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Original Research

Deep Venous Thrombosis in Burn Patients, the Need for Continuous Surveillance; Lagos State University Teaching Hospital (LASUTH), Ikeja; Our Nigeria Experience.

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Abstract

Background: Venous thromboembolism (VTE) remains a major cause of morbidity and mortality in clinical practice. Burn patients are in the highest risk category for VTE due to pathophysiological changes and use of multiple monitoring system[1]. Deep venous thrombosis (DVT) prophylaxis in burns has always been contentious. Reported incidence of DVT in burns ranges from 0.25% to 23%[2]. The objective of our study is to present our experience of VTE in burns in Lagos, Nigeria.

Method: Retrospective study of Burns Patients diagnosed with VTE between May 2016 and April 2021 was conducted in Lagos State University Teaching Hospital. Data were obtained from the case notes and analyzed for demographic characteristics, severity of injury and outcome.

Results: A total of 592 burns injured patients were admitted during the study period. Five patients; four adults and one child were diagnosed with DVT (0.8%) of lower extremities. They were two males and three females with Male to Female ratio 1:1.5. The ages ranged between 8 and 77years, mean 33±23.2 years. TBSA ranged between 22% to 45%, mostly mixed thickness. The average time of diagnosis was 6 weeks post burn. Most common presentation were limb swelling and pain. Confirmation was with Doppler Venous Ultrasound. Treatments included Inferior vena cava filter placement, thrombolysis, and anticoagulation. Mortality was 40% from pulmonary embolism; one of which had a filter.

Conclusion: Burn Injury is one of the main risk factors for DVT, when the Total Body Surface Area (TBSA) ≥40%. Other significant factors are length of hospital stay and the use of central lines. This implies that research for DVT and prophylactic anticoagulation may be considered for burn patients with these risk factors, even if the burn patient is asymptomatic.

Key Words: Venous Thrombo-Embolism, prophylaxis, risk, anticoagulation.

Introduction:

A Deep Vein Thrombosis (DVT) occurs when a clot of blood develops in one or more of the body's deep veins; most commonly, in the legs. A patient leg may expand as a result of deep vein thrombosis, which can produce discomfort or soreness as well as obvious, overflowing surface veins and discoloration. Fecher, et al., [5] found that smoking, being overweight, being inactive, and other medical conditions are among the potential causes of DVT. The potential indicator of DVT is the development of blood clots, which can be seen using ultrasonography[2]. Patients with burn injuries typically need to recover for extended periods of time. Virchow's triad hypercoagulability, endothelial damage, and hemostasis interplay dynamically to produce DVTs. Numerous risk factors have been discovered as knowledge of this trio has grown, including both inherited and learned variables. Antithrombin, proteins C and S1 deficits are examples of genetic factors. Additional risk factors include advanced age, obesity, surgery, extended immobility, numerous fractures from trauma, a history of DVT, the use of oral contraceptives, and cancer3.

The D-dimer test is an important tool in the surveillance of DVT in burns patients. D-dimer is a protein fragment that is released into the bloodstream when a blood clot is broken down. As such, an elevated level of D-dimer can be indicative of a recent or ongoing blood clot. While a positive D-dimer test does not necessarily mean that a DVT is present, it can be used as a guide to help determine whether further testing is warranted. For example, if a patient has an elevated D-dimer level and is at risk for DVT, a Doppler ultrasound may be performed to confirm or rule out the presence of a blood clot. In addition to the D-dimer test, there are other non-invasive imaging tests that can be used to detect a blood clot, such as ultrasound and computed tomography (CT) scans. The role of the D-dimer test in the surveillance of DVT in burns patients is still being studied, but it is likely that it will continue to play an important role in the diagnosis and management of this condition. It has been demonstrated that severe infections, cancer and chemotherapy, sickle cell disease, central venous catheters (CVCs), and sickle cell disease enhance the chance of developing DVT in pediatric patients5. As a result of this, burn patients, particularly those whose burns, account for a significant portion of their total body surface area (%TBSA), meet all three of Virchow's triad requirements[3]. During their prolonged hospital stay, they typically have many surgeries, numerous blood transfusions, and indwelling CVCs, which place them at a greater risk of developing DVT. Research has demonstrated that CVCs are the most common risk factor for DVT in critically ill individuals3. There are, however, very few data about the incidence of DVT in burn patients, and especially less in the pediatric age category, as there are very few researches looking into burns in children. Both adult and pediatric age groups may experience symptomatic or asymptomatic DVTs associated with CVCs. Nonetheless, clinical differentiation in relation to the danger of Adults with developing PE continue to get the same attention among researchers, whereas children's symptoms are still not fully understood[4]. The first factor in the diagnosis of DVT is a high index of clinical suspicion; the course of treatment is then decided. Duplex ultrasonography is typically used to confirm DVT suspicions, which are based on signs and symptoms. To raise clinical suspicion, it is important to stratify patients based on their risk of having pulmonary embolism (PE), DVT, or venous thromboembolism (VTE), especially since symptoms are not always evident. Determining whether to use preventive measures including early mobilization, compression devices, and low molecular weight heparin (LMWH) is made easier with the use of stratification[3]. Adults are the primary target of the current DVT treatment guidelines, with children receiving case-by-case care. It is imperative to seek early management due to the substantial morbidity and death associated with viral thromboencephalitis. If DVTs are treated appropriately, they can either disappear or cause bleeding, extension, recurrence, PE, or even death. Major bleeding (30% at 3 years) and PE development (13% at 30 days, 26% at 1 year, and 35.3% at 3 years) are associated with death. Since

