

arteries. Echocardiography provides a reliable assessment of these structures, and CTA can be reserved for complex cases.

Keywords: TTE, CTA, TOF, PA, Pediatric

INTRODUCTION

Worldwide, congenital heart disease (CHD) is one of the most common structural birth defects and a leading cause of death in children under five, accounting for 204,223 deaths in 2021.¹ Among the various types of CHD, Tetralogy of Fallot (TOF) is the most frequently occurring form of cyanotic heart disease affecting approximately 4-5 out of 100,000 live births, representing around 7% to 10% of all CHD cases.^{2,3} In Bangladesh, a nationwide study reported that the overall prevalence of CHD among children was 18.9 per 1,000 live births, with TOF accounting for 10.34% of cyanotic CHD.⁴

TOF typically presents with malaligned outlet ventricular septal defect (VSD) and varying degrees of obstruction at the infundibular and/or pulmonary valve level, overriding of aorta.⁵ In current clinical practice, most children with TOF undergo complete surgical repair during infancy or early childhood, with survival rates now exceeding 90%. Without definitive treatment, long-term survival is limited. Nearly half of untreated patients die within the first 5 to 10 years, primarily due to complications like chronic hypoxemia, infective endocarditis, brain abscess, or stroke.^{6,7}

In TOF, thorough assessment of the pulmonary artery anatomy and valve is critical for effective surgical planning. A precise understanding of both the morphology and caliber of the pulmonary arteries is essential for selecting the appropriate surgical intervention in patients.⁸ Likewise, the structure of the pulmonary valve and the size of the annulus play a key role in guiding surgical planning, predicting postoperative complications, and influencing long-term outcomes.⁹ Thus, it often necessitates a structured imaging approach that is tailored to the patient's age, condition, and local resources for accurate assessment and intervention planning.¹⁰

Transthoracic echocardiography (TTE) is the most commonly used first-line imaging modality for the diagnosis of TOF. This noninvasive test provides detailed assessment of right ventricular outflow tract obstruction (RVOTO), the location and number of ventricular septal defects (VSDs), associated anomalies, the aorta, and coronary artery variants. However, it is operator-dependent and has limitations in evaluating complex abnormalities.¹¹

In contrast, computed tomography angiography (CTA) enables detailed visualization of the pulmonary artery anatomy, allowing imaging in multiple planes. It also provides clear views of the heart chambers, mediastinum, and adjacent blood vessels.¹² However, CTA is costly, exposes patients to radiation, need sedation for children's and poses a risk of adverse reactions to contrast material.¹³

In resource-limited settings of Bangladesh, access to CTA may be constrained by availability and cost, particularly in peripheral healthcare centers, making TTE the most commonly used imaging modality for the evaluation of TOF. Although TTE and CTA have both been used to assess pulmonary arteries diameter, their comparative performance in this context has not been sufficiently explored in our country. Therefore, this study aims to compare TTE and CTA in the measurement of pulmonary arteries diameters to assess their role in guiding surgical management.

METHODS

A cross-sectional, retrospective study was conducted at Ibrahim Cardiac Hospital and Research Institute (ICHRI), Dhaka after obtaining ethical approval from the Institutional Review Board.

Hospital record of all consecutive patient .5 years old with diagnosed TOF who underwent TTE followed by CTA from January 2024 to September 2025 were collected after obtaining permission from the hospital authority. Patients with a documented history of complex congenital cardiac anomalies, other significant congenital or acquired conditions, or any prior cardiac intervention or surgery were excluded. Additionally, cases with incomplete medical records or suboptimal image quality in either TTE or CTA