Benha Journal of Applied Sciences (BJAS) **print: ISSN 2356–9751**
Vol.(5) Issue(8) Part (2) (2020), (237-241) **online: ISSN 2356–976x**
http://bjas.journals.ekb.eg

Role of Echocardiography in Assessment of Right Ventricular Function in Patients with Non-massive Pulmonary Embolism

A.M.Aziz, H.A.Mansour , A.I.Atia and M.M.Ali
Cardiology Dept., Faculty of Medicine, Benha Univ., Benha, Egypt
E-Mail: Amrmadycardio@gmail.com

Abstract

A prognostic value of right ventricular (RV) systolic function assessed by echocardiography in patients with acute non-massive pulmonary embolism (PE) remains controversial. We planned to assess right ventricular capacity in patients with non-enormous aspiratory embolism utilizing tissue Doppler and dot following echocardiography. 50 continuous patients analyzed as intense non-enormous pneumonic embolism were tentatively enlisted and echocardiographic assessments were performed inside multi week of conclusion to gauge different boundaries of RV systolic capacity. The essential endpoint was in-emergency clinic occasions, the composite of in-medical clinic PE-related demise, need of added substance therapies, for example, thrombolysis and need of inotropics because of unsteady fundamental sign. Result: PESI score was essentially higher in those with in emergency clinic occasion (120) contrasted with those with no occasion (72). P esteem was =0.002. As respect PESI grade ≥ 3, It was altogether higher in those with in-emergency clinic occasion (80%) contrasted with those with no occasion (39%). P esteem was 0.004. Mean RV worldwide divider strain was fundamentally lower in those with in-clinic occasion (- 11%) contrasted with those with no occasion (- 19%). P esteem was 0.002. Mean FAC was essentially lower in those with in-medical clinic occasion (34%) contrasted with those with no occasion (43%). P esteem was 0.004. Mean TAPSE was altogether lower in those with in-medical clinic occasion (1.4 cm) contrasted with those with no occasion (1.8 cm). P esteem was 0.005. Mean S speed was altogether lower in those with in-emergency clinic occasion (11 cm/s) contrasted with those with no occasion (14 cm/s). P esteem was 0.006. . RV strain surveyed with dot following echocardiography is a free prognostic marker for in-clinic occasions in patients with intense non-enormous PE. Our outcomes may help recognize high–middle of the road hazard patients who need a closer observing.

Keywords: Echocardiography, Right ventricular function, Pulmonary embolism.

1. Introduction

Acute PE may prompt RV pressure over-burden and brokenness, which can be identified by echocardiography. There is no individual echocardiographic boundary that gives quick and solid data on RV size or capacity. This is the reason echocardiographic measures for the finding of PE have contrasted between studies [1]. Because of the announced negative prescient estimation of 40–half, a negative outcome can't reject PE [2]. Then again, indications of RV over-burden or brokenness may likewise be found without intense PE, and might be because of corresponding cardiovascular or respiratory disease[3] Echocardiographic assessment isn't compulsory as business as usual demonstrative workup in hemodynamically stable patients with suspected PE2.RV widening is found in ≥25% of patients with PE on transthoracic echocardiography (TTE) and is helpful for hazard delineation of the disease [4] .The blend of an aspiratory launch quickening time (estimated in the RV surge lot) <60 ms with a pinnacle systolic tricuspid valve inclination <60 mmHg ('60/60' sign), or with discouraged contractility of the RV free divider contrasted with the 'echocardiographic' RV peak (McConnell sign), is reminiscent of PE [5]. Decreased tricuspid annular plane systolic journey (TAPSE) may likewise be available in PE patients [6]. Mobile right-heart thrombi are recognized by TTE or transoesophageal echocardiography (TOE), or by CT angiography, in <4% of unselected patients with PE [7]. Their commonness may arrive at 18% among PE patients in the escalated care setting8. Versatile right-heart thrombi basically affirm the finding of PE and are related with high early mortality, particularly in patients with RV brokenness [7].

Echocardiographic boundaries of RV work got from Doppler tissue imaging and divider strain appraisal may likewise be influenced by the presence of intense PE. The new presentation of dot following echocardiography (STE) has given a target intends to measuring the electro-mechanical delay between the RV and LV with improved precision and more prominent reproducibility than can be achieved with conventional 2DE [9].

2. Patients and methods

2.1 Study design

It is a single center observational prospective study that will be conducted at cardiology department of Benha university hospital.

2.2 Patients

50 patients with non-massive pulmonary embolism will be enrolled in the study.

