Lateral Chest X-ray for Differentiating between Left Ventricular Enlargement and Left Atrial Enlargement

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Background: Chest x-ray is the widely available diagnostic test for assessing the cardiac size and aiding diagnosis of cardiac diseases, especially where transthoracic echocardiography (TTE) is not available. The measurement of cardiothoracic ratio (CTR) from the postero-anterior (PA) view have some limitations in differentiating left ventricular dilatation (LVD) from isolated left atrial enlargement (LAE). We proposed that measurement CTR from lateral CXR may be useful in this setting.

Objective: To study the accuracy and the best cut-point of CTR in distinguishing LVD from isolated LAE measured from CXR-PA and lateral view compared to the gold standard value of LV dimension from TTE. We developed new method to measure CTR in lateral view called AB and AV methods.

Methods: This was a retrospective-diagnostic study. We identified consecutive cases with LVD and cases with isolated LAE from Siriraj echocardiography database during 2014 - 2016. The CXR in both views was required to be done within 60 days of performed TTE. CTR in both PA and lateral view were measured by the investigator blinded to TTE result. We also measured LV using Hoffman & Rigler method (H&R) in lateral view. We then analyzed the sensitivity and specificity of these measurements compared to the TTE criteria for LVD.

Results: Total 360 cases (mean age 59.9 ±16.3 years, 46.9% male) were eligible with the inclusion criteria of LVD (181 cases) and LAE (179 cases). The diagnoses from TTE were valvular heart disease (36.9%), hypertensive heart disease (16.9%), and myocardial disease (21.4%). CTR in lateral film was not better than measurement in PA view to distinguish LVD from isolated LAE. The best cut points of CTR in the lateral view using AB method and AV method were 0.6 (AUC 0.65, sensitivity 58.6%, specificity 72.1%), and 0.75 (AUC 0.63, sensitivity 36.5%, specificity 90.5 %), respectively. While the best cut-point determine by CTR in PA view was 0.6 (AUC 0.61, sensitivity 49.7%, specificity 72.6%). The intraobserver and interobserver reliability of CTR measurements were good in all CTR measurement.

Conclusion: Both CTR measurements in PA and lateral view perform poorly in differentiating LVD from isolated LAE. Therefore, TTE is mandatory to evaluate LV dimension and function in modern practice. However, in the setting where echocardiography is unavailable, the extreme CTR (AV method) from lateral view might help to identify LV dilatation and aid in diagnosis of underlying cardiac condition.

Keywords: Cardiothoracic ratio from lateral CXR, Left ventricular dilatation