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Journal of Applied and Basic Sciences (JABS), the official publication of the Ambrose Alli University, Ekpoma, Nigeria, publishes original research papers, review articles, techniques, short reports, case reports, letters conference proceedings and book reviews from all over the world, in all aspects of sciences.

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Journal of Applied and Basic Sciences is a multidisciplinary peer-review journal in clinical sciences. JABS is international in scope and publishes articles of scientific excellence written in English, in all aspects of Medicine, Engineering, Agriculture, Environmental and Natural Sciences. It is published twice a year in January and July.

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Each article should include an abstract of not more than 250 words. The abstract should give the rationale for the study, describe the methods, present the significant results and state succinctly the interpretation of the data.

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Author(s) should supply up to four key words that may be used for indexing from the list provided. This should be placed at the end of the abstract.

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Text should be organised as follows:

Introduction, Methods, Results, Discussion and references. The introduction should describe the purpose of the study

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Acknowledgement

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Books

2. Oluwasumi J.O. *Plastic Surgery in the tropic*, London, Macmillan, 1979; 44-74

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3. Lambo T.A. Researchers in Human Science. In: Igene J.O., Chikwen J.O., Omotara B.A., Oyegbile S.A. eds *primary health Care*, Ibadan, Ibadan University Press, 1985:5-10.

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2. Expenses for colour reproduction of figures
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Book Reviews

JABS will review selected books in all aspects of sciences from time to time. Authors interested in having a book reviewed should send a copy to the Editor-in-Chief.

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Sonography of deep venous thrombosis of the lower limb in Ilorin Nigeria.

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Abstract

Background: Deep venous thrombosis (DVT) is a common medical problem worldwide; about 10-20% of patients may develop the complication of pulmonary embolism (PE) which may lead to death. Venography, once the diagnostic test of choice for detection, has been largely replaced by color flow Doppler ultrasound (CFDU) in recent years.

Objective: To assess the usefulness of CFDU in the detection of DVT of the lower limb, in patients with clinical suspicion of DVT in our environment.

Materials and methods: A total of 76 consecutive patients with clinical suspicion of DVT referred to Kwara State Advanced Diagnostic Centre who had CFDU of the lower limbs from April 2013 to April 2015. Examination was carried out using a General Electric (GE) Logic P5 ultrasound machine equipped with a 7.5 -10MHz probe. In addition to spectral and color flow, power Doppler was routinely used in the calf veins.

Results: Deep venous thrombosis was confirmed in a total of 45 patients (59.2%) out of the 76 patients with clinical suspicion of DVT, while 31(40.8%) had no DVT. Out of this number 26 (34.2%) were females, while 19 were males (25%).

The commonest risk factors were paralysis from CVA and prolonged immobility post-surgery.

DVT was commoner in above-the-knee -veins 40(90%) than in the calf veins 5(10%).

Other findings include lower limb cellulitis, ruptured Baker's cysts and lymphedema occurring in 10(13,2%) patients.

Conclusion: Colour flow Doppler ultrasound proved to be a reliable non-invasive technique for the diagnosis of DVT, with a relatively high incidence in patients who have prolonged immobility e.g. patients with stroke, and post-surgical patients. Pregnant patients especially those embarking on long distance journeys are also prone to DVT.

Keywords: Sonography of deep venous thrombosis of the lower limb in Ilorin Nigeria

Introduction

Deep venous thrombosis (DVT) is a condition where clots form in intact blood vessels as a result of endothelial damage or occlusion, stasis of blood flow or conditions causing increased coagulation (Virchow's Triad) and migrate to remote sites^{1,2}. Deep venous thrombosis is a common medical problem worldwide, about 10-20% of patients may develop the complication of pulmonary embolism(PE) which may lead to death.¹ With the possibility of the potentially fatal PE complicating lower limb(LL) DVT, it becomes imperative to diagnose this entity accurately³.

Acute deep venous thrombosis (DVT) is highly placed in the differential diagnoses of the painful and/or swollen leg. Unfortunately, clinical findings may be accurate only 58-

70% of the time⁴. Venography, once the diagnostic test of choice for LL DVT detection, has been largely replaced by LL duplex ultrasonography in recent years^{4,5}. This non-invasive diagnostic method approaches venography in accuracy for the diagnosis of proximal DVT^{4,5} and has now become the modality of choice for diagnosing DVT worldwide including Nigeria⁴⁻⁶. Other conditions mimicking DVT like lymphedema and ruptured popliteal (Baker's) cyst all of which can give a swollen limb can also be reliably distinguished from DVT⁴⁻⁶.

