

Optimal cut plane for the measurement of tricuspid annular plane systolic excursion: how should we measure TASPE?

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Introduction: Assessment of right ventricular systolic function plays an important role in management of cardiovascular disease. Tricuspid annular plane systolic excursion (TAPSE) is the most widely used quantitative parameter; however, there is a lack of evidence regarding the appropriate cut plane for its measurement.

Purpose: This study aimed to elucidate the optimal cut plane for TAPSE measurement, focusing on the incidence angle of the M-mode cursor and relationship to an angle-independent right ventricular systolic parameter.

Methods: This retrospective study included 113 adult patients referred for echocardiography for a variety of clinical indications. TAPSE was measured using the M-mode in the standard, focused, and modified apical four-chamber views (**Figure 1**). Incident angles between the M-mode cursor and the direction of the lateral tricuspid annulus movement were also measured. Right ventricular free wall longitudinal strain was measured as an angle-independent parameter.

Results: TAPSE measured from the modified apical four-chamber view was the largest among the three approaches (standard apical four-chamber view: 20.7 ± 5.2 mm; focused apical four-chamber view: 19.9 ± 4.7 mm; modified apical four-chamber view: 22.9 ± 5.5 mm; one-way repeated measures ANOVA $P < 0.001$) (**Figure 2A**). The incident angle was the smallest in the modified apical four-chamber view (standard apical four-chamber view: 24.1 ± 9.8 degrees; focused apical four-chamber view: 28.6 ± 11.0 degrees; modified apical four-chamber view: 14.7 ± 7.9 degrees; one-way repeated measures ANOVA $P < 0.001$) (**Figure 2B**). TAPSE from the modified apical four-chamber view showed a better correlation with right ventricular free wall longitudinal strain compared to other approaches (standard apical four-chamber view: $r = 0.632$ [95% confidence interval: 0.506 to 0.731], $p < 0.001$; focused apical four-chamber view: $r = 0.626$ [95% confidence interval: 0.499 to 0.727], $p < 0.001$; modified apical four-chamber view: $r = 0.700$ [95% CI: 0.592 confidence interval 0.783], $p < 0.001$, respectively).

Conclusions: The modified apical four-chamber view was the most optimal for TAPSE measurements owing to the largest value and the smallest incident angle. Standardization of

measurements to the modified apical four-chamber view would provide accurate assessment of the right ventricular systolic function in daily practice.

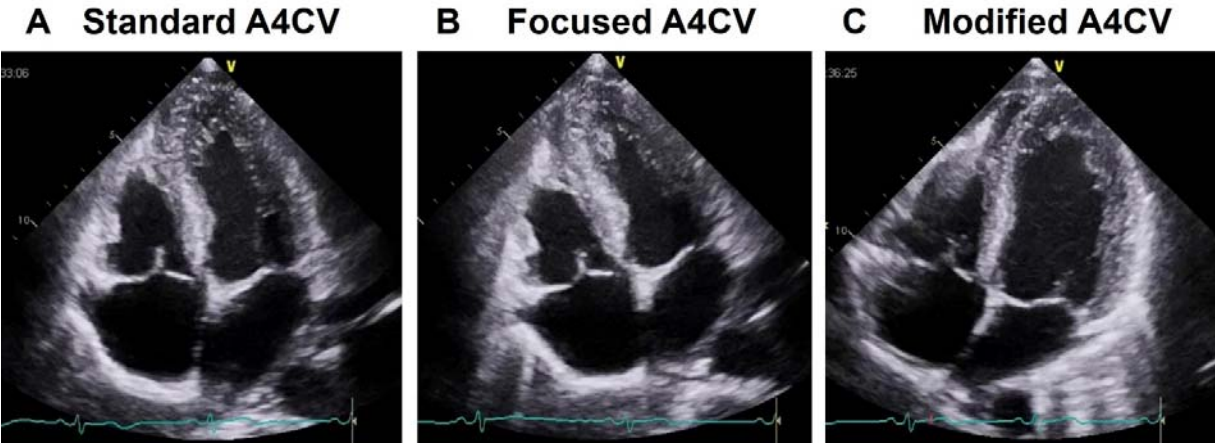


Figure 1. Apical four-chamber views used to perform comprehensive evaluation of the right heart.
(A) Standard apical four-chamber view (A4CV). (B) Right ventricular focused A4CV. (C) Right ventricular modified A4CV.

