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Correlation between Ultrasound scan and D-dimer test in deep vein thrombosis in Aseer area, Saudi Arabia.

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Recently many people all over the world suffer from deep vein thrombosis. The ultrasound plays an effective role in diagnosis DVT, because it is safe, cheap, fast, has dynamic evaluation and real-time imaging. There for correlation between Ultrasound scan and D-dimer test in deep vein thrombosis is significant. Aim of the study: to find the correlation of using ultrasound and D dimer test in the diagnosis of DVT, the efficiency and accuracy of both of them either as a companied diagnostic method or as an individual method. The study will decrease the time waiting to start in management process. This is a retrospective descriptive study to assess the Correlation between Ultrasound scan and D-dimer test in deep vein thrombosis, cross-sectional study including 186 patients with lower limbs pain. Attended to Aseer central Hospital, emergency Department, Abha, Saudi Arabia. we started collecting data one year prior to November 2022, The study have included both gender with (deep vein thrombosis), The cases that we have studied are available on the PACS system of Radiology Department in Aseer Hospital, which reported previously with DVT protocol, D dimer test result are collected from the hospital information system. All the information are anonymous and confidential. A total of 186 patients with lower limbs pain and swelling coming to emergency department, Aseer Hospital, Saudi Arabia, refer to do the US and D dimer test. They were 80 males (43%), and 106 were females (57%). of the US and D dimer test for assessing DVT for all cases coming to emergency department with lower limbs complain and swelling. It has high sensitivity (86%). Specificity is (23%), PPV (25%), and NPV (84 %) for Correlation between Ultrasound scan and D-dimer test in deep vein thrombosis.ultrasound plays an effective role when Correlate with D-dimer test in deep vein thrombosis with excellent sensitivity and adequate accuracy. It should have considered as a primary imaging modality for lower limbs complained and swelling.

Keywords: Ultrasound, sensitivity, Deep vein thrombosis, specificity.

INTRODUCTION

Deep vein thrombosis (DVT) is the occurrence of a clot in the lower limbs vein. It usually diagnosed by ultrasound.

The aim of this study is to find the correlation of using ultrasound and D dimer test in the diagnosis of DVT cases and the accuracy either of them companied or as individual test, to implement a better management for DVT cases and decrease the time waiting to start in management process.

Testing for D-dimer and a normal baseline ultrasound examination decreases the number of subsequent ultrasound examinations considerably without any increased risk of venous thromboembolic complications. Ultrasound and D-dimer test enabled treatment decisions to be made at the time of presentation in most patients (E Bernardi et al. 1998)The ability to perform ultrasound scanning to assess for lower extremity DVT accounts for 90% to 95% of total DVT, That can significantly impact emergency room throughput and the avoidance of additional unnecessary investigations . When the patient considered as a low risk patient, bedside assessment can be useful to prevent the utilization of a d-dimer test and formal elective ultrasound scan. D-dimer has a high amount of false positive results, causing additional workup to be completed. (Lee JA, et al. 2011and Wells PS, et al. 2003) Elective ultrasound is not always available, and the test usually takes one hour to perform (Enrico Bernardi et al. 1998) Using of D-dimer with ultrasound in the diagnosis of patients with possible deep vein thrombosis is highly cost-

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effective (Cho, et al. 2020)

MATERIALS AND METHODS

This study is a descriptive cross-sectional one conducted at the Radiological Center in Aseer Hospital, Aseer Region - SAUDI ARABIA. Randomly selected sample size of 186 adult patients from different age groups male and female. Sample included all the cases performance of the US and D dimer test for assessing DVT, all cases coming to emergency department with lower limbs complain and swelling that have been suspected DVT. We started collecting data one year prior to November 2022, the cases that we have studied are available in the PACS system of Radiology Department, which reported previously with DVT and other are negative ultrasound finding. Ultrasound protocol, D dimer test result are collected from the hospital information system. All the information are anonymous and confidential.

Pediatric and neonate are excluded from this study. ULTRASOUND Machine is GENERAL 4D ADVANCE – PHILIPS – EPIQ7 – USA, Transducer; A high-frequency linear probe -vascular linear 7.5 - 12 MHz transducer to improve resolution. The technique protocol meets the standard by the American Institute of Ultrasound in Medicine (AIUM). (lan B, et al. 2012)

Statistical analysis

Data were collected in the tabulated database sheet and analyzed using SPSS version 20 (IBM corporation, Armonk, SY, USA). Descriptive statistics describe the qualitative data as frequency and mean with standard deviation (SD). The statistical diagnostic test was applied to find the US's sensitivity and specificity in diagnosing various Deep vein thrombosis correlated to d dimer test.

RESULTS

A total of 186 patients with lower limbs pain and swelling coming to emergency department, Aseer Hospital, Saudi Arabia, refer to do the US and D dimer test. They were 80 males (43%), and 106 were females (57%) (Table 1); the age range was 12 to 89 years. The mean age was 52.4 years,. Most of the patients were frequent in 66 years and older, then 46-55 years and less frequent less than 25 years (figure 2 and 3). The distribution of sonographic findings of the DVT among males and females was demonstrated in table 3 and figure 3. DVT ultrasound finding for females and males (22 vs. 21), respectively.

Table 7 summarizes the performance of the US and D dimer test for assessing DVT for all cases coming to emergency department with lower limbs complain and swelling. It has high sensitivity (86%). Specificity is (23%), PPV (25%), and NPV (84 %) for Correlation between Ultrasound scan and D-dimer test in deep vein thrombosis.

