

**A LABORATORY STUDY OF BLOOD PLATELET DISTRIBUTION WIDTH (PDW) IN LARYNGEAL CANCER PATIENTS BEFORE AND AFTER SURGERY****Moayad Jalal Kheirbek^{1*}, Mostafa Ibrahim² and Faisal Radwan³**¹Postgraduate Student (PhD), Department of Ear, Nose, Throat and Head Diseases, Faculty of Human Medicine, Tishreen University, Latakia, Syria.²Professor, Department of Ear, Nose, Throat and Head Diseases, Faculty of Human Medicine, Tishreen University, Latakia, Syria.³Assistant Professor, Department of Laboratory Medicine, Faculty of Human Medicine, Tishreen University, Latakia, Syria.***Corresponding Author: Moayad Jalal Kheirbek**

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ABSTRACT

Laryngeal cancer constitutes 2% of diagnosed cancer cases and affects men more than women, with an incidence rate of 100, 000/5. The aim of the research was to study changes in platelet distribution width (PDW) in patients before and after surgery, and then compare these values with a control group. The research was conducted on all patients who underwent laryngectomy in 2022 and 2023 from the Department of Otorhinolaryngology and Surgery at Tishreen University Hospital in Latakia, after obtaining informed consent, where a prospective study was conducted, and the number of patients reached (30) patients. A research form was organized for the patients. The results of the research showed that there were no significant changes in platelet distribution width (PDW) in patients with laryngeal cancer one week after surgery compared to their values before surgery. Laryngeal cancer patients had significantly higher PDW levels than healthy individuals, both before and after surgery. The study recommends the importance of conducting more studies to confirm our results in larger groups of patients and different and multiple time periods. The association of PDW with the general condition of patients should be evaluated and factors that may affect their PDW should be investigated, such as the type of anesthesia, the type of chemotherapy or radiotherapy involved, and the patient's general health condition.

KEYWORDS: PDW, laryngeal cancer, patients.**INTRODUCTION**

Laryngeal cancer is one of the most common head and neck cancers, and the incidence rate of males to females is 10/1. The most common areas of infection are the glottis, and the most common histological pattern is squamous cell carcinoma.^[1,2]

PDW refers to the variation in platelet size, and is considered an indicator of platelet function and activity. A direct relationship was found in healthy people between MPV and PDW, and the normal values for platelet distribution width range between 16.7-9.2 fl.^[3,4]

The analysis is performed by drawing a venous blood sample and placing it in a tube containing EDTA on an automated blood analyzer as part of the complete blood count (CBC) analysis, where a set of mathematical calculations are performed to determine its value.^[5,6]

It is known that tumor cells, unlike normal cells, produce quantities of special proteins that activate plasminogen, which can affect all local and systemic hemostasis systems.^[7]

Detailed information about fibrinolysis in patients with laryngeal cancer is very limited, especially in the postoperative period.

The study of PDW in patients with laryngeal cancer before and after surgery is an important topic in the field of laryngeal surgery. Due to the technical and scientific development in the departments of otolaryngology and laboratory medicine at Tishreen University Hospital, it was important to conduct this study, which will add an additional insight to the current medical literature that will facilitate the management of these cases by otolaryngologists and head and neck surgeons. PDW measurements can help improve surgical outcomes by identifying patients who are more susceptible to surgical

complications and providing preventive interventions. This research may lead to the development of new mechanisms that help in the management of laryngectomy patients.

The aim of the research was to study the PDW changes in patients with laryngeal cancer before and after surgery, by studying the difference in PDW values for patients before and after surgery, and then comparing these values with a control group.

METHODS AND MATERIALS

The research was conducted on all patients who underwent laryngectomy surgery in 2022 and 2023 from the referrals of the Department of Otorhinolaryngology and Surgery at Tishreen University Hospital in Lattakia, after obtaining informed consent, where a prospective study was conducted, and the number of patients reached (30) patients. A research form was organized for the patients.

A research form was organized for the patients, and the form included the following

- 1- Patient's identity.
- 2- The chief complaint the major health problem or concern, The complaint brought by the patient.
- 3- History of the present illness: detailing the complaint along with accompanying complaints, past medical, medication and family history.
- 4- Clinical examination: Conduct a clinical and endoscopic examination of the larynx.
- 5- Radiological investigations: A radiological study to determine the stage of the tumor.

