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A Simple Tool to Predict Transradial Access Failure for Coronary Angiography

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Based on multiple large clinical trials, the transradial access (TRA) approach has been widely accepted as the preferred method of vascular access for coronary angiography and percutaneous coronary intervention [1-3]. However, it is not without its limitations and complications. The major concern with the radial approach is access failure, requiring crossover to the traditional transfemoral access (TRA) approach. The rate of TRA failure requiring TFA crossover has been documented in the literature to occur in up to 11% of cases [4-7]. Unfortunately, the need for TFA crossover due to TRA failure can negatively affect patient care. For example, patients experience the discomfort associated with two needle punctures and are exposed to the potential complications of both radial and femoral artery access, which includes infection, bleeding, thrombosis, and arterial aneurysm. Additionally, TRA failure requiring TFA crossover can delay emergent coronary interventions in patients presenting with ST-segment elevation myocardial infarctions, where every minute is valuable time to the myocardium [8].

Recent studies have identified anatomical, procedural, and pathophysiologic factors predisposing patients to TRA failure. Patients with small arterial diameters, subclavian tortuosity, short ascending aortas, and small wrist circumferences have been identified as anatomic factors associated with a higher likelihood TRA failure [5,6,8-10]. From a procedural standpoint, cannulation of the radial artery is one of the most common causes of the TRA failure [8]. Cannulation failure can vary between proceduralist depending on their experience and skill level, however a major contributor to cannulation failure is variations in patients' arterial anatomy [8]. In a recent study, we found that the most common cause of TRA failure in our patient population was difficulties with threading the wire in patients with radial artery stenosis and vascular tortuosity [4]. Experts have found that difficulties with cannulation of the radial artery can trigger arterial vasospasm and remodeling, making subsequent access attempts progressively more difficult [8,11-13]. Many pathophysiologic factors have also been found to contribute to TRA failure. For example, patients with a history of coronary artery bypass grafting and those presenting with unstable myocardial infarctions are at high risk for crossover to TFA [6,8].

Despite the many recognized contributing factors, currently, there are no quick or easy tools for cardiologist to use to predict TRA failure. The use of ultrasound has been widely incorporated into most cath labs to assist with vascular access. Studies have found that the use of ultrasound during radial artery access can help predict the success of TRA coronary angiography [14]. However, even with the wide utilization of ultrasound for first-attempt radial access, TRA failure requiring crossover to another vascular site has remained a limitation of the radial approach [15]. We recently studied the use of the CHA_2DS_2-VASc score to predict patients at high risk for TRA failure requiring crossover to TFA [4]. The CHA_2DS_2-VASc score has been used to predict the risk of embolic stroke in patients with atrial fibrillation as well as adverse cardiac events in patients without atrial fibrillation [4,16]. Given that patients at increased risk for TRA failure share many of the same risk factors as patients with atrial fibrillation at increased risk for embolic stroke, we chose to use the CHA_2DS_2-VASc in our study [4]. We found that almost 20% of patients with a CHA_2DS_2-VASc score of greater than 4 had TRA failure requiring crossover to the TFA compared to 6.3% and 12.5% of patients with a score of less than 3 and 3-4, respectively [4]. Furthermore, we found that in our studied population, patients the highest rate of TRA failure requiring crossover were those with a

CHA_2DS_2-VASc score of 8 or higher [4].

We believe that the CHA_2DS_2-VASc score can be used by cardiologists as a simple tool to predict TRA failure. By calculating a CHA_2DS_2-VASc score, physicians can easily and quickly determine which patients are at risk for TRA failure and proceed with a femoral approach in those with a high score. This simple scoring system will not only save time in emergent situations but also eliminate the potential complications of attempting and failing the radial approach. While our study demonstrated promising results and supports the use of the CHA_2DS_2-VASc score to predict TRA failure, more studies are needed to fully assess its use in the cath lab.

Conflict of Interest

None to declare.

Author Contributions

All authors reviewed the literature and helped write the manuscript. Benjamin Fogelson DO, Hassan Tahir MD, James Livesay DO, and Raj Baljepally MD performed critical revisions of the article and approved the final version of manuscript.

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