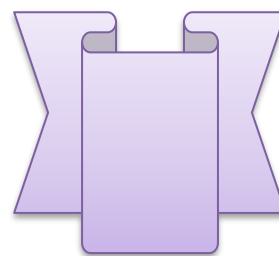
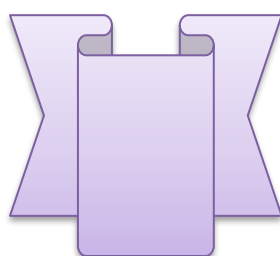
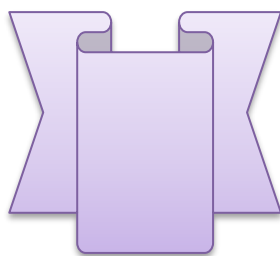
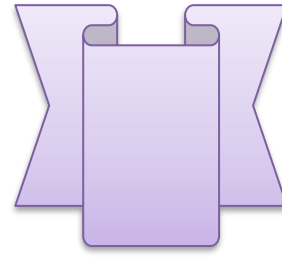
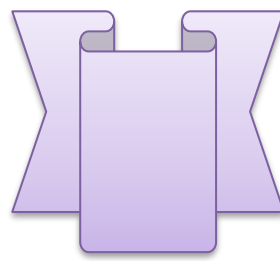
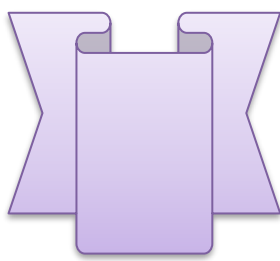
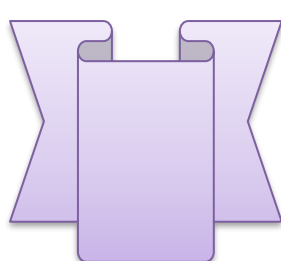
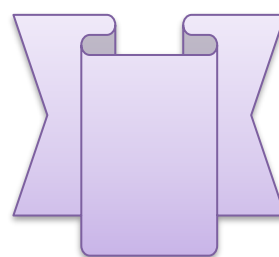
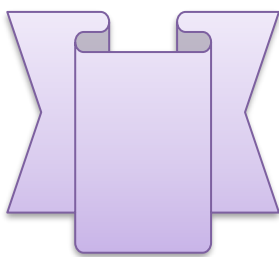
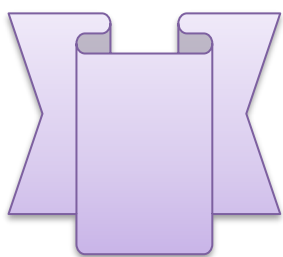


INTERNATIONAL JOURNAL OF MEDICAL ARTS



Volume 5, Issue 10, October 2023

<https://ijma.journals.ekb.eg/>



Print ISSN: 2636-4174

Online ISSN: 2682-3780



Available online at Journal Website
<https://ijma.journals.ekb.eg/>
 Main Subject [Andrology]



Original Article

Value of Platelet Indices in Evaluation of Varicocele Patients and Its Associated Abnormal Semen Parameters: A Cross Sectional Study

Mohamed Ibrahim Hossam Ahmed ^{*1}, Mohamed Ismail M. Kamel ², AbdElaleem AbdElaleem Elgendy ³

¹ Department of Dermatology, Venereology and Andrology, The Egyptian Ministry of Health, Cairo, Egypt

² Department of Dermatology, Venereology and Andrology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

³ Department of Clinical Pathology, Faculty of Medicine, Al-Azhar University, Cairo, Egypt

ABSTRACT

Article information

Received: 24-09-2023

Accepted: 06-11-2023

DOI:
10.21608/IJMA.2023.238566.1821.

*Corresponding author

Email: me66989@gmail.com

Citation: Ahmed MIH, Kamel MIM, Elgendy AA. Value of Platelet Indices in Evaluation of Varicocele Patients and Its Associated Abnormal Semen Parameters: A Cross Sectional Study. IJMA 2023 October; 5 [10]: 3682-3686. doi: 10.21608/IJMA.2023.238566.1821.

