"Focus on Pocus" .... A Step Forward

Shibba Takkar Chabbra[1] Amit Kapila[2]

[1]Department of Cardiology, Dayanand Medical College and Hospital, Unit Hero DMC Heart Institute, Ludhiana, Punjab, India
[2]Department of Orthopedics, Fortis Hospital, Mohali, Punjab, India62113114

Address for correspondence Shibba Takkar Chhabra, DM, Department of Cardiology, Hero DMC Heart Institute, Civil Lines, Ludhiana, Punjab, India (e-mail: shibbachhabra@yahoo.com).

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Deep vein thrombosis (DVT) and pulmonary embolism (PE), the essential components of venous thromboembolism (VTE), represent the third most common causes of acute cardiac catastrophes the world over.[1] A progressive increase in annual PE incidence rates over the last decades have been reported by several longitudinal studies. Mortality due to cardiovascular collapse is well-known in more than 30% of subjects either suddenly or within a short span of few hours, even before apt treatment can be initiated or starts having its effect. Hence, prompt diagnosis of acute PE is essential and lifesaving. Serial point-of-care ultrasound (POCUS), point of care ultrasonography performed by emergency physicians, can be an asset to aid not only in early diagnosis of PE but also its risk stratification and management plan. The present study conducted in female population triaged patients with suggestive symptoms and high probability to exceed (PTE) probability on Wells' score.[2] It was found that D dimers were significantly higher in truly positive females (3878 ± 810 vs. 1688 ±321), with a highly significant area under curve (AUC) of 0.81. FOCUS algorithms consisting of acute right ventricular (RV) dilatation and acute tricuspid regurgitation were noticed in 70% of positive females. Tricuspid annular plane systolic excursion (TAPSE) values were significantly below a cutoff of 1.8. (AUC 0.88), with a decrease in sensitivity of TAPSE if cutoff was decreased to 1.2. (AUC 0.31). The cutoff value of TAPSE was identified as 1.8 in female patients, which dropped further down to 1.5 compared with the entire study population. It is concluded that TAPSE can prove as a modality for early identification of PTE and subsequent early institution of medical therapy.

Mean TAPSE dimensions of 15.2 mm and 22.7 mm were reported by Laham et al, in a recent tricuspid annular plane of systolic excursion to prognosticate acute pulmonary symptomatic embolism (TAPSEPAPSE) study, in subjects with and without hemodynamically critical acute PE, respectively ($p \leq 0.0001$).[3]Receiver operating characteristic (ROC) curve evaluation pinpointed the cutoff value to diagnosed critical PE as 18.2 mm. TAPSE value of 15.2 mm was 53.3% sensitive and 100% specific in diagnosing hemodynamically and clinically critical PE. It was concluded that TAPSE dimensions less than 15.2 mm are highly specific for recognizing critical acute PE. Moving a step forward, Lyhne et al hypothesized that an echocardiographic ratio of TAPSE upon pulmonary arterial systolic pressure (PASP) had an edge and could forecast detrimental consequences greater than either of dimensions considered independently.[4] They found it appropriate for risk gradation in intermediate-risk PE. The primary and secondary outcome of this single center retrospective study of the pulmonary embolism response team (PERT) registry spanning over 7 years (2012 -2019) were a 7-day cumulative outcome of death or hemodynamic devaluation and 30-day all-cause mortality, respectively. The primary cumulative outcome was met in 135 of 627 subjects included in the study. The univariate evaluation revealed that the TAPSE/PASP was linked with primary endpoint significantly more ($p < 0.001$) than either TAPSE or PASP individually ($p = 0.017$ and $p < 0.0001$, respectively). A cutoff TAPSE/PASP value of 0.4 was concluded to be appropriate for prognosticating negative outcomes in PE patients. Both 7- and 30-day all-cause mortality was forecasted by TAPSE/PASP ratio while TAPSE and PASP individually did not.

Jae-Hyeong Park et al in an echocardiographic analysis of acute PE patients found that TAPSE was significantly correlated with right ventricular fractional area change (RVFAC), RV Tei index, brain natriuretic peptide (BNP), and pulmonary vascular resistance ([$r = 0.841$, $p < 0.001$], [$r = -0.347$, $p = 0.018$], [$r = -0.634$, $p < 0.001$] [$r = -0.635$, $p < 0.001$], respectively).[5] The optimal TAPSE value for diagnosing RV systolic dysfunction (RVFAC < 35%) was detected to be 1.75 cm (AUC = 0.96, $p < 0.001$; sensitivity 87% and specificity 91%). TAPSE appears to be an attractive tool for diagnosing RV dysfunction as, unlike the other qualitative RV variables of RV dysfunction, TAPSE lays out a definite objective value that corresponds to RV systolic function. This permits an easy differentiation of normal versus abnormal. Moreover, TAPSE is reproducible by operators and has high interobserver accuracy. It relies less on image quality and can be used by

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emergency physicians with a low learning curve. TAPSE is fraught with several limitations as well. It calculates the longitudinal expedition of the tricuspid annulus in a single direction and misses the transverse excursion of the RV free wall and septum, contributing to RV ejection fraction (EF). Therefore, in subjects with regional differences in RV function, TAPSE may not be as accurate. Also, the numerical value may be affected by the angle created between the M-mode cursor and the tricuspid annulus. Also, reduced TAPSE is not specific for diagnosing PE. RV dysfunction secondary to other etiologies (e.g., pulmonary hypertension [HTN]/congenital heart failure [CHF]) may have a reduced TAPSE. The precise cutoff value of numerical estimation has yet to be pinpointed, and the present study is an effort in a similar direction.

POCUS appears to be an attractive tool in the hands of the emergency physician. Studies on a larger scale, especially in female subjects, can be contributory invalidating this tool as a part of the PERT team diagnostic algorithm. Single and serial measurements as TAPSE and TAPSE/PASP ratio can diagnose, risk stratify, and prognosticate a patient of acute PE, aiding in prompt management decisions which could be lifesaving. So, I can conclude by saying, “Let's FOCUS on POCUS” …. a step ahead in acute PE management.

Conflict of Interest
None declared.

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