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Can the preoperative hematologic factors play a role in predicting adult post-tonsillectomy hemorrhage?

Ameliyat öncesi hematolojik faktörler erişkinlerdeki tonsillektomi sonrası kanamayı tahmin etmede rol oynayabilir mi?

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ABSTRACT

Objectives: This study aimed to assess the preoperative hematologic factors for predicting post-tonsillectomy hemorrhage (PTH).

Patients and Methods: In the retrospective study, the records of 44 patients (21 males, 23 females; mean age 30.5±9.4 years; range, 18 to 55 years) who underwent tonsillectomy for chronic or recurrent tonsillar infections were reviewed. Age, sex, coagulation profile [international normalized ratio (INR), activated partial thromboplastin time (aPTT)], complete blood cell count [hematocrit (HTC), neutrophil (NEU) count, lymphocyte (LYMP) count, platelet (PLT) count, mean platelet volume (MPV), red cell distribution width (RDW)] such values have been recorded. Patients were divided into two groups according to the presence of PTH. Group A (8 males, 13 females; mean age 30.5±11.1 years) included patients without PTH and Group B (13 males, 10 females; mean age 30.5±7.8 years) was comprised of patients with PTH.

Results: In the evaluation of the coagulation profile, aPTT values were 24.5±1.9 sec in Group A and 26.4±17 sec in Group B (p= 0.017). Median value of INR was similar between the groups (p=0.60). No difference was detected between the groups regarding the following parameters of the complete blood count: HTC (p=0.49), NEU (p=0.17), LYMP (p=0.45), PLT (p=0.71), MPV (p=0.27), and RDW (p=0.29).

Conclusion: It is important to perform relevant blood tests should in the preoperative period, in addition to INR and aPTT tests. New studies are needed to determine the relationship of MPV and RDW with PTH.

Keywords: Adult, hemorrhage, hematologic tests, risk factors, tonsillectomy.

ÖZ

Amaç: Bu çalışmada tonsillektomi sonrası kanama (PTH)'yı tahmin etmek için ameliyat öncesi hematolojik faktörler değerlendirildi.

Hastalar ve Yöntemler: Retrospektif çalışmada, kronik veya tekrarlayan tonsil enfeksiyonları nedeniyle tonsillektomi yapılan 44 hastanın (21 erkek, 23 kadın; ort. yaş 30.5±9.4 yıl; dağılım, 18 to 55 yıl) kayıtları gözden geçirildi. Yaş, cinsiyet, pıhtılaşma profili [uluslararası normalleştirilmiş oran (INR), aktive parsiyel tromboplastin zamanı (aPTT)] ve tam kan sayımı [hematokrit (HTC), nötrofil (NEU) sayısı, lenfosit (LYMP) sayısı, trombosit (PLT) sayısı, ortalama trombosit hacmi (MPV), kırmızı hücre dağılım genişliği (RDW)] gibi değerler kayıt altına alındı. Hastalar PTH varlığına göre iki gruba ayrıldı. Grup A (8 erkek, 13 kadın; ort. yaş 30.5±11.1 yıl) PTH gözlenmeyen hastaları, Grup B (13 erkek, 10 kadın; ort. yaş 30.5±7.8 yıl) PTH gözlenen hastaları içerdi.

Bulgular: Koagülasyon profilinin değerlendirilmesinde aPTT değerleri Grup A'da 24.5±1.9 sn, Grup B'de 26.4±17 sn idi (p=0.017). Uluslararası normalleştirilmiş oranın medyan değeri gruplar arasında benzerdi (p=0.60). Gruplar arasında istatistiksel olarak anlamlı fark saptanmayan tam kan hücre sayımı parametreleri şunlardır: HTC (p=0.49), NEU (p=0.17), LYMP (p=0.45), PLT (p=0.71), MPV (p=0.27) ve RDW (p=0.29).

Sonuç: Ameliyat öncesi dönemde INR ve aPTT testlerine ek olarak ilgili kan testlerinin yapılması önemlidir. Ortalama trombosit hacmi ve RDW ile PTH arasındaki ilişkiyi belirlemek için yeni çalışmalara ihtiyaç vardır.