Background: Varicocele is present in up to 19–41% of men with primary infertility and 80% of men with secondary infertility. Varicocele is associated with abnormal semen parameters. The role of platelet indices [PIs] in many vascular diseases, including varicocele, has been widely studied.

Aim of the Study: The aim of this study was to evaluate the platelet indices in varicocele patients and its value in association with abnormal semen parameters.

Patients and Methods: A cross sectional study was conducted on 122 male patients with varicocele, recruited from Dermatology, Venereology & Andrology Outpatient Clinics in Al-Azhar University Hospitals, Cairo, Egypt. The patients were classified into two groups [61 patients with varicocele associated with normal semen parameters and 61 patients with varicocele associated with abnormal semen parameters]. All patients were subjected to history taking, general and genital examination, complete blood count [CBC] and Scrotal Doppler Ultrasound. PIs were then compared between the two groups by their characteristics and grade of varicocele using appropriate statistical tests.

Results: Of the studied platelet indices, the mean platelet volume [MPV] and plateletcrit [PCT] were significantly higher in varicocele group associated with abnormal semen parameters compared to varicocele group associated with normal semen parameters [9.5 ± 1.4 vs. to 7.9 ± 0.98 ; and 0.22 ± 0.05 vs. 0.18 ± 0.04]. In the varicocele group associated with abnormal semen parameters, the mean PCT and platelet distribution width [PDW] were significantly higher in the studied varicocele grades II and III compared to grade I. A significant moderate positive correlation was found between MPV and PCT and the number of sperms in the varicocele group associated with abnormal semen parameters.

Conclusion: The study findings indicating that MPV and PCT were significantly higher in Varicocele patients with abnormal semen parameters than in normospermic varicocele patients.

Keywords: Platelets; Platelet indices; Mean platelet volume; Varicocele; Semen.



This is an open-access article registered under the Creative Commons, ShareAlike 4.0 International license [CC BY-SA 4.0] [<https://creativecommons.org/licenses/by-sa/4.0/legalcode>].

INTRODUCTION

Varicocele is defined as an abnormal dilatation, elongation and tortuosity of the scrotal pampiniform plexus of veins. Varicocele incidence is approximately 10-15% of the general male population and in up to 19-41% of men with primary infertility and 80% of men with secondary infertility [1-3].

Measurement of platelet indices [PIs] will provide an indicator for vascular disease and its severity, including varicocele [4, 5]. The role of platelets and PIs in many vascular diseases has been widely studied. Platelet indices [mean platelet volume [MPV], plateletcrit [PCT], and platelet distribution width [PDW]] are standard indicators of platelet function in vascular disease pathophysiology [5]. Increased MPV was found to be associated with the presence and prognosis of many vascular diseases, including peripheral, cerebrovascular, and coronary artery disease [6-8].

The role of PIs in varicocele has also been widely studied, and the higher MPV values were found to be associated with varicocele [4]. Platelet indices might be useful for detection and screening of varicocele and its infertility risk [7]. Platelet indices can also be used as monitoring after varicocelectomy operation, where varicocelectomy can normalize the elevated mean platelet volume levels [4].

Until now, the relationship of platelet indices and their effect on sperm has not been studied in varicocele patients. The objective of this study was to assess the value of platelet indices in varicocele patients associated with abnormal semen parameters.

PATIENTS AND METHODS

A cross sectional study was conducted on 122 male patients with varicocele. The patients were recruited from Dermatology, Venereology and Andrology outpatient Clinics in Al-Azhar University Hospitals. The study patients were classified into two groups [61 patients with varicocele associated with normal semen parameters [Group A] and 61 patients with varicocele associated with abnormal semen parameters [Group B]].