Correlation Between Ultrasound scan and D-dimer test in DVT

Table 1 : Gender frequency of the study sample					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	80	43.0	43.0	43.0
	female	106	57.0	57.0	100.0
	Total	186	100.0	100.0	



Figure 1: Gender frequency of the study sample







Figure 2.: Distribution of Age Groups frequency

Table 3:	Ultrasound	finding	frequency	of	the	study
sample						

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Normal	143	76.9	76.9	76.9
	Abnormal	43	23.1	23.1	100.0
	Total	186	100.0	100.0	



Figure 3: Age groups Ultrasound finding frequency of the study sample

Table 🦂	4:	distribution	of	ultrasound	findings	of	DVT
accord	ing	g to gender					

		Ultrasou	Total	
		Normal		
Gender	male	58	22	80
	female	85	21	106
Total		143	43	186



Figure 4: Distribution of ultrasound findings of DVT according to gender

Table 5: Gender D- dimer cross- tubulation finding

		D- dimer result (Binned)		Total
		Normal	Abnormal	
Gender	male	11	69	80
	female	27	79	106
Total		38	148	186



Fingure 5: Gender D- dimer cross- tubulation finding

Table 6: Ultrasound * D-dimer result (Binned) Cross tabulation Count

		D- dimer re	esult (Binned)	Total
		Normal	Abnormal	
Ultrasound	Normal	32	111	143
Finding	Abnormal	6	37	43
Tot	al	38	148	186



Figure 6: Ultrasound * D-dimer result (Binned) Cross tabulation



Figure 7: Age groups Ultrasound finding frequency of the study sampl

Fable 7:Performance of US in the diagnosis of DVT an	d
D- dimer test result	

Absence or presence of DVT	Values
True positive (TP)	37
True negative (TN)	32
False-positive (FP)	111
False-negative (FN)	6
Performance of US in the	diagnosis of DVT
pathologies	
Sensitivity	86%
Specificity	23%
Desitive was disting value (DD)/)	
Positive predictive value (PPV)	25 %



Image 1: A Doppler sonogram shows DVT of a common femoral vein.

Correlation Between Ultrasound scan and D-dimer test in DVT



Image 2: A Doppler sonogram shows DVT of a left Popliteal vein.



Image 3: A sonogram shows DVT of a left Popliteal vein.

DISCUSSION

Ultrasound is the best imaging modality for assessing deep vein thrombosis and it provides useful information for several pathologies that affect the lower limbs, because it is safe, cheap, fast, has dynamic evaluation and real-time imaging (E Bernardi, et al 1998)

In this study, as a total of 186 patients with lower limbs pains and swelling who had been scan with the US and D dimer test. The prevalence of lower limbs pains and swelling was more frequent in females than males; 106 females (57%) vs. 80 males (43%), 43 patients of them had DVT finding in ultrasound scanning, 6 patient of them having normal D dimer test and 37 patients having high D dimer test (with high sensitivity (86%), this agree with Enrico Bernardi et al. 1998) and (Swaroopa Pulivarthi et al.

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2014) (investigate the efficacy of using a rapid plasma ddimer test as an adjunct to compression ultrasound for diagnosing clinically suspected deep vein thrombosis.) and 143 Patients are normal ultrasound finding.

148 patients having high D dimer test and 38 patient having low D dimer test. Our study shows more patient having high D dimer test with no DVT finding in ultrasound this disagree with study done by Clive, (Clive Kearon, et al 2022) (The diagnostic strategy **u**sing a combination of clinical pretest probability and D-dimer identified a group of patients at low risk for DVT during follow-up while substantially reducing the need for ultrasound imaging.) However, trauma, surgery, and motor weakness are known as factors that affect D-dimer levels.

38 of the 43 patients with DVT diagnosed by ultrasound had high D dimer result, this is similar to study done by: (Cho, et al. 2020) (Ultrasound is a useful screening parameter for deep vein thrombosis when D-dimer levels is high.

(When the cutoff D-dimer level was set at 2.20 $\mu g/ml$ for DVT, the sensitivity was 0.64% and the specificity was 0.69%.)

The current study found that the elevation of the D dimer result does not necessarily mean the presence of DVT, this similar to study done by Swaroopa Pulivarthi, et al, (Swaroopa Pulivarthi, et al 2014) which said: (Every effort should be made to implement the diagnostic strategies for VTE. The major limitation of D-dimer testing is its use in special clinical settings that result in low specificities, such as in oncology patients, elderly patients, and pregnant women. However, the test retains its high sensitivity and NPV in those situations.)

CONCLUSION

Ultrasound plays an effective role when Correlate with Ddimer test in deep vein thrombosis with excellent sensitivity of (86%) when correlate with D dimer test. It should have considered as a primary imaging modality for lower limbs complained and swelling.

CONFLICT OF INTEREST

The authors declared that present study was performed in absence of any conflict of interest.

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AUTHOR CONTRIBUTIONS

ABDULRHMAN SALEM contributed to the study design and literature search. SAEED MOSHABAB: definition of intellectual content, Sayda Abdelrahim: edited and reviewed the manuscript. Motaen Ibrahim Tomehy: performed the literature search. Elgeili Yousif; manuscript preparation and data acquisition and statistical analysis.

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