



Contents lists available at ScienceDirect

European Journal of Obstetrics & Gynecology and Reproductive Biology

journal homepage: www.elsevier.com/locate/ejogrb

Full length article

Are the Wells Score and the Revised Geneva Score valuable for the diagnosis of pulmonary embolism in pregnancy?



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ARTICLE INFO

Article history:

Received 3 September 2017

Accepted 28 December 2017

Keywords:

Pulmonary embolism

Pregnancy

Post partum

ABSTRACT

Objectives: To evaluate and to compare the predictive accuracy of the Wells score and the revised Geneva scores for the diagnosis of pulmonary embolism in the pregnant and postpartum population.

Study design: All pregnant or post-partum patients with a suspected PE and for whom a diagnostic imaging testing was performed (VQ scintigraphy or computed tomography pulmonary angiography) over a 3-year period were included in the study.

The Wells and Revised Geneva Scores were calculated on the same cohort of patients and dichotomized into low and intermediate/high probability groups. The sensitivities and specificities were calculated. Overall accuracy was determined using receiver operator characteristic curve analysis.

Results: A total of 103 patients were included. The overall prevalence of PE was 26.2% (27/103).

Using the Wells Score, the prevalence of patients with PE in the low, intermediate and high probability categories was 20.5%, 43.5% and 50% respectively.

Using the Revised Geneva Score, the prevalence of patients with PE in the low, intermediate and high probability categories was 17%, 36.2 and 33.3% respectively.

In low risk groups of the Wells score and the simplified revised Geneva score the prevalence of PE was not statistically significantly different: respectively: 20.5% and 17.5% ($p = 0,232$).

The agreement on clinical assessment using the Wells score and using the revised Geneva score was weak (κ coefficient = 0.154). In total, 26 (25.2%) patients were classified differently using the 2 scores.

There was no significant difference in the overall accuracies of the Wells (0.67, 95% CI 0.54–0.79) and Revised Geneva Scores (0.64, 95% CI 0.52–0.76) as determined by the area under the ROC curves ($P = 0.628$).

The sensitivity, specificity, PPV and NPV of the Wells score and the revised Geneva score were respectively: 40.7%, 81.5%, 44%, 79.4% and 62.9%, 59.2%, 35.4%, 81.8%.

Conclusion(s): The Wells score and the revised Geneva seems not to be valuable in the pregnant and post partum population.

A specific risk score of PE for pregnant and postpartum population is needed to reduce the rate of unnecessary imaging studies, especially in this specific population were the use of radiation and contrast agent is problematic.

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Introduction

Maternal mortality is a major public health problem worldwide and pulmonary embolism (PE) is one of its leading causes responsible for up to 200 deaths every day [1].

Even in the developed countries were imaging studies and multidisciplinary approaches are commonly available, pulmonary embolism still represent the first cause of maternal mortality [2].

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The elements of Virchow's triad (venous stasis, vascular damage, and hypercoagulability) are all present during pregnancy and the postpartum period, moreover, signs and symptoms of a suspected PE and/or deep vein thrombosis (DVT) can frequently overlap with classical dyspnea, chest pain and leg swelling often observed in the course of normal pregnancy leading to a diagnosis dilemma [3].

False-negative results are a concern because untreated PE has a mortality rate as high as 30% in pregnancy and consequence on fetus are untimely dependant on the consequence on the mother [4], conversely, false-positive results are worrying as the misdiagnosis of PE in pregnant women, will have implications on delivery plans, future options for contraception, and thromboprophylaxis in subsequent pregnancies [5].

As a consequence, the Royal College of Obstetricians and Gynecologists [6], and the American Thoracic Society [7], recommends that all pregnant or postpartum women with suspected PE should receive diagnostic imaging.

However, the imaging investigations used to diagnose PE (VQ scintigraphy or computed tomography pulmonary angiography (CTPA)) carries risks of radiation exposure, reaction to contrast media and incurs costs for the health service [8].