The patients eligible to be included in this study were male patients with varicocele >18 years. However, patients aged below 18 years,

patients with coronary artery disease, hypertension, hyperlipidemia, peripheral vascular disease or diabetes mellitus, patients with history of testicular tumor, hydrocele, undescended testis, inguinal hernia or epididymo-orchitis, inguinal and scrotal surgeries or splenectomy, were not eligible for the study. Patients with hematologic diseases were also excluded. The study patients were recruited consecutively during a period from the first of April 2021 until the end of March 2023.

All study patients were subjected to history taking including Demographic data such as age, occupation, marital status, special habits, medical and surgical history.

The patients were submitted to general examination; including blood pressure measurement, bruises, and lower limb edema, and genital examination; including testicular size, consistency and presence of varicocele. Finally, all studied patients were subjected to semen analysis, scrotal duplex ultrasound and complete blood count [including the studied platelet indices].

An informed consent was taken from all subjects before enrollment in the study. Data privacy and confidentiality were taken into consideration and the collected data were only used for the research purpose.

The statistical analysis was done using SPSS software, version 22.0, for Windows [SPSS, Inc., Chicago, IL]. The demographic data of the studied patients were tabulated and presented in frequency number and percent for categorical variables and mean and standard deviation for continuous variables. The studied characteristics, mean platelet indices were compared between varicocele patients associated with normal semen parameters [group A] and varicocele patients associated with abnormal semen parameters [group B] using chi square and independent t test as appropriate. Also, the mean platelet indices were also compared by the grades of varicocele using t test in varicocele group associated with normal semen parameters and one-way ANOVA analysis in varicocele group associated with abnormal semen parameters.

Pearson's correlation between platelet indices and sperm count was done among the studied varicocele group associated with abnormal semen parameters. P values ≤ 0.05 were used as a level of statistical significance.

RESULTS

The average age of the 122 patients included in the study was 29.6 ± 4.9 years. Among them, 62.3% were married and 39.3% were smokers. Approximately half of the patients [49.2%] had bilateral varicocele, while 32.8% had varicocele on the left side and 18% had varicocele on the right side. The grades of varicocele observed were as follows: 39.3% grade I, 36.1% grade II, 24.6% grade III, and 0% subclinical [table 1].

The average platelet count was measured to be 227.8 ± 48.9 , while the average platelet volume was found to be 8.7 ± 1.5 . Additionally, the mean plateletcrit [PCT] percentage was 0.20 ± 0.05 , and the mean platelet distribution width was 12.2 ± 2.2 [table 2].

The comparison of mean platelet indices between two groups of patients based on their semen parameters is presented in Table 3. Group A represents individuals with varicocele associated with normal semen parameters, while group B represents patients with varicocele associated with abnormal semen parameters. With the exception of mean platelet count and mean platelet distribution width, the mean values of the other studied platelet indices were

significantly higher in group B. Specifically, the mean platelet volume was 9.5 ± 1.4 in group B, whereas it was 7.9 ± 0.98 in group A. Furthermore, the mean plateletcrit percent was 0.22 ± 0.05 in group B compared to 0.18 ± 0.04 in group A.

The average platelet indices categorized by varicocele grades [grade I, II, and III] among patients with varicocele associated with abnormal semen parameters [group B, n=61]. No significant variations were observed in platelet count and mean platelet volume among the three varicocele grades. However, the mean platelet, plateletcrit and platelet distribution width were significantly elevated in varicocele grades II and III compared to grade I, with p-values of 0.001 and 0.01, respectively.

Correlation analysis revealed a significant moderate positive correlation between MPV and PCT, and the number of sperms in this studied group. The correlation coefficient [r] was 0.35 for MPV and 0.34 for PCT. Additionally, although not statistically significant, there was a weak positive relation between PLT and PDW, and the number of sperms in this study group. The correlation coefficient [r] was 0.10 for PLT and 0.21 for PWD [table 5].