6- Pathological anatomical findings.

7- PDW values before and after surgery, and PDW values in control cases.

The results of laboratory tests for PDW were compared for patients with controls immediately before surgery, for patients with controls one week after surgery, for patients immediately before surgery and one week after surgery.

Exclusion criteria: Within two months of previous surgery and non-surgical patients, or patients with severe tissue trauma, within three months of chemotherapy or radiotherapy, patients with sepsis or serious hepatic, hematologic, and renal diseases, patients with other cancers or a history of previous cancer.

Equipment used: CBC analyzer Sysmex to determine PDW values.

Kits: In this research, I used kits available from international companies recognized by scientific research centers, such as Biorex (India).

RESULTS AND DISCUSSION

The PDW results of patients were compared immediately before surgery, and one week after surgery, as well as the PDW laboratory test results of patients with controls immediately before surgery, and patients with controls one week after surgery.

Comparison of PDW laboratory test results for patients immediately before surgery and one week after surgery.

Table 1: Results of the t-test for the difference between the mean values of platelet distribution width for patients immediately before surgery and one week after surgery.

Paired Samples Statistics

PDW	N	Mean	Std. Deviation	Std. Error Mean
Pre-surgical	30	11.8467	3.67355	0.67070
Post-surgical	30	11.7267	3.13027	0.57151

Paired Samples Test

T	Df	Sig. (2-tailed)	Mean	Std. Error Mean	95% Confidence Interval of the Difference	
					Lower	Upper
0.752	29	0.458	0.12000	0.87352	-0.20618	0.44618

From Table (1), it was found that the average platelet distribution width of patients before surgery was (11.8467) fl with a standard deviation of (3.67355), and the average platelet distribution width of patients after surgery one week was (11.7267) fl with a standard deviation of (3.13027). It was found that the probability value of significance was $P=0.458>0.05$, which indicates that there is no statistically significant difference between the average platelet distribution width of patients before and one week after surgery.

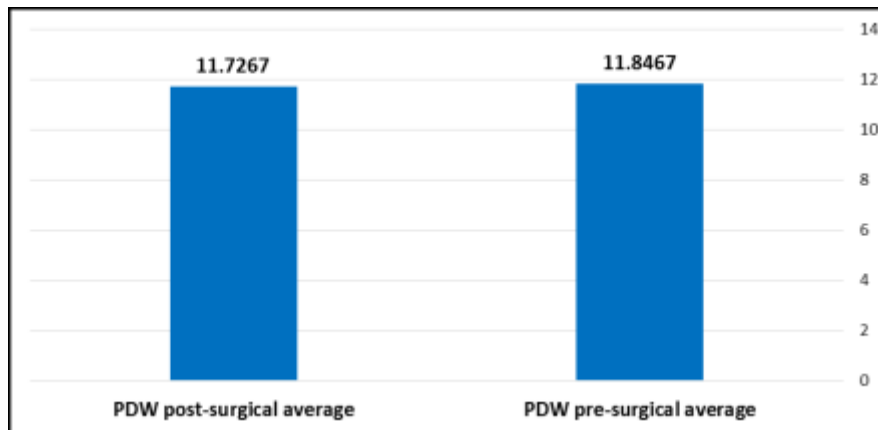


Figure 1: Chart of the difference between PDW values for patient before surgery and one week postoperatively.

Comparison of laboratory test results to display platelet distribution in patients immediately before surgery and the control group.

Table 2: T-test results for the difference in the results of PDW laboratory tests For patients immediately before surgery, with the control group.

Group Statistics

PDW	N	Mean	Std. Deviation	Std. Error Mean
Pre-surgical	30	11.8467	3.67355	0.67070
Control group	30	9.9800	0.46118	0.08420

Independent Samples Test

T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
2.762	58	0.008	1.86667	0.67596	0.51358	3.21975

From Table (2) it was found that the average platelet distribution width of patients before surgery was (11.8467) fl with a standard deviation of (3.67355), and the average platelet distribution width of the control group was (9.98) fl with a standard deviation of (0.46118). It was found that the probability value of

significance $P = 0.008 < 0.05$, which indicates the presence of a statistically significant difference between the average platelet distribution width of patients before surgery and the control group, and this difference is in favor of the platelet distribution width of patients before surgery.

