Differences of wells scores accuracy, caprini scores and padua scores in deep vein thrombosis diagnosis

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Abstract. Deep Vein Thrombosis (DVT) is the venous thrombus in lower limbs. Diagnosis is by using venography or ultrasound compression. However, these examinations are not available yet in some health facilities. Therefore many scoring systems are developed for the diagnosis of DVT. The scoring method is practical and safe to use in addition to efficacy, and effectiveness in terms of treatment and costs. The existing scoring systems are wells, caprini and padua score. There have been many studies comparing the accuracy of this score but not in Medan. Therefore, we are interested in comparative research of wells, caprini and padua score in Medan. An observational, analytical, case-control study was conducted to perform diagnostic tests on the wells, caprini and padua score to predict the risk of DVT. The study was at H. Adam Malik Hospital in Medan. From a total of 72 subjects, 39 people (54.2%) are men and the mean age are 53.14 years. Wells score, caprini score and padua score has a sensitivity of 80.6%; 61.1%, 50% respectively; specificity of 80.65; 66.7%; 75% respectively, and accuracy of 87.5%; 64.3%; 65.7% respectively. Wells score has better sensitivity, specificity and accuracy than caprini and padua score in diagnosing DVT.

1. Introduction
DVT results from the formation of blood clots (thrombi) in the deep veins often found in the lower leg veins (such as veins in the calf, femoral veins or poplitea veins) or veins in the pelvic cavity. The accurate and prompt diagnosis of DVT is important in reducing the risk of complications such as pulmonary embolism, post-thrombotic syndrome and pulmonary hypertension.1 Incidence of DVT in a population of 1: 1000 in the United States.2 Incidence of DVT in general population is 5 per 10,000 population/year and its incidence increases with age.3

The gold standard to diagnose DVT is by using venography. The venographic examination is not available in all health services; other possible tests are doppler ultrasonography or compression ultrasound. However, just like venographic examination, the ultrasound examination is not always available either. Therefore, many scoring systems are developed to diagnose DVT.4,5 The scoring method is practical and safe to use in addition to efficacy, as well as effectiveness in terms of treatment and cost. The existing scoring system is wells score, caprini score, padua score and many another score.

Many types of research have been done to compare wells score, caprini score, and padua score but there is not yet in Medan. Therefore, this study is conducted to compare the accuracy of wells score, caprini score, and padua score to know which scoring system is best chosen to be in daily practice.
2. Methods
This research is an analytic, case-control study conducted at H. Adam Malik Hospital Medan. The inclusion criteria for this study were patients with pretibial edema who were suspected of having DVT and aged over 18 years and were willing to abide by the study procedure whereas the exclusion criteria were patients using oral anticoagulation or injections or autoaggregation. The wells, caprini and padua score were then implemented. Samples were distinguished for DVT and non-DVT groups. Furthermore, in each group, the doppler ultrasound examination was performed. All the results of doppler scans and ultrasound were analyzed to see the accuracy of the various score in diagnosing DVT.

The sum of the score defines the patient’s risk level; Wells Score: low risk (0 point), moderate risk (1-2) and high risk of DVT (3 points). Caprini score: very low risk (0 point), low risk (1-2), moderate risk (3-4), and high risk of DVT (≥ 5 points) (figure1). Padua score: low to moderate risk (0-2 points) and high-risk of DVT(≥3 points).

The wells score was calculated: one point was allocated to active cancer (treatment ongoing or within previous 6 months or palliative), paralysis, paresis, or recent plaster immobilization of the lower extremities, recently bedridden for three days or major surgery within 12 weeks requiring general or regional anesthesia, localized tenderness along the distribution of the deep Veins, entire leg swollen, calf swelling >3cm asymptomatic side (measured 10cm below tibial tuberosity), pitting edema limited to the symptomatic leg, collateral superficial veins (non-varicose), previous DVT, and -2 points to alternative diagnosis as likely as or more likely than DVT. The Padua Score calculated: three points were allocated to active cancer, previous venous thromboembolism (VTE), reduced mobility, already known thrombophilic condition; two points to recent trauma and/or surgery, and one point to elderly age ≥70 years, heart and/or respiratory failure, acute myocardial infarction or ischaemic stroke, acute infection and/or rheumatologic disorder, obesity (BMI ≥30 kg/m²), and ongoing hormonal treatment.
3. Results
The study was 72 patients who had met inclusion and exclusion criteria with characteristics such as table 1. Based on the expression levels of D Dimer, elevated D Dimer was found in 27 subjects (75%) in DVT group whereas in the non-DVT group there were only 16 subjects (44.4%). Using Chi-Square test, a significant difference in D Dimer level (p=0.008) and leucocyte level (p=0.009) were found between the DVT and non-DVT groups. From bleeding test, there was also a significant difference PT level (p=0.029) and for TT level (p=0.011) between the two study groups.