2.3 Inclusion criteria

- Age ≥18 years
- CT finding of intense PE
- Echocardiography assessment was performed inside multi week, since PE was analyzed

2.4 Exclusion standards

- Presented with stun or hypotension at the confirmation
- Had problematic echocardiographic pictures for the evaluation of RV work
- Had a last finding other than intense PE after workup.

2.5 All patients went through

Clinical assessment, including clinical history, actual assessment, including PE seriousness list (PESI, electrocardiography, chest radiography, echocardiography, processed tomography (CT), and lab tests including troponin-I and D-Dimer.

Echocardiography

We estimated the RV record of myocardial execution (RIMP), two-dimensional RV partial zone change (FAC), tricuspid annular plane systolic journey (TAPSE), and longitudinal S′ speed of the tricuspid horizontal annulus (S′ speed). RIMP was determined as the RV isovolumic time isolated by the launch time .Offline spot following examinations were performed. RV worldwide longitudinal divider strain was estimated from the RV-centered apical 4-chamber see utilizing dot following echocardiography RV worldwide divider strain was estimated from the entire RV myocardium including the interventricular septum.

Documentation In-emergency clinic occasions including: In-clinic aspiratory embolism-related passing, need of thrombolysis and need of inotropes.

3. Results and conversation

Results

This investigation was led in cardiology branch of Benha University emergency clinic on 100 patients with non-enormous pneumonic embolism.

General attributes as per event of in clinic occasion

There were no huge contrasts between the two gatherings as respect all broad qualities including age, sexual orientation, diabetes mellitus, hypertension & malignancy, DVT Table (1).

Table (1) General characteristic according to occurrence of in-hospital event**.**

			In hospital events (n=5)	No events (n=43)	P value
Age (Years)	Mean ±SD		50 ±10	52 ±16	0.57
Gender	Male	n (%)	2 (30.8)	18 (40.2)	0.61
	Female	n (%)	4 (69.2)	26 (59.8)	
DM	Yes	n (%)	2 (30.8)	10 (23.0)	0.64
HTN	Yes	n (%)	1 (15.4)	12 (26.4)	0.4
Malignancy	Yes	n (%)	1 (23.1)	5 (11.5)	0.32
DVT	Yes	n (%)	5 (69.2)	21 (49.4)	0.12

Vital signs according to occurrence of in hospital event

There were no significant differences between both groups as regard all vital signs including heart rate, systolic blood pressure, and respiratory rate and O2 saturation Table (2).

Table (2) Vital signs according to occurrence of in-hospital event**.**

		In hospital events (n=5)	No events (n=43)	P value
Heart rate	Mean ±SD	115 ±11	110 ±12	0.15
Systolic blood pressure	Mean ±SD	112 ±9	115 ±14	0.41
Respiratory rate	Mean ±SD	30 ±4	25 ±3	0.34
Oxygen saturation	Mean ±SD	90 ±2	91 ±3	0.09

PESI score and grade according to occurrence of in hospital event

PESI score was significantly higher in those with in hospital event (120) compared to those with no event (72). P value was =0.002. As regard PESI grade ≥ 3, It was significantly higher in those with in-hospital event (80%) compared to those with no event (39%). P value was 0.004 Table (3) Fig (1).

Table (3) PESI score and classification according to occurrence of in-hospital event**.**

			In hospital event (n=5)	No events (n=43)	P value
PESI score	Mean ±SD		120 ±35	72 ±20	0.002
PESI grade ≥ III	Yes	n (%)	4 (80)	17 (39)	0.004