There is paucity of data regarding the role of color-flow Doppler (CFDU) in the diagnosis of DVT in our environment. The aim of this study, therefore, is to evaluate the role and usefulness of Doppler US in evaluating patients with clinical suspicion of DVT in our environment.

Materials and Methods

This study was carried out at the Kwara Advanced Diagnostic Centre, Ilorin Kwara State, Nigeria (State-

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owned diagnostic Centre) which serves Kwara state and neighbouring states with a sizeable referral from surrounding tertiary and private Institutions. It was a retrospective observational study from April 2013 to April 2015 using color-flow Doppler ultrasonographic examinations of the lower extremities involving 76 consecutive patients with clinical suspicion of DVT referred for Doppler US.

All examinations were done using a General Electric (GE) Logic P5 ultrasound machine equipped with a 7.5 to 10 MHz multi frequency linear transducer. Examination was done using standard technique for the diagnostic Centre and carried out by three Consultant Radiologists during the period of study.

In all patients, the affected extremity was examined initially in the supine position during which the common femoral vein (CFV), the superficial femoral vein (SFV) were scanned. Examination of the popliteal vein took place in the prone or left lateral decubitus position. The tibial and femoral veins were also scanned routinely. When findings were equivocal, the other limb was scanned for comparison.

Power Doppler was used routinely for the calf veins. For the purpose of analysis the lower limb veins were divided into above the knee veins (femoropopliteal segment) and below the knee vein (tibioperoneal trunk)

The vein compressibility was noted to be normal when the vein could be compressed completely with the lumen disappearing from view on ultrasound. If incomplete collapse was seen, vein compressibility was noted to be abnormal. This was diagnostic of a DVT. Direct visualization of the thrombus and venous distension by the thrombus were also suggestive of DVT.

Veins were evaluated for spontaneous flow and augmentation of flow with distal compression.

Presence of persistent filling defects on color Doppler or complete absence of luminal flow was diagnostic of DVT.

Normal augmentation was noted to be present when blood flow through a vein (as denoted by color on the screen) was greatly enhanced with compression of the extremity distal to the point of interest. Lack of augmentation is suggestive of an occlusion in the vein segment between the site of compression and the transducer.

On pulsed wave Doppler, absence of the normal venous spectral pattern as well as loss of normal respiratory phasicity was suggestive of DVT.

For the purpose of this study we did not attempt to classify the age of the clot.

Data was analysed and results presented in descriptive statistics using Statistical Package for Social Sciences (SPSS) version 20.

Results

The mean age of the patients was 51.7 ± 15 , with a range of 23 to 75 years.

There were 33 males (43.4%) and 43 females (56.6%). Majority of the patients 41(53.9%) presented with leg swelling, while others presented with calf pain 12(15.8%) and some had both leg swelling and tenderness 23(30.3%) (Table1).

Table 1: Clinical presentation

Clinical signs	Frequency	Percent
Leg swelling	41	53.9
Calf pain	12	15.8
Leg swelling and tenderness	23	30.3
Total	76	100.0

The age distribution is displayed in table 2. The highest number of patients confirmed to have DVT was found in the 60 to 70 age group with a total number of 22 (28.9%) patients, while the lowest number was in the 21-30 age group which 2(2.6%) had DVT.

DVT was confirmed in 45 (59.2%) out of the 76 patients with clinical suspicion of DVT while 31 patients (40.8%) did not DVT.

Table 2 : Cross tabulation of age groups versus DVT

Age groups	Deep venous thrombosis		Total
	Yes	No	
21-30	2(2.6)	4(5.3)	6(7.9)
31- 40	9(11.8)	2(2.6)	11(14.5)
41- 50	9(11.8)	8(10.5)	17(22.4)
51-60	7 (9.2)	7(9.2)	14(18.4)
61- 70	15(19.7)	7(9.2)	22(28.9)
71-80	3(3.9)	3(3.9)	6(7.9)
Total	45(59.2)	31(40.8)	76(100)

More females had DVT making up 26(34.2%), against 19 males (25%); however the difference is not statistically significant ($p > 0.05$).