Anahtar sözcükler: Yetişkin, kanama, hematolojik testler, risk faktörleri, tonsillektomi.

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Tonsillectomy is one of the most performed surgical operations by otolaryngologists worldwide. The indications of this surgery are mainly chronic or recurrent tonsillar infections, tonsillar hypertrophy with obstructive symptoms, and tonsil-related malignancies. Although postoperative complications are relatively rare, post-tonsillectomy hemorrhage (PTH) has high morbidity and potentially life-threatening complications with a mortality rate of 1 in 20,000 tonsillectomies.[1] In the literature, the overall prevalence of PTH ranges between 1.5 and 20%, consisting of a primary PTH (occurring the first 24 h of the surgery) rate of 0.2 to 2.2% and a secondary PTH (occurring after the first 24 h of the surgery) rate of 0.1 to 3.5%.[2,3]

As reported previously, risk factors for PTH include sex, age, tonsillectomy indication, type of operation, and how skilled the surgeon is.[2-7] In this study, we aimed to investigate the role of preoperative hematologic factors to predict PTH in adults.

PATIENTS AND METHODS

The retrospective study was conducted at University of Health Sciences Adana City Training and Research Hospital, department of otolaryngology with 44 adult patients (21 males, 23 females; mean age 30.5±9.4 years; range, 18 to 55 years) who underwent tonsillectomy between January 2019 and January 2020. The patients in the study underwent tonsillectomy for chronic or recurrent tonsillar infections by the traditional cold dissection technique, which involves removal of the tonsil by dissecting the peritonsillar fossa, with continuous hemostasis obtained through bipolar electrocoagulation during surgery. The procedures were performed under general anesthesia using a standard anesthesia protocol. The surgery was performed by surgeons with at least seven years of experience. Chronic or recurrent tonsillar infections were defined as ≥3 episodes with sore throat in the preceding year, despite adequate medical treatment including antibiotics. The presence of systemic disease or known coagulopathy, a simultaneous procedure in addition to tonsillectomy, surgical techniques other than the traditional cold dissection technique, and patients who underwent tonsillectomy for other indications, such as tonsillar hypertrophy with obstructive symptoms, peritonsillar abscess, or tonsil related malignancies, were among the exclusion criteria. The patients included in the study were divided into two groups according to the presence of PTH: Group A (8 males, 13 females; mean age 30.5±11.1 years) was comprised of patients without PTH and Group B (13 males, 10 females; mean age 30.5±7.8 years) included patients with PTH. Patients in Group B were operated on by other surgeons in an external center and then referred to us since ours is a tertiary center that accepts referral patients, and the follow-up of these patients with PTH was performed in an external center. All information of the referenced patients was obtained and recorded. Written informed consent was obtained from all patients following the detailed explanation of the risks and benefits of participation. The study was approved by the Ethics Committee for Clinical Research at Adana City Training and Research Hospital (data/no: July 1, 2020/978-60). The study was conducted in accordance with the principles of the Declaration of Helsinki.

All medical records were evaluated for age, sex, coagulation profile [international normalized ratio (INR), activated partial thromboplastin time (aPTT)], complete blood cell count [hematocrit (HTC), neutrophil (NEU) count (10^3 µL), lymphocyte (LYMP) count (10^3 µL), platelet (PLT) count (10^3 µL), mean platelet volume (MPV), red cell distribution width (RDW)], the postoperative day of bleeding, and applied hemostasis route (Severe bleeding controls were performed under general anesthesia with the help of bipolar cautery.). All blood parameters included in the evaluation were the results from the day before the operation.

Statistical analysis

Statistical analysis was performed with IBM SPSS version 21.0 software (IBM Corp., Armonk, NY, USA). In the analysis, continuous variables were assessed for normal distribution with the Shapiro-Wilk test. Normally distributed variables were examined using the independent samples t-test to determine the differences between groups. Mann-Whitney U test was used to compare two independent groups that did not comply with the normal distribution. Chi-square test was used for variables in a categorical structure. Numerical variables were expressed as mean ± standard deviation, and categorical variables were expressed as frequencies and percentages. Statistical significance level was set at $p<0.05$.