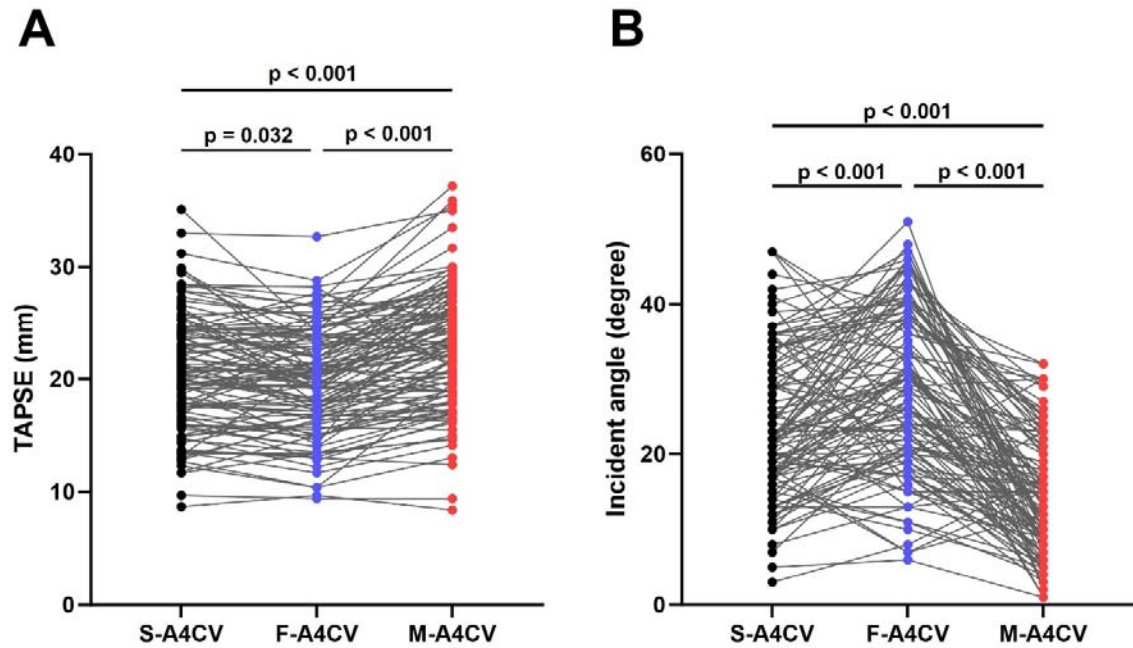


Figure 2. Comparison of the TAPSE and the incidence angle of the M-mode cursor measured from the standard A4CV, focused A4CV, and modified A4CV.
S-A4CV = standard A4CV; F-A4CV = focused A4CV; M-A4CV = modified A4CV.

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M モード法による三尖弁輪収縮期移動距離計測の最適断面に関する検討:TAPSE の計測にはどの断面を用いるべきか

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【背景】三尖弁輪収縮期移動距離 (TAPSE) は、簡便に計測でき、日常診療でよく用いられる右室収縮機能指標であるが、その誤差要因として角度依存性が問題となる。右室を描出するための心尖部断面として、standard apical 4-chamber view、focused apical 4-chamber view および modified apical 4-chamber view の 3 断面がガイドラインに記載されているが、TAPSE の計測に最適な断面に関するエビデンスは不足している。本研究の目的は、超音波ビームの入射角度および非角度依存性の右室機能指標との関連に着目し、TAPSE 計測に最も適する断面を明らかにすることである。

【方法】心エコー検査を施行した 113 例を対象に、右室を描出するための 3 断面において、M モード法を用いて TAPSE を計測するとともに自由壁側三尖弁輪の収縮期移動ベクトルと超音波ビーム方向とのなす角度 (θ) を計測した。非角度依存性の指標として右室自由壁側の収縮期長軸方向ストレイン (RV-St) を計測した。

【結果】TAPSE は、modified apical 4-chamber view で他の 2 断面に比し有意に大であった (standard: 20.7 ± 5.2 mm; focused: 19.9 ± 4.7 mm; modified: 22.9 ± 5.5 mm; one-way repeated measures ANOVA $P < 0.001$)。 θ は modified apical 4-chamber view で他の 2 断面に比し有意に小であった (standard: 24.1 ± 9.8 度; focused: 28.6 ± 11.0 度; modified: 14.7 ± 7.9 度; one-way repeated measures ANOVA $P < 0.001$)。TAPSE と RV-St との相関は、modified apical 4-chamber view で他の 2 断面より良い傾向を認めた (standard: $r = 0.63$, $p < 0.001$; focused: $r = 0.63$, $p < 0.001$; modified: $r = 0.70$, $p < 0.001$)。

【結論】TAPSE の計測には、TAPSE が最も大きく計測され、超音波ビームの入射角度が小さくかつ RV-St とよく相関する modified apical 4-chamber view を用いるのが良いと考えられた。TAPSE の計測断面を modified apical 4-chamber view に統一することにより、日常の検査における右室収縮機能指標の計測精度が向上するものと考えられた。