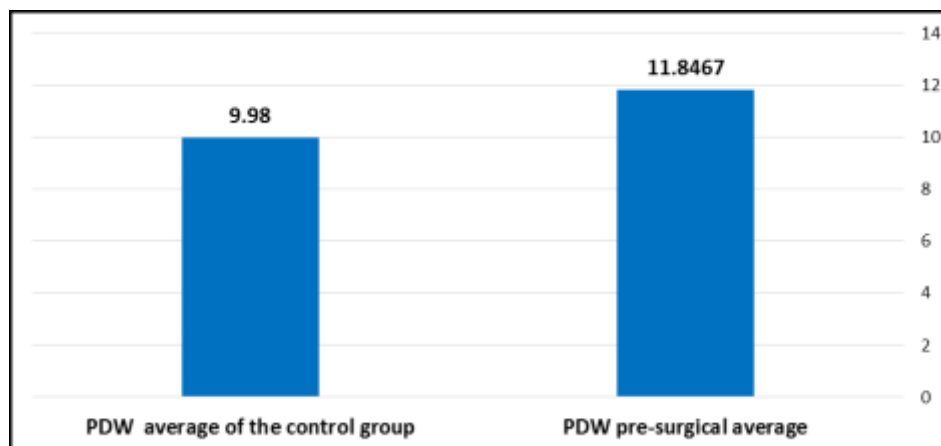


Figure 2: Chart of the difference between PDW values for preoperative patients and the control group.

Comparison between the results of PDW laboratory tests for patients one week after surgery, with the control group.

Table 3: T-test results. test for the difference in the results of PDW laboratory tests for patients one week postoperatively, with the control group.**Group Statistics**

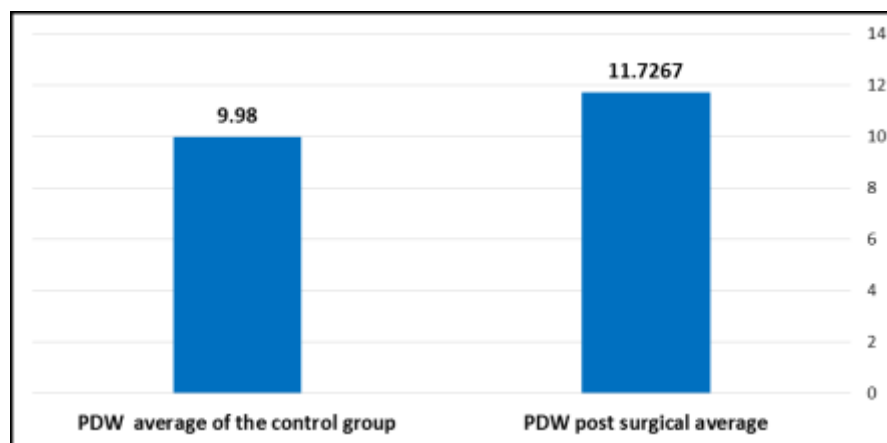
PDW	N	Mean	Std. Deviation	Std. Error Mean
Post-surgical	30	11.7267	3.13027	0.57151
Control group	30	9.9800	0.46118	0.08420

Independent Samples Test

T	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
3.024	58	0.004	1.74667	0.57768	0.59032	2.90301

From Table (3), it was found that the average platelet distribution width of patients after one week of surgery was (11.7267) fl with a standard deviation of (3.13027), and the platelet distribution width of the control group was (9.98) fl with a standard deviation of (0.46118). It was found that the probability value of significance was

$P=0.004<0.05$, which indicates the presence of a statistically significant difference between the average platelet distribution width values of patients after one week of surgery and the control group, and this difference is in favor of the platelet distribution width of patients after one week of surgery.