Table [1]: Characteristics of all studied patients

Characteristics*		N= 122
Age in years; mean \pm SD [Range]		29.6 \pm 4.9 [19,44]
Marital status	Single	46 [37.7]
	Married	76 [62.3]
Smoking status	No	74 [60.7]
	Yes	48 [39.3]
Varicocele	Bilateral	60 [49.2]
	Left	40 [32.8]
	Right	22 [18.0]
Varicocele grades	Grade I	48 [39.3]
	Grade II	44 [36.1]
	Grade III	30 [24.6]
	Grade 0 [subclinical]	0 [0.0]

Table [2]: Platelet indices in all studied patients

Platelet indices	N= 122
PLT [$\times 10^3/\mu\text{l}$]	227.8 \pm 48.9
Mean platelet volume [MPV]	8.7 \pm 1.5
Plateletcrit [PCT] [%]	0.20 \pm 0.05
Platelet distribution width [PDW]	12.2 \pm 2.2

Table [3]: Comparison of mean platelet indices among the studied patients by semen parameters

Platelet indices	Group A [n= 61]	Group B [n= 61]	P value
	[Normal semen parameters]	[Abnormal semen parameters]	
PLT count [$\times 10^3/\mu\text{l}$]	226.7 \pm 59.5	228.9 \pm 35.9	0.80
Mean platelet volume	7.9 \pm 0.98	9.5 \pm 1.4	<.0001*
Plateletcrit [PCT] [%]	0.18 \pm 0.04	0.22 \pm 0.05	<.0001*
Platelet distribution width	11.7 \pm 1.6	12.4 \pm 2.4	0.19

Table [4]: Mean platelet indices by grades of varicocele among the studied abnormal semen parameters [group B] patients [n= 61]

Platelet indices	Grade I varicocele [n= 8]	Grade II varicocele [n= 23]	Grade III varicocele [n= 30]	P value
PLT [$\times 10^3/\mu\text{l}$]	217.2 \pm 61.3	221 \pm 40.9	237 \pm 35.9	0.16
Mean platelet volume	8.7 \pm 1.6	9.4 \pm 1.8	9.9 \pm 2.0	0.15
Plateletcrit [PCT] [%]	0.18 \pm 0.05	0.21 \pm 0.04	0.31 \pm 0.09	0.001*
Platelet distribution width	11.1 \pm 0.5	12.2 \pm 1.9	13.4 \pm 2.4	0.01*

Table [5]: Pearson's correlation between platelet indices and sperm count among the studied varicocele patients with abnormal semen parameters [n= 61]

Platelet indices	Mean \pm SD	Sperm count Mean \pm SD	Correlation coefficient [r]	P value
PLT [$\times 10^3/\mu\text{l}$]	228.9 \pm 35.9	16.6 \pm 16.4	0.10	0.47
Mean platelet volume [MPV]	9.5 \pm 1.4	16.6 \pm 16.4	0.35	0.01*
Plateletcrit [PCT] [%]	0.22 \pm 0.05	16.6 \pm 16.4	0.34	0.01*
Platelet distribution width	12.4 \pm 2.4	16.6 \pm 16.4	0.21	0.16

DISCUSSION

The current study was conducted to assess the value of platelet indices in varicocele patients and its associated abnormal semen parameters. Among the studied patients, the mean platelet count was 227.8 ± 48.9 , the mean platelet volume was 8.7 ± 1.5 , the mean PCT percent was 0.20 ± 0.05 , and the mean PDW width was 12.2 ± 2.2 . Comparing these results by semen parameters, the study showed that MPV was significantly increased in varicocele patients associated with abnormal semen parameters. Although it was higher in varicocele patients associated with abnormal semen parameters, the PLT count and PDW showed no significant differences. Consistent with this finding, patients with varicocele showed significantly higher MPV [8]. In contrast to these finding, however, **Polat et al.** [9] found no significant difference in terms of platelet count and other platelet indices [MPV, PDW and PCT] between the normal and abnormal semen parameters [$P > 0.05$].