DVT poses a serious risk to patients overall, early identification and treatment should be the main priorities. One method is to research populations that are susceptible to DVT. Data on burn victims is still lacking despite substantial study, particularly when it comes to juvenile groups.

Meanwhile most DVT is occult and resolves impulsively with no issues, mortality from DVT-related enormous pulmonary embolism (PE) initiate up to 300,000 mortality yearly in the US[8] Possible difficulties of DVT are: Up to 40% of burn individuals had quiet PE when symptomatic DVT is diagnosed[9], Paradoxic emboli (rare), Persistent DVT Post thrombotic syndrome (PTS). The (AAFP)/ (ACP) endorsements for examination of burn patients with credible DVT are as follows[10]: Authenticated quantifiable calculation rules (e.g., Wells) can be adopted to check pretest probability of VTE and come up with a good result. In a well isolated patients with low pretest possibility of DVT or PE, it is adequate to acquire a high detector of D-dimer. Factor-Xa antagonist adopted in the cure of DVT are: Fondaparinux and Rivaroxaban[11,12,13,14] American Heart Association (AHA) endorsements for Inferior Vena Cava IVC sieves are5: known severe superior DVT or acute PE in individual approved for anticoagulation, thrombo-embolism while on anti-coagulation, there is serious loss of blood which need stoppage of anticoagulation therapy.

Reported incidence of DVT in burns ranges from 0.25% to 23%[2]. The objective of our study is to present our experience of VTE in burns in Lagos State University Teaching Hospital, Ikeja, Lagos.

Methods:

Retrospective study of Burns Patients diagnosed between May 2016 and April 2021 was conducted and patients who had DVT selected. Data were obtained from the case notes and analyzed for demographic characteristics, severity of injury and outcome.

Results:

A total of 592 patients with burns injuries were admitted during the study period. Five patients; four adults and one child were diagnosed with DVT (0.8%) of lower extremities. They were two males and three females with Male to Female ratio 1:1.5. The ages ranged between 8 and 77years, mean 33±23.2 years. TBSA ranged between 22% to 45%, mostly mixed thickness burns. Average duration of admission was 6 weeks, i.e. length of hospital stay (LOS). Most common presentation were limb swelling and pain. Confirmation was with Doppler Venous Ultrasound. Treatments included Inferior vena cava filter placement, thrombolysis, and anticoagulation. Mortality was 40% from pulmonary embolism; one of which had filter.