**Figure 3: Chart of the difference between PDW values for patients one week postoperatively and the control group.****CONCLUSIONS**

1- The results showed no statistically significant difference between the mean values of platelet distribution width (PDW) of patients before and after one week of surgery, which indicates that PDW is not affected by laryngectomy one week after surgery, and there are several possible reasons for this, including

- Nature of surgery: Laryngeal cancer surgery may have less effect on platelet production and blood clotting mechanisms compared to other types of surgery.
- Time: The first week after surgery may be a very short period to monitor any significant changes in platelet size, which may appear more clearly after a longer period of time.
- Individual factors: Each patient's response to surgery and treatment may vary individually, which may reduce the strength of the overall effect of surgery on the patient group.
- Other factors: There may be other factors that affect platelet size and mask any potential effect of surgery, such as the type of anesthesia, the type of chemotherapy or radiation therapy involved, and the patient's general health condition.

2- The results showed a statistically significant difference between the mean platelet distribution width (PDW) of patients before surgery and the control group, and this difference was in favor of the platelet distribution width (PDW) of patients before surgery, which indicates that laryngeal cancer patients may have higher levels of PDW compared to healthy people, and there are several possible explanations for this result

- Chronic inflammation: Laryngeal cancer is often associated with chronic inflammation in the body, and this inflammation can lead to changes in platelet production and size.
- Nutrition: There may be differences in nutrition between cancer patients and healthy people, which affects platelet production.
- Treatment: The treatment used for laryngeal cancer may have an effect on platelet production and size, such as chemotherapy or radiation.
- Cancer itself: Cancer may directly affect the bone marrow, which is the place where platelets are produced, leading to changes in their size.

3- The results showed a statistically significant difference between the mean platelet distribution width (PDW) of patients one week after surgery and the control group, and this difference is in favor of the platelet distribution width (PDW) one week after surgery, which indicates that PDW may increase in laryngeal cancer patients one week after surgery compared to healthy people, and there are several possible explanations for this result

- Inflammatory response to surgery: It is normal for an inflammatory response to occur after surgery, this response may lead to increased production of platelets that vary in size, which increases the PDW value.

- Changes in platelets: Surgery or medications used during the treatment period may affect platelet production or function, which leads to differences in platelet size, which increases the PDW value.

- Other factors: Other factors may play a role in the increase in the PDW value, such as the type of anesthesia used and the general health condition of the patient.

Our results are consistent with the studies of

1- Erliang et al., which were conducted at Harbin Medical University Hospital in China and published in 2021 under the title prognostic value of platelet distribution width and mean platelet volume in patients with laryngeal cancer.^[8]

The study aimed to determine the prognostic value of mean platelet volume (MPV) and platelet distribution width (PDW) as survival indicators in laryngeal cancer patients. The study included (640) patients with laryngeal cancer. A statistical study was conducted and they found that high PDW and low MPV values can serve as independent biomarkers for worse survival in laryngeal cancer patients. They concluded that high PDW and low MPV can be used as blood markers to predict poor survival in laryngeal cancer patients.

2- The study of Shuang et al. conducted at Harbin Medical Hospital in China and published in 2017 under the title of Platelet indices in laryngeal cancer.^[9]

The study aimed to verify the relationship of platelet markers with laryngeal cancer.

The study included 216 patients with laryngeal cancer with 189 patients with benign laryngeal lesions and 213 controls during 2015, and clinical and laboratory data of the participants were collected at the time of initial diagnosis.

The results showed that MPV values were significantly lower and PDW values were significantly higher in patients with laryngeal cancer compared to controls and patients with benign laryngeal lesions. The prevalence of laryngeal cancer increased with lower MPV values and higher PDW values. MPV and PDW played a role as a risk factor in distinguishing between laryngeal cancer and benign laryngeal lesions. They concluded that

patients with laryngeal cancer had lower MPV and higher PDW compared to those without laryngeal cancer. In addition, MPV and PDW values differed in patients with malignant tumors than benign lesions.

RECOMMENDATIONS

1- Conducting more studies to confirm our results in larger groups of patients and different and multiple time periods for analysis.

2- Evaluate the association of PDW with the general condition of patients and investigate factors that may affect their PDW such as the type of anesthesia, the type of chemotherapy or radiation therapy, and the patient's general health condition.

3- Evaluate the association of MPV with clinical outcomes of patients, such as survival rates and cure from cancer.

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