Comparing platelet indices by varicocele grades in the present study, there was no statistically significant differences in the mean platelet indices by grades of varicocele among the varicocele group associated with normal semen parameters. In the varicocele group associated with abnormal semen parameters, however, the mean PCT and PDW were significantly higher in the studied varicocele grades II and III compared to grade I with p value of 0.001 and 0.01, respectively. Also, mean PLT count and MPV was higher in varicocele patients with grade III in varicocele group associated with abnormal semen parameters, although not significant. This result makes

speculate that whether platelet count affects MPV in varicocele patients or the PLT was associated with the pathogenesis of varicocele [10], and consistent with these findings, **Bozkurt et al.** [10] stated that the increase in MPV was due to the varicocele disease and that the increase in the grade of varicocele was associated with higher MPV in varicocele patients. Similarly, MPV in patients with varicocele was found to be significantly higher than in healthy subjects without varicocele [2].

In our study, the mean PCT and PDW were significantly higher in the studied varicocele grades II and III compared to grade I in varicocele group associated with abnormal semen parameters. **Zhang et al.** [11], however, found no significant differences between patients with varicocele and those without varicocele regarding the level of PDW. Also, comparison of PDW between patients with varicocele and those without varicocele has showed no significant difference in a recent Turkish study [12]. However, there is no discrepancy between our study and the two previously mentioned studies as these two studies had compared the level of PDW between health subjects and varicocele patients. In our study, however, we compared varicocele patients by their varicocele grades where the mean PDW was increased by increasing grades of the varicocele. Several studies concerning the PDW levels and varicocele gained conflicted conclusion [12-15]. Of course, the number of studies about PDW and varicocele was less [8], and our study is one that concerned with comparing the PDW among patients with varicocele by their grades.

The present study results found significant moderate positive correlation between MPV, PCT

and the number of sperms among the studied varicocele group associated with abnormal semen parameters. Although not significant, there have also been positive, but weak, relation between the PLT count and PDW and the number of sperms among this studied group. There is limited research exploring any potential relationship between platelet indices and sperm characters in varicocele patients.

Finally, based on the findings of our study, it is postulated that increased platelet indices [MPV and PCT] in varicocele patients may be related to the effect of varicocele on number of sperms.

The strengths of this study include that it is the first to study the value of platelet indices in evaluation of varicocele patients and its associated abnormal semen parameters. Unlike other similar studies, the sample size was relatively large and included 122 patients with various grades of varicocele that allowed comparison of the studied platelet indices by varicocele grades. Furthermore, the study was compared the platelet indices by semen parameters [normal vs. abnormal], and finally the study estimated the correlation between platelet indices and sperm count among the studied varicocele patients associated with abnormal semen parameters.

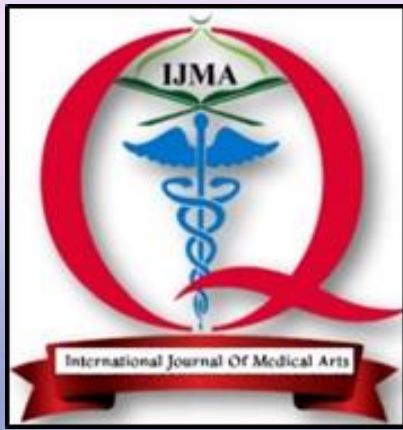
There are some limitations to this study. Other markers of platelet activation [platelet factor IV and β -thromboglobulin] and inflammation markers were not recorded and analyzed. The future studies should be taken these markers into consideration.

Conclusion: The study findings indicating that [MPV and PCT] were significantly higher in varicocele patients with abnormal semen parameters than in normospermic varicocele patients. More studies involving larger sample size are needed to evaluate the association of platelet indices and abnormal semen parameters.

