Applicability of Wells’ Criteria for Diagnosis of Deep Vein Thrombosis in Lower Extremities at Dhulikhel Hospital, Kathmandu University Hospital

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Abstract

Introduction: Deep vein thrombosis (DVT) is the presence of thrombus in deep venous system, commonly encountered in lower extremities. P. S. Wells was one of the pioneers to diagnose DVT without relying on imaging methods and using the clinical criteria for patient management.

Methods: All the patients with clinical suspicion of DVT in lower extremities (new onset edema, pain) visiting the Outpatient Department or Emergency Department of Dhulikhel Hospital between September 2012 and August 2016 were included in the study. The patients were asked/examined for knowing all the points in Wells’ criteria. Confirmation of the diagnosis was done by color Doppler ultrasonography on the same day by a radiologist. The patients were categorized into three groups as ≥3 as high probability, 1–2 as moderate probability, and <0 as low probability.

Results: There were 68 patients with a history suggestive of DVT. Doppler ultrasonography being considered as gold standard for diagnosis confirmed 65 cases as DVT (95.6%) on the 1st day and remaining 3 cases were confirmed on the 3rd day in repeat Doppler ultrasonography. Mean age was 55.5 years (range: 34–75, standard deviation [SD] 11.3 years). Mean days of history was 3 days (range 1–10 days, SD 2.2 days). Pitting edema was present in 95.6% of cases which was the most common clinical characteristic in patients with DVT. This was followed by swelling of entire leg (67.6%), followed by localized tenderness along the distribution of deep venous system (64.7%). In 51 cases (75%), Wells’ score was ≥3 (high probability), while in 14 cases (20.6), it was 1–2 (moderate probability) and in 3 cases (4.4%) it was <0 (low probability). In terms of positive Wells’ score (≥2), there were 55 cases (80.9%).

Conclusion: Wells’ scoring can be used for diagnosis of DVT in lower extremities, but for further accuracy, it needs to be reconfirmed by Doppler ultrasonography.

Keywords: Deep vein thrombosis, Doppler ultrasonography, Wells’ score

Introduction

Deep vein thrombosis (DVT) is the presence of thrombus in deep venous system, commonly encountered in lower extremities. Deep vein thrombosis in lower extremities is not only limb-threatening but also life-threatening due to chances of pulmonary embolism.[1] Chronic venous insufficiency, a sequela of DVT, can limit person for performing regular activities and can impact economic burden to the society. Before easy availability of imaging modalities, this condition used to be diagnosed solely by history and examination. With advent and use of Doppler, such techniques for diagnosis are rarely followed completely.

As Doppler examination is not still readily available even in many urban places of countries like Nepal, such clinical methods should be practiced regularly. Wells was one of the pioneers to diagnose DVT without relying on imaging methods and using the clinical criteria for patient management.[2] Following setting up his criteria in 1995, it has been revised couple of times. Currently, there are 8 clinical characteristics with score 1 each and criteria with score 2 as shown in Table 1.[3] The diagnosis of DVT based on clinical characteristics has been found useful to find the likelihood of DVT.[4]

The aim of this study is to find applicability of Wells’ clinical criteria for diagnosis of DVT in lower extremities by making Doppler ultrasonography finding as gold standard.

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How to cite this article: Karmacharya RM, Batajoo H, Shakya YR, Pradhan S. Applicability of wells’ criteria for diagnosis of deep vein thrombosis in lower extremities at Dhulikhel hospital, Kathmandu university hospital. Indian J Vasc Endovasc Surg 2017;4:173-5.

Access this article online

Quick Response Code:  
Website: www.indjvascsurg.org  
DOI: 10.4103/ijves.ijves_34_14

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METHODS
This is a hospital-based prospective study, in which all the patients with clinical suspicion of DVT in lower extremities (new onset edema, pain) visiting the Outpatient Department or Emergency Department of Dhulikhel Hospital between September 2012 and August 2016 were included in the study. The patients were excluded if there is a previous history of DVT, patients in anticoagulation therapy. The patients were asked/examined for knowing all the points in Wells’ criteria. Confirmation of the diagnosis was done by color Doppler ultrasonography on the same day by a radiologist. The patients were categorized into two groups as positive Wells’ criteria if the score in ≥2 and negative Wells’ criteria if the score is <2. The pretest probability was classified as high probability if the score was 3–8, moderate probability if score was 1–2, and low probability if score was ≤0 and database collection was done in Microsoft office access and statistical analysis was done in SPSS version 13.0. SPSS Inc., IBM Corporation, Chicago.