In the non-pregnant population, the Wells score and the revised Geneva scores are currently used and validated for PE diagnosis as accurate clinical protocols that triage patients into low, medium and high risk groups, reducing the rate of unnecessary imaging studies [9,10].

Recently a pilot study validated the Wells score in 100 pregnant women, against computed tomography pulmonary angiography (CTPA), showing adequate sensitivity and specificity and a negative predictive value as high as 100% in the low risk population [11].

The aim of the present study was to evaluate and to compare the predictive accuracy of the modified Wells score and the revised Geneva scores in the pregnant and postpartum population.

Methods

This study was carried out in Tunis Maternity and Neonatology Center (a university teaching tertiary referral hospital) with over 17,000 deliveries per annum.

After obtaining approval from the Institutional Review Board, we performed a retrospective review of all pregnant or early-postpartum patients admitted to the emergency department with a suspected pulmonary embolism (defined as acute onset of new or worsening shortness of breath or chest pain without any other obvious cause) during the period from January 2013 through December 2015.

As confirmed pulmonary embolism was documented by a positive CTPA, or a high-probability VQ scintigraphy result, patients in whom a diagnostic imaging testing for this suspicion was not performed (VQ scintigraphy or CTPA) were excluded.

Medical records were reviewed for clinical data used in the Wells score (Table 1) and the revised Geneva score (Table 2) and the two scores were calculated for each patient.

Accuracy of categorization of patients into pretest clinical probability groups (low, moderate, and high) was assessed by calculating pulmonary embolism prevalence.

The accuracy of the clinical probability assessment methods was compared by using the AUC of receiver operating characteristic curves [12].

The receiver operating characteristic curve illustrates the performance of a binary classifier system (pulmonary embolism versus no pulmonary embolism) as the discrimination threshold of a continuous or discrete variable. In our study, because of 3-level categorization of gestalt assessment, we used discrete 3-level variables (1 low, 2 moderate, and 3 high).

For the 2 methods (Wells score, and revised Geneva score), we compared AUC in receiver operating characteristic analyses of the 3-level classification scheme.

Agreement between clinical assessment methods was determined by κ test. The statistical analysis consisted of a comparison by the χ^2 test (for categorical variables) or Mann-Whitney U test (for continuous variables).

All statistical analyses were performed with SPSS (version 15.0; SPSS, Inc., Chicago, IL).

Significance was accepted at $p < 0.05$.

Results

A total of 145 patients were admitted to the Tunis Maternity and Neonatology Center for a suspected pulmonary embolism during the study period.

One hundred and three patients were pregnant and 32 were postpartum.

The mean age was 30.56 years (range, 18–38 years).

The presenting symptoms were shortness of breath (87.73%), chest pain (57.54%), mixed chest pain and shortness of breath (49.05%), palpitation was observed in 17.92% patients.

Of these 145 patients, 39 patients were excluded from the study analysis as the diagnosis of pulmonary embolism was ruled out before VQ scintigraphy or CTPA were performed and another pathology has been confirmed: pneumonia (22 patients); asthma crises (5 patients); cardiopathy (9 patients); pyelonephritis (2 patients) and angiocholitis (1 patient) Fig. 1.

Table 1
Wells score for pulmonary embolism.

Wells score for pulmonary embolism Points	
Clinical signs and symptoms of DVT (minimum leg swelling and pain with palpation of deep veins)	+3.0
PE as or more likely than an alternative diagnosis is less likely than	+3.0
Heart rate >100	+1.5
Immobilization or major surgery in previous 4 weeks	+1.5
Previous, objectively diagnosed PE or DVT	+1.5
Hemoptysis	+1.0
Malignancy (treatment ongoing or within the last 6 month, or palliative)	+1.0
Scoring system	
3 levels pretest probability	
Low	<2
Moderate	2–6
High	>6

DVT: deep vein thrombosis. **PE:** pulmonary embolism.

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