Table 1: Summary of Demographic Characteristics

Age (yr)	TBSA (%)	Sex	LOS	Location of CVC	CVC in burn extremity	Time of DVT diagnosis	Intervention	outcome
8	33	F	60	Femoral	Yes	6	Anticoagulation	Alive
22	24	F	56	Subclavian	No	6	Anticoagulation	Dead
30	40	F	120	Subclavian& jugular	No	6	Anticoagulation	Alive
32	41	M	210	Subclavian& jugular	No	8	IVC filter+ Thrombolysis	Dead
77	26	M	70	Femoral	No	7	IVC filter+ Thrombolysis	Alive

LOS: length of Hospital Stay, CVC: Central Venous Access F: Female, M: Male

Table II: Burn Associated Risk Factor

No of Patients	TBSA	CVC	CVC in DVT Extremity	Ventilator	Immobility	Wound Infection	DVT in Burn Extremity	Etiology (flame)
5	32.8±6.9	103±58.4	1(20%)	1(20%)	5(100%)	3(60%)	1(20%)	5(100%)

Discussion:

Association between thromboembolism and burns has been described in autopsy data for more than 20years. Harrington[3] and Colleague recorded 1.77% This is in variance to our own series at 0.8%. The identified risk factors are comparable to results from the study by Mullin et al. Patients that developed DVT while on prophylaxis had associated risk factors-Table II .All the patients had unilateral limb swelling as the major symptom. Dimer assay were elevated in 60% of the patients. Thrombolysis with streptokinase was administered to patients with proximal DVT while others had therapeutic anticoagulation with LMWH. Swollen limbs with associated pain in burns should raise red flag for investigation. Measures should be put in place to prevent them.

DVT surveillance in burns patients is an important part of ensuring their safety and recovery. The risk of developing a deep vein thrombosis (DVT) is increased in burns patients due to a number of factors, including immobility, dehydration, and inflammation. To reduce the risk of DVT, it is important to have a comprehensive surveillance program in place. This may include regular monitoring of blood clots, use of compression stockings, and early mobilization of the patient. In addition, some studies have shown that the use of anticoagulants may be beneficial in reducing the risk of DVT in burns patients. There are several factors that contribute to the increased incidence of DVT in burns patients. Firstly, immobility is a major risk factor, as it can lead to reduced venous blood flow and stasis of blood in the veins. Additionally, dehydration is common in burns patients due to fluid loss from the skin, which can lead to an increased risk of blood clots. Inflammation, which is also common in burns patients, can promote the formation of blood clots by activating the coagulation system. Finally, the use of invasive devices such as central lines and catheters can also increase the risk of DVT.

Continuous surveillance is important. According to this study, DVT was considered a serious health issue among burn patients at LASUTH; nevertheless, the incidence of DVT in burn patients varies widely between studies because of variations in patient populations, the size and severity of burns, and the use of preventive regimens[3]. When mechanical and pharmacologic prophylaxis was applied, the overall incidence of DVT was (0.8%) in this retrospective research of 592 burn patients with a mean TBSA of 22% to 45%. When the same analysis was restricted to those who took the recommended prophylaxis, the incidence of DVT decreased to (0.25%), according to a comparison between the DVT incidence in our research and that of Fecher et al.[5]. According to these findings, proper prophylaxis can dramatically lower the risk of DVT in burn patients.

According to Zhang et al.[5], DVT can develop anytime from one to twelve days after a burn, on average. However, in the first three weeks following burn, 70% of patients develop DVT. The majority of the patients in this study had unilateral limb swellings, which led to an elevation in the Dimer assay in 60% of the patients. Patients with proximal DVT were treated with thrombolysis and streptokinase, while other patients received therapeutic anticoagulation with LMWH. However, when comparing this study to one conducted by Fecher et al.,[5] who used a similar procedure, one of the most significant findings was the risk of DVT in burn patients with tachycardia.

The patients' risk of developing DVT increased thrice if their heart rate exceeded 90 beats per minute. The indications and symptoms of this is deadly but frequent were dyspnea, fast breathing, abrupt onset of chest discomfort, and intense coughing without any apparent reason. Their study revealed that each of the variables they analyzed which included gender, the total affected body surface area, the existence of an inhalational injury, burn events, surgical events, and the length of hospital stay was an independent predictor of the development of DVT in burn patients. This result is in line with our current research, which also indicated that patients who develop DVT were predicted by comparable characteristics. The D-dimer test is an important tool in the surveillance of DVT in burns patients. D-dimer is a protein fragment that is released into the bloodstream when a blood clot is broken down. As such, an elevated level of D-dimer can be indicative of a recent or ongoing blood clot. While a positive D-dimer test does not necessarily mean that a DVT is present, it can be used as a guide to help determine whether further testing is warranted. For example, if a patient has an elevated D-dimer level and is at risk for DVT, a Doppler ultrasound may be performed to confirm or rule out the presence of a blood clot. In addition to the D-dimer test, there are other non-invasive imaging tests that can be used to detect a blood clot, such as ultrasound and computed tomography (CT) scans.