RESULTS
There were 68 patients with a history suggestive of DVT after excluding five patients with chronic DVT. Doppler ultrasonography being considered as gold standard for diagnosis confirmed 65 cases as DVT (95.6%) on the 1st day and remaining 3 cases were confirmed on the 3rd day in repeat Doppler ultrasonography. Of the 68 cases, 24 cases (35.3%) were male and 44 cases (64.7%) were female. Mean age was 55.5 years (range: 34–75, standard deviation [SD] 11.3 years). In 29 cases (42.6%), right side was affected, while in 35 cases (51.5%), left side was affected and in two cases (2.9%), both the limbs were affected. Mean day of history at the time of presentation was 3 days (range 1–11 days, SD 2.2 days). Table 2 shows total number of cases in different clinical characters of Wells’ criteria. Pitting edema was present in 95.6% of cases which was the most common clinical characteristic in patients with DVT. This was followed by swelling of entire leg (present in 67.6%), followed by localized tenderness along the distribution of deep venous system (present in 64.7%).

Mean Wells’ score was 3.58 (range = 0–6). In 55 cases (80.9%), Wells’ score was ≥3 (positive Wells’ score). In terms of pretest probability, there were 51 cases (75%) with Wells’ score 3–8 (high probability) while in 14 cases (20.6%) it was 1–2 (Moderate probability) and in 3 cases (4.4%) it was ≤0 (low probability).

DISCUSSION
Our study shows that DVT is more common in female compared to male. In a study by Mohammad Mozafar et al., of the 177 patients, 52.54% were female and 47.45% were male. DVT is almost equally common any of the side.[5] The research hospital being at hilly region with many of the catchment areas not properly linked by motorable roads, the mean day of presentation being 3.1 days is as expected.

Table 1: Wells’ clinical criteria for detecting deep vein thrombosis

| Clinical characteristics                                      | Score |
|--------------------------------------------------------------|-------|
| Active cancer                                                | 1     |
| Paralysis, paresis, or recent cast immobilization of the lower extremities | 1     |
| Recently bedridden >3 days or major surgery within 4 weeks    | 1     |
| Localized tenderness along the distribution of the deep venous system | 1     |
| Swelling of entire leg                                       | 1     |
| Calf swelling by >3 cm compared to the asymptomatic leg (measured 10 cm below tibial tuberosity) | 1     |
| Pitting edema (greater in the symptomatic leg)               | 1     |
| Swollen unilateral superficial veins (nonvaricose)            | 1     |
| Alternative diagnosis as likely or more likely than deep vein thrombosis | -2    |

Table 2: Total number of cases in different clinical characteristics of Wells’ criteria

| Clinical characters                                      | Present (total=68) | Percentage |
|----------------------------------------------------------|--------------------|------------|
| Active cancer                                             | 4                  | 5.9        |
| Paralysis, paresis, or recent cast immobilization         | 27                 | 39.7       |
| Recent bedridden >3 days or major surgery within 4 weeks  | 25                 | 36.8       |
| Localized tenderness along the distribution of deep venous system | 44                 | 64.7       |
| Swelling of entire leg                                    | 46                 | 67.6       |
| Calf swelling by >3 cm compared to the asymptomatic leg measured 10 cm below tibial tuberosity | 42                 | 61.8       |
| Pitting edema                                             | 65                 | 95.6       |
| Nonvaricose unilateral prominent veins                    | 8                  | 11.8       |
| Alternative diagnosis likely as or more likely than deep vein thrombosis | 7                  | 10.3       |

Mean age of 55.5 years is similar to the study by Mohammad Mozafar et al.[5]

Pitting edema was present in 95.6% of cases which was the most common clinical characteristic in patients with DVT. This was followed by swelling of entire leg (present in 67.6%), followed by localized tenderness along the distribution of deep venous system (present in 64.7%).

In our study, the mean Wells’ score was 3.58, and in 80.9% cases, Wells’ score successfully predicted DVT by being ≥2. In original Wells’ study, DVT was present in only 3% of cases with low prediction score. Wells’ score has been extensively validated in both outpatient cases and admitted cases in hospitals in Canada, Europe, and the United states, but such validation is scarce in South East Asian people.[6-8]

The missing of cases in Wells’ score can be in conditions such as isolated infrapopliteal DVT which can be as high as 12% of all lower extremities DVT as shown by studies by Sartori et al.[9]
These shortcomings can be decreased if measurement of D-dimer also be done to rule out DVT. Studies combining the Wells’ score and D-dimer measurement have found more sensitivity and specificity.\cite{10-12}

**Conclusion**

Wells’ scoring can be used for diagnosis of DVT in lower extremities but needs to be adjuncted by Doppler ultrasonography for more accuracy. Of the various parameters, pitting edema, swelling of entire leg, and localized tenderness along the distribution of deep venous system are most often present.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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