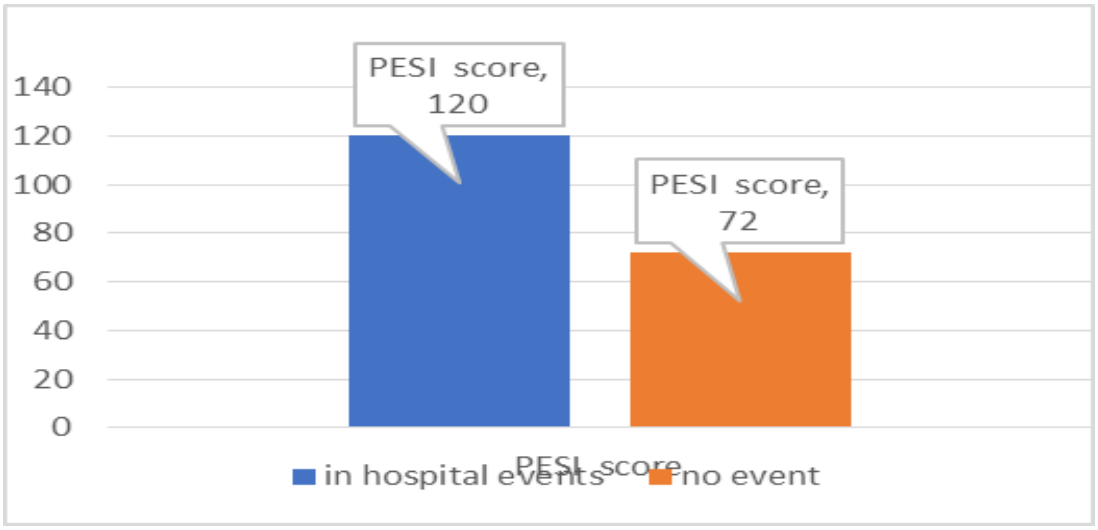

Fig (1) Mean PESI score in those with & without in-hospital events**.**

Laboratory findings according to occurrence of in hospital event

There were no significant differences between both groups as regard all laboratory findings including hemoglobin, creatinine, troponin and D-dimer Table (4).

Table (4) Laboratory findings according to occurrence of in-hospital event.

		In hospital events (n=5)	No events (n=43)	P value
Hemoglobin (g/dl)	Mean ±SD	11 ±1.1	11.5 ±1.3	0.88
Creatinine (mg/dl)	Mean ±SD	0.8 ±0.1	1 ±0.2	0.91
Troponin I (ng/ml)	Median (range)	3.1(0.05-9.3)	0.9(0.02-10)	0.22
D-Dimer (ng/ml)	Median (range)	811 (511-5036)	720 (223-3122)	0.312

Medications according to occurrence of in hospital event

There were no significant differences as regard use of NOAC, warfarin Table (5).

Table (5) Medications according to occurrence of in-hospital event.

			In hospital events (n=5)	No events (n=43)	P value
NOACs	Yes	n (%)	4 (80)	26 (60)	0.09
Warfarin	Yes	n (%)	3 (60)	17 (39.5)	0.52

Echocardiographic parameters according to occurrence of in hospital event

Mean RV global wall strain was significantly lower in those with in-hospital event (-11%) compared to those with no event (-19%). P value was 0.002. Mean FAC was significantly lower in those with in-hospital event (34%) compared to those with no event (43%). P value was 0.004. Mean TAPSE was significantly lower in those with in-hospital event (1.4 cm) compared to those with no event (1.8 cm). P value was 0.005. Mean S velocity was significantly lower in those with in-hospital event (11 cm/s) compared to those with no event (14 cm/s). P value was 0.006. There were no significant differences as regard RIMP Table (5) Fig (2).

Table (5) Echocardiographic parameters according to occurrence of in-hospital event.

		In hospital events (n=5)	No events (n=43)	P value
RV global wall strain (%)	Mean ±SD	-11 ±2.5	-19 ±4.1	0.002
RIMP	Mean ±SD	0.6 ±0.1	0.8 ±0.2	0.3
FAC (%)	Mean ±SD	34 ±4	43 ±6	0.004
TAPSE (cm)	Mean ±SD	1.4 ±0.2	1.8 ±0.5	0.005
S velocity (cm/s)	Mean ±SD	11 ±2.3	14 ±2.6	0.006

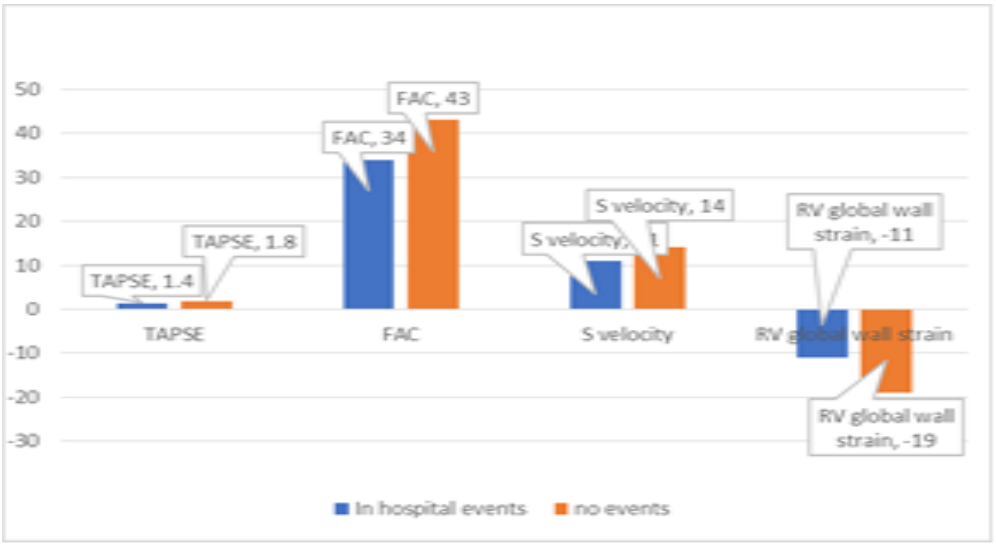

Fig (2) Echocardiographic parameters in those with & without in-hospital event.

