding since many patients that do have coagulation disorders who have negative bleeding history may bleed post operatively.

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Conflicts of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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