Out of the 45 patients confirmed with DVT, the left leg was affected in 40(88.8%) patients, while the right leg was affected in 3(6.6%) patients and in 2(4.4%) both limbs were involved (Table 3).

Table 3: Cross tabulation of affected leg versus DVT

Affected leg	Deep Venous Thrombosis		
	Yes(n%)	No(n%)	Total
Left leg	40(52.6)	23(30.3)	63(82.9)
Right leg	3(3.9)	6(7.9)	9(11.8)
Both leg	2(2.7)	2(2.7)	4(5.3)
Total	45(59.2)	31(40.8)	76(100)

The risk factors are shown in table 4. 61(80.3) patients had known risk factors while 15(19.7%) had no known risk factors.

The commonest risk factor is paralysis from CVA seen in 17(22.4%) patients, followed by recent surgery in 12(15.8%) patients. Others are also shown in (Table 4).

Table 4: Risk Factors for DVT

Risk factors	Frequency	Percent
Paralysis	17	22.4
Surgery	12	15.8
Pregnancy	4	5.3
Travelling	10	13.1
Malignancy	14	18.4
Unknown	15	19.7
Trauma	4	5.3
Total	76	100.00

The highest number of patients found to have DVT occurred in paralysed patients 12 (15.8%) (Table5).

Table 5: Cross tabulation of risk factors versus deep venous thrombosis.

Risk Factors	Deep venous thrombosis		
	Yes(n%)	No (n%)	Total
Paralysis	12(15.8)	5(6.6)	17(22.4)
Surgery	7(9.2)	5(6.6)	12(15.8)
Pregnancy	2(2.6)	2(2.6)	4(5.3)
Travelling	7(9.2)	3(3.9)	10(13.2)
Malignancy	7(9.2)	7(9.2)	14(18.4)
Unknown	9(11.8)	6(7.9)	15(19.7)
Trauma	1(1.3)	3(3.9)	4(5.3)
Total	45(59.2)	31(40.8)	76(100)

Similarly the highest frequency of DVT amongst risk factors was also seen in paralysed patients 12 out of 19(70.5%)(Table 6) followed by travellers 7 out of 10 (70%) patients.

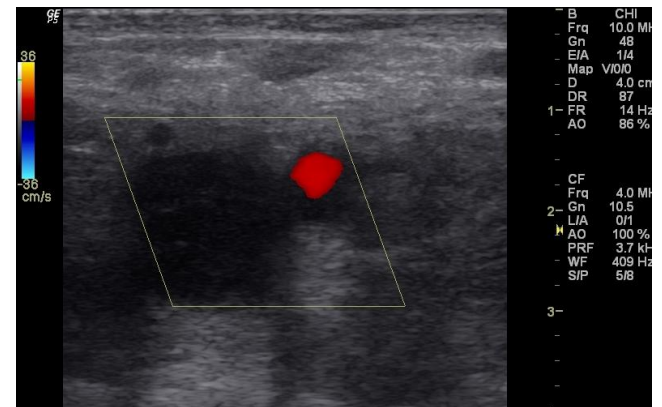
Table 6: Cross tabulation of risk factors versus DVT, showing percentage of DVT within each risk factor.

Risk Factors	Deep venous thrombosis		
	Yes(n%)	No (n%)	Total
Paralysis	12(70.5)	5(29.5)	17(100)
Surgery	7(58.3)	5(41.6)	12(100)
Pregnancy	2(50.0)	2(50.0)	4(100)
Travelling	7(70.0)	3(30.0)	10(100)
Malignancy	7(50.0)	7(50.0)	14(100)
Unknown	9(60.0)	6(40.0)	15(100)
Trauma	1(25.0)	3(75.0)	4(100)
Total	45(59.2)	31(40.8)	76(100)

The commonest locations were in the above knee vein seen in 40((90%) patients (SFV, CFV, and popliteal veins).Fig 1 shows acute DVT in the left superficial femoral vein. 5 patients (10) % had DVT in below- the- knee- veins. (peroneal and tibial veins).

Ancillary findings include cellulitis in 5 (6.6%) patients, ruptured Baker's cyst 2(2.6%) patients , and lymphedema seen in 3(3.9%) patients.