4. Discussion

Patients with submassive or middle danger PE analyzed as RV hypokinesia surveyed utilizing subjective translation were remembered for the investigation. As the subjective appraisal of RV capacity might be emotional, the consideration of patients may likewise be abstract. In this way, we included patients with non-monstrous PE remembering patients with okay for our examination. Dahhan et al. exhibited that the expansion of echocardiographic boundaries to clinical boundaries may improve the danger forecast in intense PE. In the current investigation, we found that the RV worldwide divider strain was the best prognostic imaging pointer in patients with intense non-enormous PE.

In the current stage, the rules don't give any cut-of estimations of quantitative boundaries for RV work. The dichotomous choice about RV brokenness would be abstract and thusly deceptive for tolerant administration, particularly in patients with moderate danger. Accordingly, a more goal and quantitative worth is needed in this clinical circumstance, and the cut-of estimation of RV worldwide divider strain of −11%, which was the aftereffect of our investigation, can be helpful for this reason. As a diminished RV systolic capacity decided by RV worldwide divider strain worth may predict a helpless transient guess, we recommend that patients with non-monstrous PE at this high danger may warrant a more forceful initial treatment strategy.

5. Conclusion

RV global wall strain assessed with speckle tracking echocardiography is an independent prognostic marker for in-hospital events, such as in-hospital PE-related death, additive need of aggressive treatment, and need of inotropics due to unstable vital sign in patients with acute non-massive PE. Our results may help identify high-intermediate risk patients who need a closer monitoring.

References

[1] S.V.Konstantinides, G.Meyer, C.Becattini. ESC Guidelines for the diagnosis and management of acute pulmonary embolism developed in collaboration with the European Respiratory Society (ERS) The Task Force for the diagnosis and management of acute pulmonary embolism of the European Society of Cardiology (ESC). European heart journal, Vol.41(4),PP.543-603,2020.

[2] A.Perrier, P.M.Roy, O.Sanchez. Multidetector-row computed tomography in suspected pulmonary embolism. New England Medicine, Vol.352(17),pp.1760-1768,2005.

[3] C.Bova, F.Greco, G.Misuraca. Diagnostic utility of echocardiography in patients with suspected pulmonary embolism. The American emergency medicine, Vol.21(3),PP.180-183,2003.

[4] M.Paczyńska, P.Sobieraj, Ł.Burzyński. Tricuspid annulus plane systolic excursion (TAPSE) has superior predictive value compared to right ventricular to left ventricular ratio in normotensive patients with acute pulmonary embolism. Archives of medical science: AMS, Vol.12(5),pp.1008,2016.

[5] A.Torbicki. Echocardiographic diagnosis of pulmonary embolism: a rise and fall of McConnell sign?. European Echocardiography, Vol.6(1),PP.2-3,2005.

[6] E.Schmid, J.N.Hilberath, G.Blumenstock. Tricuspid annular plane systolic excursion (TAPSE) predicts poor outcome in patients undergoing acute pulmonary embolectomy. Heart, lung and vessels, Vol.7(2),PP.151,2015.

[7] S.V.Konstantinides, A.Torbicki, G.Agnelli. ESC Guidelines on the diagnosis and management of acute pulmonary embolism: The Task Force for the Diagnosis and Management of Acute Pulmonary Embolism of the European Society of Cardiology (ESC) Endorsed by the European Respiratory

Society (ERS). European heart journal, Vol.35(43),PP.3033-3080,2014.

[8] E.Ferrari, M.Benhamou, F.Berthier, M.Baudouy. Mobile thrombi of the right heart in pulmonary embolism: delayed disappearance after thrombolytic treatment. Chest, Vol.127(3),PP.1051-1053,2005.

[9] A.Meris, F.Faletra, C.Conca. Timing and magnitude of regional right ventricular function: a speckle tracking-derived strain study of normal subjects and patients with right ventricular dysfunction. the American Society of Echocardiography. vol.23(8),PP.823-83,2010.