RESULTS

There were no significant differences between Group A and Group B in terms of sex (p=0.25). Activated partial thromboplastin time values were 24.5±1.9 sec in Group A and 26.4±17 sec in Group B (p=0.017). The median value of INR was similar between the groups (Q1:Q3, 0.90:1.10; p=0.60). No difference was detected between the groups regarding the following parameters of the complete blood count: HTC (p=0.49), NEU (p=0.17), LYMP (p=0.45), PLT (p=0.71), MPV (p=0.27), and RDW (p=0.29) (Table 1-3).

Table 1
Comparison of complete blood count results between the groups

Variables	Group A (n=21) Mean±SD	Group B (n=23) Mean±SD	*p*
Age (year)	30.5±11.14	30.5±7.8	0.987
HTC (%)	38.71±4.406	39.91±6.921	0.494
PLT (10^3/μL)	287142.86±57058.992	280043.48±68915.942	0.713
MPV (fL)	8.29±1.189	8.83±1.922	0.265
aPTT (Sn)	24.48±1.887	26.43±3.174	0.017

SD: Standard deviation; HTC: Hematocrit; PLT: Platelet; MPV: Mean platelet volume; aPTT: Activated partial thromboplastin time.

Table 2
Comparison of median values between groups

Variables	Group A (n=21) Median	Group A (n=21) Q1-Q3	Group B (n=23) Median	Group B (n=23) Q1-Q3	*p*
RDW (%)	14.00	13.00:15.00	14.00	13.25:15.00	0.292
INR	1.00	0.90:1.10	1.00	0.90:1.10	0.596
LYMP (10^3/μL)	3,200.00	2,450.00:4,050.00	3,000.00	2,525.00:4,500.00	0.445
NEU (10^3/μL)	4,000.00	3,400.00:5,100.00	4,700.00	3,525.00:6,600.00	0.172

Q: Quartile; RDW: Red cell distribution width; INR: International normalized ratio; LYMP: Lymphocyte; NEU: Neutrophil.

Table 3
Minimum-maximum values

Variables	n	Mean±SD	Min-Max
Age (year)	44.00	30.5±9.4	18.00-55.00
RDW (%)	44.00	13.9±1.6	12.00-18.00
PLT (10^3/μL)	44.00	283,431.82±62,905.39	147,000.00-449,000.00
aPTT (Sn)	44.00	25.5±2.8	20.00-33.00
INR	44.00	1.0±0.1	0.85-1.20
HTC (%)	44.00	39.3±5.8	27.00-51.00
NEU (10^3/μL)	44.00	5,109.09±2,272.77	2,600.00-13,000.00
LYMP (10^3/μL)	44.00	2,670.45±1,063.91	1,000.00-6,800.00
MPV (fL)	44.00	8.6±1.6	5.00-12.00
Postoperative day of bleeding	23.00	7.2±3.1	1.00-15.00

SD: Standard deviation; RDW: Red cell distribution width; PLT: Platelet; aPTT: Activated partial thromboplastin time; INR: International normalized ratio; HTC: Hematocrit; NEU: Neutrophil; LYMP: Lymphocyte; MPV: Mean platelet volume.

Of the 44 patients, PTH occurred in 23 (52.3%). Of these 23 patients, only one had a primary PTH, and the others had secondary PTH. Post-tonsillectomy hemorrhage episodes were eliminated with non-invasive treatment in 16 (69.6%) patients, while seven (30.4%) patients required reoperation under general anesthesia since it was not eliminated by non-invasive treatment.

DISCUSSION

Post-tonsillectomy hemorrhage is the most common complication that can result in increased morbidity and potentially life-threatening consequences. Previous studies have reported age and sex as a significant risk factor for PTH. Tomkinson et al.[5] identified the male sex and an age of 12 years or older as a risk for PTH.

