Comparative Analysis of MitraClip/TriClip and PASCAL Implantation in Transcatheter Tricuspid Valve Repair for Tricuspid Regurgitation: A Systematic Review and Meta-analysis

Mahmoud Balata (M.D.)[1], Mohamed Ibrahim Gbreel (MBBCh).[2], Marwa Hassan (M.D. PhD)[3]., Marc Ulrich Becher (M.D. PhD.)[1,4]

1. *Department of Internal Medicine and Polyclinic II, University Hospital Bonn, Germany.*
3. *Faculty of Medicine and Surgery, October 6 University, Giza, Egypt.*
3. *Department of Immunology and Endocrinology, Theodor Bilharz Research Institute, Giza, Egypt.*
4. *Department of Cardiology, City Hospital Solingen, Solingen, Germany.*

Background:
The edge-to-edge transcatheter tricuspid valve repair (TTVR) has emerged as a promising technique for the treatment of tricuspid regurgitation (TR). Despite its potential, comparative data on the performance of the novel edge-to-edge devices—MitraClip, PASCAL, and TriClip—remain controversial.

Aim and objectives:
In this study, we aim to evaluate the safety and efficacy of these devices in treating TR.

Methods:
Five databases were systematically searched up to May 2023, with an updated search conducted in May 2024. Only original studies were included in the analysis and were critically evaluated using an adapted version of the Newcastle-Ottawa Scale (NOS) for observational cohort studies and the Cochrane Risk of Bias (ROB) tool for randomized controlled trials.

Result:
The database search yielded 2239 studies, out of which 21 studies were included in the final analysis. These studies encompassed a total of 2178 patients who underwent TTVR using either the MitraClip, TriClip, or PASCAL devices. The risk of bias across these studies ranged from moderate to high. No significant differences were found among the three devices in terms of effective regurgitant orifice area (EROA) and tricuspid regurgitant volume. However, TriClip demonstrated statistically superior efficacy in reducing vena contracta compared to both MitraClip and PASCAL ($P < 0.01$) [TriClip: (MD = -7.4; 95% CI: -9.24, -5.56), MitraClip: (MD = -4.04; 95% CI: -5.03, -3.05), and PASCAL: (MD = -6.56; 95% CI: -7.76, -5.35)]. The procedural success rates and incidence of single leaflet device attachment (SLDA) were similar across all devices. Furthermore, there were no significant differences in mortality, stroke rates, or major bleeding events among the three devices.

Conclusion:
The TriClip outperforms the MitraClip and PASCAL in reducing vena contracta width, indicating greater effectiveness for severe tricuspid regurgitation. All devices show similar safety profiles and procedural success rates. Further research is needed to confirm these results.

Keywords:
Tricuspid regurgitation, TriClip, MitraClip, Pascal, Transcatheter tricuspid valve repair, Meta-analysis.