The role of the D-dimer test in the surveillance of DVT in burns patients is still being studied, but it is likely that it will continue to play an important role in the diagnosis and management of this condition. Based on the results of this investigation in identifying a multitude of risk factors in the research, the study allowed for an in-depth exploration of the implications of two potential predictors: swollen limbs with associated pains, which calls for continuous surveillance and practice. These risk factors are crucial to understanding and developing new strategies for preventing DVT among the LASUTH population. This clarifies the significance of recognizing these possible risk factors and their effects on the regular assessment conducted by medical experts.

Conclusion:

Burns are a major risk factor for DVT, especially when covering large surface areas (≥40% TBSA) and combined with other factors (i.e., swollen limb with associated pain, prolonged hospitalization and central lines). Thus, investigations for DVT and prophylactic anticoagulation should be considered for burn patients with these risk factors, even if they are asymptomatic.

References:

1. Kesieme, E.; Kesieme, C.; Jebbin, N., Irekpita, E.; Dongo,A. Deep vein thrombosis: A clinical review. J. Blood Med.2011; 2, 59.
2. Wahl WL, Brandt MM, Ahrns KS, Zajkowski PJ, Proctor MC, Wakefield TW, et al. Venous thrombosis incidence in burn patients: Preliminary results of a prospective study Burn Care Rehabil.2002;23:97-102
3. Harrington DT, Mozingo DW, Cancio L, Bird P, Jordan B, Goodwin CW. Thermally injured patients are at significant risk for Thromboembolic Complications. J. Trauma.2001;50:495-49.
4. Mullins F,Mian M, Jenkins D,Brandigi C, Shaveer J, Friedman B et al. Thromboembolic complicationin burn patients and associated risk factors J.Burn care Res 2013;34:355-60
5. Fecher, M.S. O'Mara, I.W. Goldfarb, H. Slater, R. Garvin, T.J. Birdas, et al. Analysis of deep vein thrombosis in burn patients, burns, 30 (2004), pp. 591-593,
6. W. Zhang, J.F. Zhang, M. Wang, C.D. Xia, L.J. Wang, B.H. Liu, et al. Occurrence of deep venous thrombosis in adult burn patients and its risk factors, Zhonghua Shao Shang Za Zhi, 36 (2020), pp. 54-57.
7. Cato, B. Bailiff, J. Price, C. Ermogeneous, J. Hazeldine, W. Lester, et al., Heparin resistance in severe thermal injury: a prospective cohort study, Burns Trauma, 9 (2021), Article tkab032
8. Tapson VF. Acute pulmonary embolism. N Engl J Med. 2008 Mar 6. 358(10):1037-52.

9. Haeger K. Problems of acute deep venous thrombosis. I. The interpretation of signs and symptoms. Angiology. 1969 Apr. 20(4):219-23.
10. McLachlin J, Richards T, Paterson JC. An evaluation of clinical signs in the diagnosis of venous thrombosis. Arch Surg. 1962 Nov. 85:738-44.
11. Meignan M, Rosso J, Gauthier H, et al. Systematic lung scans reveal a high frequency of silent pulmonary embolism in patients with proximal deep venous thrombosis. Arch Intern Med. 2000 Jan 24. 160(2):159-64.
12. Snow V, Qaseem A, Barry P, et al. Management of venous thromboembolism: a clinical practice guideline from the American College of Physicians and the American Academy of Family Physicians. Ann Intern Med. 2007 Feb 6. 146(3):204-10.
13. Buller HR, Ten Cate-Hoek AJ, Hoes AW, et al. Safely ruling out deep venous thrombosis in primary care. Ann Intern Med. 2009 Feb 17. 150(4):229-35.
14. Bauersachs R, Berkowitz SD, Brenner B, et al. Oral rivaroxaban for symptomatic venous thromboembolism. N Engl J Med. 2010 Dec 23. 363(26):2499-510.
15. Buller HR, Prins MH, Lensin AW, et al. Oral rivaroxaban for the treatment of symptomatic pulmonary embolism. N Engl J Med. 2012 Apr 5. 366(14):1287-97.