Several studies included patients of all ages. This may explain why age is not a risk factor in our present study of only adult patients. Although male sex has been reported as a higher independent risk factor for PTH in some studies, it has not been proven in the literature.[2,3,5,7]

In a study conducted in Germany, it was observed that the cold tonsillectomy method and other methods did not create a statistical difference in terms of PTH.[7] In their study, Ikoma et al.[3] performed all tonsillectomies with cold dissection under general anesthesia. They preferred suture ligation or bipolar cautery according to the bleeding status. In their study, male sex, age over 15 years, surgeon's experience of five years or less, surgery with the indication of habitual tonsillitis significantly increased the risk of PTH. In two separate studies, the prevalence of PTH was found to be 11.6% and 14.5%, respectively.[3,8] Clinical risk factors for PTH reported in the literature include age, sex, surgical technique and device, the skill level of the surgeon, and indication for tonsillectomy.[9-11]

We performed our operations in adult patients with chronic tonsillitis indication, under general anesthesia, with cold dissection technique, without using suture ligation, and with surgeons who have at least seven years of experience in their field, regardless of the season or month. All referred patients met the criteria. In our study, the sex did not make a statistically significant difference between the groups. Post-tonsillectomy hemorrhage was observed in 23 patients, and seven patients were reoperated. The high numbers may be due to the fact that we are a center that accepts patients from neighboring hospitals and provinces. In total, our rate of reoperation due to PTH is 15.9%.

International normalized ratio and aPTT are the most commonly used preoperative coagulation tests. The deficiency of clotting factors or the presence of an inhibitor in the circulation increase these values. These values do not indicate platelet dysfunction. International normalized ratio and aPTT are routinely examined due to the potentially fatal postoperative tonsil hemorrhage. For example, alarming disorders such as von Willebrand disease may be discovered in an asymptomatic patient. Also, the postoperative tonsillar fossa is an open wound that heals secondarily, and even standard patients may experience significant bleeding. One important study found a link between abnormal coagulation tests and postoperative bleeding.[12] Tests are also significant medicolegally. Preoperative anamneses are crucial in determining the familial tendency to bleed. Sometimes patients experience the first hemostatic problem during or after surgery and thus are diagnosed.[6,12] Preoperative INR and aPTT values were found to be associated with the risk of bleeding after tonsillectomy (p=0.012 and p=0.015, respectively).[2] A statistically significant relationship was found with the higher bleeding risk and an INR value of ≥1.2 and aPTT value of ≥35.[2] The author states that these coagulation parameters should be evaluated preoperatively not only to identify patients with as yet unknown coagulation disorders but also to stratify patients according to their postoperative bleeding risk. However, some authors argue that in patients without a history of coagulopathy, the coagulation study does not predict hemorrhagic risk, even if altered. Some authors state that coagulation disorders double the risk of bleeding after tonsillectomy.[2,13,14] Koshkareva et al.[15] concluded that patients with abnormal preoperative hematologic tests (7.1%) have a significantly higher incidence of bleeding than those with normal tests (2.9%). Kang et al.[16] suggested that even patients with baseline abnormal clotting results, which returned to normal after retesting, have a four-fold higher risk of postoperative bleeding compared to patients with normal coagulation tests. Parallel results were obtained in our study as well. It was observed that aPTT values were higher in Group B (p=0.017). Post-tonsillectomy hemorrhage may be closely related to aPTT. Although aPTT values of 35 and above are emphasized in the literature, the highest value is 33 in our study. We concur that aPTT and PTH are closely related.

In a revealing study of epistaxis patients, low MPV and high RDW levels resulted in increased bleeding tendency in patients with recurrent epistaxis.[17] Although the exact mechanism is not known, it is considered appropriate to evaluate the etiological causes in these patients. In recent years, changes in MPV and RDW values have been frequently investigated in many clinical pathologies, particularly in thrombotic disorders and cardiovascular diseases.[18-20] It has been suggested that patients with low MPV values may also be susceptible to bleeding.[18-20] In our study, the only parameter that made a statistically significant difference between the groups was aPTT (p=0.017) New studies with larger sample sizes are needed to further establish the relationship of MPV and RDW with PTH.

The limitations of our study are the relatively small sample size, including different surgeons in the operations, having chronic tonsillitis as the only indication for tonsillectomy, and performing only cold dissection as the surgical method.

In conclusion, as PTH is a significant complication, the relevant blood tests should be performed in the preoperative period in addition to INR and aPTT tests. New studies are needed to determine the relationship between MPV and RDW with bleeding.

Declaration of conflicting interests

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