Fig 1. Acute DVT in a 28 year old pregnant female, with history of long distance flight.



Note the moderately dilated common femoral vein on the right with no color flow, and internal echoes. The vein was also not compressible. The femoral artery on the left shows normal flow.

Discussion

Lower limb deep venous thrombosis no necessary is a common disease that can result in significant morbidity and even mortality. The clinical diagnosis of lower extremity venous thrombosis is often inaccurate, and therefore unreliable^{4,5}.

Our findings show a female predominance; females constituted 57.7% of cases with DVT.

Findings by other authors differ; Akimoladun et al in Ibadan¹, Mangeni et al in Uganda⁷, and Fowles et al in a study pooling data from studies mainly from Europe showed equal proportions of males and females, while Olowoyeye et al in Lagos showed a male preponderance⁶

A possible reason for this observation in our study is that 4(5.3%) cases had pregnancy as a risk factor, whereas other risk factors have no gender bias.

The incidence of DVT seems to increase with advancing age as was observed in this study, with the highest frequency (19.7%) occurring in the 61-70 year group. Similar findings have also been observed by several authors^{1,6,9}. This is attributable to the fact that older people are less active and are prone to diseases like stroke and cancers, which can make them bedridden for prolonged periods of time^{1,9}.

The commonest risk factor identified in this study is paralysis especially in patients with stroke (22.4%) who are bedridden, followed by post-surgical patients. This has also been observed in studies done locally^{1,9}. Also in a study involving a large population of 5,451 patients with ultrasound-confirmed deep vein thrombosis (DVT), including 2,892 women and 2,559 men, from United States, surgery and other causes of immobility of 30 days and longer were the commonest cause of DVT¹⁰. Explanation for this is that venous stasis tends to occur in bedridden patients who are thereby prone to DVT¹.

Pregnancy and puerperium are also identified risk factors predisposing to DVT which can occur as early as the 1st trimester¹¹. Although 4 pregnant women were referred on account of suspicion of DVT 2 had positive finding, and one of them also had a history of long distance flight over 16 hours. Yaser et al, concluded in their study that there is some evidence to suggest that flights of eight hours or more increase the risk of DVT if additional risk factors were found as seen in the aforementioned pregnant woman, who had also embarked on a long distance flight.

With regards to the location of DVT, 40 (90%) were seen in above-the-knee veins, with just 5(10%) in isolated calf veins. Generally the incidence of DVT in above-the-knee veins is commoner and diagnosis with CDFU is more accurate, than the calf veins^{4,5,12,13}.

Some authors have proffered carrying out contrast venography in patient with suspected isolated calf vein thrombosis^{12,14}. Power Doppler in addition to color Doppler has been proffered to also increase the sensitivity of ultrasound in diagnoses of calf DVT¹⁵. All patients had

below the knee veins evaluated with power Doppler in addition to CDFU in this study. In the same vein the left leg was mostly affected by DVT constituting 88% of the total number of patients with DVT. This again has been observed by other authors^{1,6,7}. Reasons proffered for this is the difference in the relationship between the common iliac vein and artery resulting in possible compression of the left common iliac vein by the common iliac artery as it crosses to the right side^{1,6}.

Ten patients with clinical suspicion of DVT had other diagnoses. Ancillary findings include Baker's cysts and cellulitis. Worthy of note is that all patients with cellulitis also had significant inguinal lymphadenopathy.

One of the advantages of ultrasound is that other differential diagnoses like the aforementioned cellulitis, lymphedema and ruptured Baker's cyst can be excluded. This has also been observed by other authors^{1,4,5,13,14}.

In the remaining patients some of which had strong clinical suspicion and risk factors and negative findings, follow-up ultrasound was requested, out of which none were positive. However, as at the time of this write-up none of the patients had contrast venography, which may or may not identify missed DVT especially in the calf veins.

In conclusion, CDFU proved to be a reliable non-invasive technique for the diagnosis of DVT, with a relatively high incidence in patients who have prolonged immobility, e.g. patients with stroke and post-surgical patients. Pregnant patients also embarking on long distance journey of more than eight hours are prone to DVT.

It is therefore advocated that preventive/prophylactic measures should be taken in this category of patients.

Patients with below-the-knee vein suspicion of DVT should have power Doppler examinations and contrast venography patients with suspicious of DVT in below-the-knee veins cases.

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