Financial and non-financial relations and activities of interest: None

REFERENCES

- Jungwirth A, Giwercman A, Tournaye H, Diemer T, Kopa Z, Dohle G, Krausz C; European Association of Urology Working Group on Male Infertility. European Association of Urology guidelines on Male Infertility: the 2012 update. *Eur Urol.* 2012 Aug;62[2]:324-32. doi: 10.1016/j.eururo.2012.04.048.
- Pyo JS, Cho WJ. Mean Platelet Volume, Platelet Distribution Width, and Platelet Count in Varicocele: A Systematic Review and Meta-Analysis. *Cell Physiol Biochem.* 2016;38[6]:2239-46. doi: 10.1159/000445579.
- Wang NN, Dallas K, Li S, Baker L, Eisenberg ML. The association between varicoceles and vascular disease: an analysis of U.S. claims data. *Andrology.* 2018 Jan;6[1]:99-103. doi: 10.1111/andr.12437.
- Zhang QF, Liang JH, He TH, Huang ZX, Liu QL, Zhang X, *et al.* Relationship between varicocele and platelet indices: changes of mean platelet volume before and after operation. *Andrology.* 2019 Nov;7[6]:846-851. doi: 10.1111/andr.12605.
- Beyan C, Beyan E. Mean platelet volume may not be related to the physiopathology of varicocele. *Andrologia.* 2015;47[4]:367. doi: 10.1111/and.12282.
- Gasparyan AY, Ayvazyan L, Mikhailidis DP, Kitis GD. Mean platelet volume: a link between thrombosis and inflammation? *Curr Pharm Des.* 2011;17[1]:47-58. doi: 10.2174/138161211795049804.
- Ghanem MA, Adawi EA, Hakami NA, Ghanem AM, Ghanem HA. The predictive value of the platelet volume parameters in evaluation of varicocelectomy outcome in infertile patients. *Andrologia.* 2020 Jun;52[5]:e13574. doi: 10.1111/and.13574.
- Garolla A, Torino M, Miola P, Caretta N, Pizzol D, Menegazzo M, Bertoldo A, Foresta C. Twenty-four-hour monitoring of scrotal temperature in obese men and men with a varicocele as a mirror of spermatogenic function. *Hum Reprod.* 2015 May;30[5]:1006-13. doi: 10.1093/humrep/dev057.
- Polat H, Sarica MA, Bulut HT, Yucel MO, Gok A, Cift A, Kalyenci B. The relationship between mean platelet volume and other platelet indices with testicular artery blood flow and fertility: a preliminary study. *Int J Clin Exp Med.* 2015 Jul 15;8[7]:11554-8. PMID: 26379980
- Bozkurt Y, Soylemez H, Sancaktutar AA, Islamoglu Y, Kar A, Penbegul N, *et al.* Relationship between mean platelet volume and varicocele: a preliminary study. *Urology.* 2012 May;79[5]:1048-51. doi: 10.1016/j.urology.2012.01.019.
- Zhang Y, Wu X, Zhang W, Gao J, Zhang Y, Zhang X. Platelet indices and varicocele: A systematic review and meta-analysis. *Andrologia.* 2021 Mar;53[2]:e13939. doi: 10.1111/and.13939.
- Yilmaz M, Karaaslan M, Ceylan C, Tonyali S. The Evaluation of Platelet Volume Indices in Patients with Varicocele. *Grand J Urol.* 2021;1[1]:6-8. doi: 10.5222/GJU.2021.43531.
- Pogorzelska K, Krętońska A, Krawczuk-Rybak M, Sawicka-Żukowska M. Characteristics of platelet indices and their prognostic significance in selected medical condition - a systematic review. *Adv Med Sci.* 2020;65[2]:310-315. doi: 10.1016/j.advms.2020.05.002.
- Mahdavi-Zafarghandi R, Shakiba B, Keramati MR, Tavakkoli M. Platelet volume indices in patients with varicocele. *Clin Exp Reprod Med.* 2014 Jun;41[2]:92-5. doi: 10.5653/cerm.2014.41.2.92.
- Çoban S, Keleş I, Biyik I, Güzelsoy M, Türkoğlu AR, Özgünay T, Ocak N. Is there any relationship between mean platelet volume and varicocele? *Andrologia.* 2015 Feb;47[1]:37-41. doi: 10.1111/and.12220.



International Journal

<https://ijma.journals.ekb.eg/>

Print ISSN: 2636-4174

Online ISSN: 2682-3780

of Medical Arts