Table 1. Basic characteristics.

| Basic Characteristics | Level |
|-----------------------|-------|
| Gender, n (%)         |       |
| Male                  | 39 (54.2)a |
| Female                | 33 (45.8)a |
| Age, year             | 53.14 (SD 15.4)b |
| Hemoglobin, gr/dl     | 10.29 (SD 2.86)b |
| Leukocyte, /mm³       | 11660 (3840-250000)c |
| Thrombocyte, /mm³     | 291.000 (39.000-741.000)c |
| Ureum, gr/dl          | 3.1 (1-4.9)c |
| Creatinin, gr/dl      | 0.95 (0.07-17)c |
| Albumin               | 3.67 ± 1.51 |
| D Dimer               | 600 (100-5000)c |
| PT, second            | 1.04 (0.75-2.7)c |
| aPTT, second          | 0.94 (0.03-1.49)c |
| TT, second            | 0.97 (0.12-1.39)c |
| INR                   | 1.04 (0.74-2.84)c |

* categorical variable: n (%)
* numeric variables, normally distributed: mean ± SD
* numeric variables, non-normally distributed: median (min-max)

The difference in the mean of wells, caprini and padua score between DVT and thenon-DVT groups in table 2. Analysis using ROC test shows that wells, caprini and padua score have area under ROC (AUROC) 0.875; 0.643; 0.657 with p-value p<0.001; 0.037; 0.022 respectively. Wells score ≥3, caprini score ≥5 and padua score ≥4 was set as the cut-off value to determine DVT with better sensitivity, specificity, and accuracy (table 3).

Table 2. Comparison of wells score, caprini score and padua score in DVT and non-DVT group.

| Score (mean ± SD) | DVT (+) | DVT (-) | p-Value |
|-------------------|---------|---------|---------|
| Wells score       | 3.33 ± 1.07 | 1.69 ± 0.79 | < 0.001 |
| Caprini score     | 4.86 ± 1.25 | 4.31 ± 1.19 | 0.030   |
| Padua score       | 3.67 ± 1.51 | 2.61 ± 1.75 | 0.016   |

Table 3. Diagnostic accuracy of Wells, Caprini, and Padua score.

|                | Sensitivity | Specificity | PPV | NPV | PLR | NLR | Accuracy |
|----------------|-------------|-------------|-----|-----|-----|-----|----------|
| Wells score    | 80.6%       | 80.6%       | 80.6%| 80.6%| 4.15| 0.24| 87.5%    |
| Caprini score  | 61.1%       | 66.7%       | 64.7%| 63.2%| 1.83| 0.58| 64.3%    |
| Padua score    | 50%         | 75%         | 66.7%| 60% | 2.00| 0.67| 65.7%    |

4. Discussion
The incidence of DVT is often at age over 45 years whereas in this study the average age of patients with DVT is 52 years. In this study, a significant difference in leucocyte levels was found between patients with DVT and without DVT (p=0.009). The more frequent incidence of leucocytosis in non-
DVT group may suggest that the possible cause of swollen legs is the presence of infection such as cellulitis or others.

In this study, the sensitivity for wells scores ≥3 points was 80.6% and specificity 80.6% with 87.5% accuracy. The study by Alfahad et al. showed 80% sensitivity, 19.4% specificity and 26.8% accuracy for wells score. From a systematic review and meta-analysis study in patients suspected of venous thrombosis, the wells score has 78% sensitivity and 98% specificity.9

In this study, the caprini score ≥5 points have a sensitivity of 61.1%, specificity 66.7%, and 64.3% accuracy. It is almost the same as the results obtained by Radu T et al, the caprini score has 82.3% sensitivity, 37.9% specificity, and 78.4% accuracy.10

In this study padua score, ≥4 points have a sensitivity of 50%, 75% specificity, and 65.7% accuracy. Similarly, Nendaz et al. found the sensitivity of 73.3% and specificity of 51.9% for padua score. In the study by Radu T et al; the padua score has 43.5% sensitivity, 81.3% specificity, and 23.3% accuracy.11

The weakness of this study is that ultrasound diagnosis of DVT requires visualization of thrombus while other conditions are only regarded as venostasis like decreased venous flow rate and widened of the vein which is part of DVT diagnosis by doppler ultrasound. Also, the study subjects were highly variable with a history of different comorbidities. It may cause considerable variation in hematologic characteristics, especially in blood-cancer patients who often show extreme blood test results such as elevated leucocytes in CML patients, including ureum and creatinine levels that directly or indirectly allow influencing the risk of DVT. The difference in DVT prevalence in this study sites from other sites may because infectious diseases rates such as cellulitis that show similar symptoms are still quite high compared to other countries in such a way that affect the results of this study.

5. Conclusion
This study showed that wells score has better sensitivity, specificity, and accuracy compared to caprini score and padua score in diagnosing DVT.

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