International Journal of Pediatric Otorhinolaryngology 95 (2017) 20–23

Contents lists available at ScienceDirect

International Journal of Pediatric Otorhinolaryngology

journal homepage: http://www.ijporlonline.com/

Assessment of red blood cell distribution width and mean platelet volume in children with epistaxis

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ARTICLE INFO

Article history:
Received 21 December 2016
Accepted 26 January 2017
Available online 29 January 2017

Keywords:
Epistaxis
Red blood cell distribution width
Mean platelet volume
Children

ABSTRACT

Objective: This study aimed to investigate whether there is a relationship between red blood cell distribution width, mean platelet volume and epistaxis in children.
Methods: Between January 2015 and July 2016, 105 children who were referred to our clinic with epistaxis and 100 sex- and age-matched controls were retrospectively analyzed. Red blood cell distribution width (RDW) and mean platelet volume (MPV) values were determined in both groups.
Results: RDW values were found significantly ($P < 0.05$) lower in the group with epistaxis than in the control group (11.95 ± 1.31 vs. 12.74 ± 1.21). MPV was 7.49 ± 1.33 in the group with epistaxis and 7.23 ± 1.06 in the control group, and there was no significant difference between the groups ($p > 0.05$).
Conclusion: We found no difference between MPV values of both groups and significantly lower RDW values in children with epistaxis. Decreased RDW values were considered as an accompanying marker rather than a result of epistaxis. In addition, it may be thought that low RDW values may increase the bleeding tendency by disrupting the thrombotic activities. Further studies are needed to validate the relation of these parameters with epistaxis and its mechanisms.

1. Introduction

Epistaxis in children is a common problem encountered by otorhinolaryngology specialists [1]. 60% of children up to 10 years old have epistaxis at least once in their lives. Epistaxis most commonly develops from Little's area where vascular anastomoses form Kiesselbach's plexus in the anterior septum. It is spontaneous and self-limiting. Epistaxis rarely occurs in children under two years old but can be the result of serious trauma or acute leukemia [2]. In older children, causes include trauma, inflammation and infections, allergic rhinitis, neoplasms, coagulopathies, medications and vascular anomalies [3]. In the majority of cases, the etiology is not determined [4]. To diagnose anemia and possible coagulation disorder, a complete blood count is recommended, including coagulations tests such as prothrombin time (PT), activated partial thromboplastin time (aPTT) and international normalized ratio (INR). However these values are normal in most patients [5]. Here in this case, we thought whether there may be other laboratory parameters, which may be associated with epistaxis.

Mean platelet volume (MPV) is a routinely-taken blood parameter associated with platelet activity [6]. It is thought that larger platelets are more able to secrete granular and thrombotic factors and therefore better able to initiate hemostasis [7,8]. In addition, a high MPV is associated with thrombotic events such as atherosclerosis, peripheral vascular disease, myocardial infarcts and stroke [9]. Red cell distribution width (RDW) shows the variation in red blood cell size and is a routine complete blood count parameter often used in the differential diagnosis of anemia [10]. High RDW is associated with thrombotic events such as myocardial infarctions, cerebral infarctions and ischemic stroke [11–14].

A previous study found a relationship between these parameters and epistaxis in adults, where adults with recurrent epistaxis had lower MPV and RDW levels [15]. However, little is currently known about RDW and MPV levels in pediatric epistaxis. In this study, for the first time, we aimed to investigate RDW and MPV levels with epistaxis in children.

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http://dx.doi.org/10.1016/j.ijporl.2017.01.030
0165-5876/

2. Material and methods

The study was approved by the Kanuni Sultan Süleyman Training and Research Hospital Clinical Research Ethics Committee, University of Health Ministry, Union General Secretariat of Public Hospitals, Istanbul Cekmece Region (Approval Number: 2016.7). Our study was a retrospective clinical design and included 105 pediatric patients between 2 and 18 years old admitted to our clinic between January 2015 and July 2016 with recurrent epistaxis. The control group consisted of 100 age- and sex- matched pediatric patients who underwent inguinal hernia repair and circumcision surgery between the same dates, without any additional disease. We exclude any child who had abnormal blood parameters (such as anemia, leukocytosis) and a diagnosis of sinonasal infections, concomitant sleep breathing disorders, acute infection, systemic and/or autoimmune diseases and chronic diseases.

RDW and mean platelet MPV levels were measured from the complete blood count (CBC) taken from both groups of patients. CBC samples were placed in test tubes containing EDTA (Ethylenedinitrilo-tetraacetic acid) within an hour to prevent platelet swelling and therefore a false increase in MPV. An automated blood cell counter (Abbott CELL-DYN Sapphire Hematology Analyzer, Santa Clara, CA, USA) was used to measure MPV and RDW, and values in the range of 6.9–10.9 femtolitres (fL) and 11.5%–14.5%, respectively, were considered normal.

