

Comparison between transthoracic echocardiography and transcranial Doppler for detection of PFO in patients in the acute phase of a pulmonary embolism. A Post-hoc analysis of EPIC-FOP

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Funding Acknowledgement: Type of funding source: None

Introduction: Patent foramen ovale is a fairly common defect found in a quarter of the population. PFO has always been associated with an increased risk of stroke, the mechanism of which has been attributed to the paradoxical embolism of venous thrombi passing through the PFO directly into the left atrium, however this mechanism remains debated to date.

For the detection of PFO, several modalities exist including transcranial doppler (TCD), transthoracic echocardiography (TTE) and transoesophageal echocardiography. This raises the question of the examination with the best diagnostic performance for its detection.

Purpose: The majority of studies comparing the different modalities of patient PFO diagnosis have been conducted in the context of stroke assessment. Very few studies have focused on the acute PE patient population. The interest of our study is therefore to evaluate the diagnostic performance of two modalities (TTE versus TCD) for the detection of shunts, especially since this population is at risk of stroke by paradoxical embolism due to the phenomenon of hyperpressure in the right heart chambers increasing the chances of having a paradoxical embolism.

Methods: We performed a post HOC analysis of the EPIC-FOP study which is a multicenter, prospective, French cohort study. Patients were recruited within 3 days of diagnosis of PE. Patients included were given a transthoracic echocardiography (TTE) with PFO screening by injection of

saline contrast and magnetic resonance imaging (MRI) within 7 days of inclusion to look for signs of recent stroke. A proportion of the patients included in this study also received a transcranial doppler in search of PFO, the results of which were used in our study.

Results: The mean age of the patients was 62 ± 14.66 years with a slight male predominance (55.6%). TCD was able to detect 97 right-left shunts while the TTE detected only 25 shunts. Concordance analysis by Cohen's Kappa Coefficient: 0.1767 [0.0427; 0.3107– $p < 0.001$] is considered poor. Using TTE as the reference examination, transcranial Doppler has a very good sensitivity 96.00% (79.65% to 99.90%) and a poor specificity 42.06% (33.33% to 51.18%). A good negative likelihood ratio 0.10 (0.01 to 0.66). Using TCD, incidence of stroke in the acute phase of PE was significantly higher in the PFO population. In the ten strokes detected 9 had occurred in patients with PFO, RR=1.43 IC95% (1.1169 to 1.8228) $p=0.0044$. The difference in proportion is calculated to be 26.92%.

Conclusion: It is the first study that compared TCD vs TEE in the setting of acute phase of PE for detection of PFO. TCD showed a good sensitivity and negative likelihood ratio that can be used as a first means to rule out PFO or associated with TTE. Also, our analysis confirms the increased risk of stroke following a PE episode when a PFO is present.