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Analysis of tricuspid regurgitation improvement following cardiac resynchronization therapy—Authors' reply

This is a response to the Letter to the Editor, EUPC-D-22-01151 'Analysis of Tricuspid Regurgitation Improvement Following Cardiac Resynchronization Therapy' by Syed Yousaf Ahmad et al. [<https://doi.org/10.1093/europace/euad007>], about the article 'Tricuspid regurgitation after cardiac resynchronization therapy: evolution and prognostic significance' by Stassen et al. <https://doi.org/10.1093/europace/euac034>.

We thank Dr Ahmad and his colleagues for their interest in our study, which evaluated the beneficial effects of cardiac resynchronization therapy (CRT) on tricuspid regurgitation (TR) severity and outcomes.¹ Previous studies have shown that significant TR is frequently observed in patients with heart failure and is independently associated with worse outcomes.^{2,3} Because right ventricular (RV) dysfunction is the major driving force of secondary TR, therapeutic strategies should first aim to attenuate or reverse RV dilatation, thereby improving the imbalance between the tethering and closing forces of the tricuspid valve. The results of our recently published study showed that CRT has the ability to reduce RV dimensions and improve TR severity in up to 40% of patients with pre-existing moderate and severe TR.

Unfortunately, lead-induced TR is frequently observed after implantation of a cardiac implantable electronic device and is associated with increased mortality and heart failure hospitalizations.⁴ In this regard, Dr Ahmad and coworkers highlight the theoretical advantages of His bundle pacing (HBP) over 'classical' CRT. His bundle pacing activates the His–Purkinje system directly, resulting in an efficient physiological and synchronized ventricular activation, thereby alleviating the detrimental effects of asynchronous ventricular activation (which contributes to the development of TR). In addition, an HBP lead can be implanted above the tricuspid annulus, which further reduces the probability of lead-induced TR.

We acknowledge that, at least in theory, HBP holds great promise in preventing lead-induced TR. However, HBP has many other disadvantages such as the difficulty of lead implantation, lower success rates in patients with QRS prolongation, reduced R-wave amplitudes, and high and unstable pacing thresholds. These disadvantages may perhaps not outweigh the advantage of a reduction in TR. Left bundle branch pacing is an alternative mode

of conduction system pacing and partially overcomes these disadvantages. However, in these patients, the lead is usually placed through the tricuspid annulus.

Most of all, it should be emphasized that the beneficial effects of 'classic' CRT have been proven in multiple randomized, controlled trials, and current guidelines of the European Society of Cardiology strongly recommend CRT in well-selected patients to reduce heart failure hospitalizations and mortality.⁵ Because randomized controlled trials on HBP are currently lacking, cardiologists should be very careful when choosing HBP over CRT in these heart failure patients. Before recommending HBP as an opportunity to reduce TR in patients needing CRT, prospective randomized clinical trials are needed to evaluate whether HBP is equal to or better than conventional CRT in patients with heart failure.

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References

1. Stassen J, Galloo X, Hirasawa K, Marsan NA, van der Bijl P, Delgado V et al. Tricuspid regurgitation after cardiac resynchronization therapy: evolution and prognostic significance. *Europace* 2022;**24**:1291–9.
2. Benfari G, Antoine C, Miller WL, Thapa P, Topilsky Y, Rossi A et al. Excess mortality associated with functional tricuspid regurgitation complicating heart failure with reduced ejection fraction. *Circulation* 2019;**140**:196–206.
3. Wang N, Fulcher J, Abeyuriya N, McGrady M, Wilcox I, Celermajor D et al. Tricuspid regurgitation is associated with increased mortality independent of pulmonary pressures and right heart failure: a systematic review and meta-analysis. *Eur Heart J* 2019;**40**:476–84.
4. Addetia K, Harb SC, Hahn RT, Kapadia S, Lang RM. Cardiac implantable electronic device lead-induced tricuspid regurgitation. *JACC Cardiovasc Imaging* 2019;**12**:622–36.
5. McDonagh TA, Metra M, Adamo M, Gardner RS, Baumach A, Böhm M et al. 2021 ESC guidelines for the diagnosis and treatment of acute and chronic heart failure. *Eur Heart J* 2021;**42**:3599–726.

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