Statistical analyses were performed using SPSS software (SPSS 22.0, SPSS, Inc., Chicago, IL). All parameters were expressed as mean ± standard deviation. The Shapiro-Wilk test was used to determine normality of distribution and the Mann-Whitney *U* test was used to compare the parametric data between groups. A value of $p < 0.05$ was considered statistically significant.

3. Results

In the pediatric epistaxis group of 105 patients, 62 (59%) were male and 43 (41%) female; in the control group of 100 patients, 45 were male and 55 female. The average age was 8.53 ± 4.01 years in the epistaxis group and 6.33 ± 3.01 years in the control group (Table 1). The mean RDW was 11.95% ± 1.31% in the epistaxis group and 12.74% ± 1.21% in the control group, a statistically significant difference ($p < 0.05$, Fig. 1). The MPV was 7.49 ± 1.33 fL in the epistaxis group and 7.23 ± 1.06 fL in the control group, but this difference was not significant ($p > 0.05$, Tables 2 and 3).

4. Discussion

Several previous studies have investigated pediatric epistaxis [5,16–19]. The CBC, PT, PTT and INR of children with recurrent epistaxis should be examined to determine whether coagulopathy could be a cause [5]. However, these tests are normal in the majority of the pediatric patient population. In a retrospective study by Damrose et al. in 90 children with epistaxis, only 7.8% had abnormalities in coagulation tests [5]. Katsanis et al. included 36 children with recurrent epistaxis in their prospective study, and found that PT, PTT and INR values of all patients were normal [16]. Sandoval et al. examined 178 pediatric patients with recurrent epistaxis and found coagulopathy in 33% [17].

Table 1
Distribution of age and gender.

	Total	Mean Age	Gender (Male)	Gender (Female)
Patient	105	8,53 ± 4,01	62	43
Control	100	6,33 ± 3,01	45	55

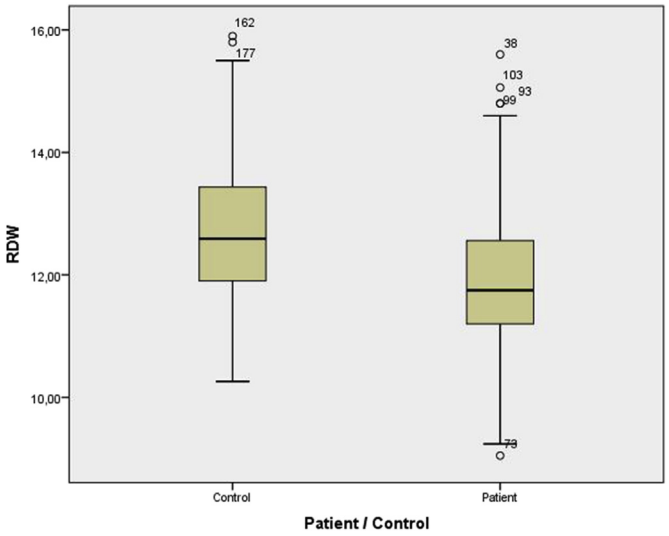

Fig. 1. RDW value effect on groups.

These studies show that routine screening tests for coagulopathy are normal in the majority of patients with epistaxis. In addition, there are no etiological factors such as trauma, infection, inflammation or mass. Therefore, other factors should be considered which may predispose epistaxis in patients and may affect hemostasis. We believe our study to be the first to assess the relationship between RDW and MPW levels and pediatric epistaxis.

Red blood cells, which are known as erythrocytes, can have different volumes due to different circumstances. Red cell distribution width shows the degree of heterogeneity of the red blood cells volume [20]. In the present study, we found lower RDW values in children with epistaxis and the difference between groups was significant. Kemal et al. also found this relationship in adult patients [15]. The relationship between high RDW and various thrombotic events such as cerebral infarct, acute myocardial infarct, and venous thromboembolism has been shown in several studies although the pathophysiological mechanisms, which explain the link, are not fully known [11–14]. Since a high RDW is associated with increased thrombotic activity, a decreased RDW may inhibit platelet-activating mechanisms and therefore may cause an increased tendency to bleed.

Patients in our study were sampled after recurrent nose bleeds during their applications and they have not received any treatment before. Now, it is not possible to say precisely with given data that decreased RDW is a reason or a marker, which accompanies epistaxis or a result. While RDW was expected to be increased due to the stress after epistaxis and increased erythropoietin, finding low RDW values in our study suggested that it should be defined as an accompanying marker rather than a result [20].

It has been shown in many studies in adults that RDW tends to increase with age. The shortening of the DNA telomere length in a given study was significiantly and independently associated with RDW addition. In children, the normal range of RDW does not change by age. It is thought that the 2-year difference between epistaxis and control groups in our study is not effective on RDW [20].

In the study by Kemal et al., statistically lower MPV values were found in the group with epistaxis [15]. It is known that a larger platelet size is correlated with an increased granular and secretion capacity. In addition, higher MPV is related with more releasing capacity of thromboxane A2, platelet factor 4 and thromboglobulin [7,8]. Therefore, it could be assumed that a high MPV is associated