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Commentary

# Commentary on Dynamic Banding (DYBAND) Technique for Symptomatic High-Flow Fistulae

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## DESCRIPTION

A significant complication of Arteriovenous Fistula (AVF) formation is the development of high-flow fistulae presenting as steal syndrome, aneurysmal dilatation or high-output cardiac failure. These high-flow fistulae are defined as having blood flow greater than 2000 ml/min compared to usual flow rates of 400 ml/min-600 ml/min and 600 ml/min-800 ml/min in autogenous fistula and prosthetic graft fistula respectively [1, 2]. Previously, symptomatic patients presenting with a high-flow fistula were exposed to an array of invasive surgical procedures including revising the arteriovenous anastomosis or placating the vein in an attempt to reduce blood flow rates. In current literature, minimally invasive banding techniques as published by Miller, et al. [3] have shown promising results in reducing blood flow rates in AVF. However, these surgical methods lack the nuanced ability to make fine adjustments in real-time to achieve optimal flow rates and symptomatic relief [2].

In this paper, Lee et al. designed and critiqued a minimally invasive novel banding technique, Dynamic Banding (DYBAND) [1]. The DYBAND procedure sought to resolve the clinical manifestations of a high-flow fistula in a predictable fashion by modelling flow rates and making precision adjustments in real time through the use of an adjustable Polyesterurethane (Braun patch) band. This minimally invasive approach avoids the use of intravascular instruments, such as balloon catheters, providing an accurate blood flow measurement (*via* Ultrasound) through the fistula and avoids the complication of neointimal hyperplasias [1].

Uniquely, the authors modelled patients' AVF flow rates using Computational Fluid Dynamic (CFD) analysis to predict blood flow rates in relation to the adjustable band diameter. Both intraoperatively and *via* computational modelling, the authors validated a linear relationship between band diameter, distal limb pressure and a reduction in blood flow through the AVF. In comparison to other banding techniques, this novel technique required no AVF clamping and thus anticoagulation is not necessary [3-6].

In previous studies, banding techniques struggled to achieve adequate flow reductions without the complication of access thrombosis resulting from excessive narrowing. The authors' model showed excessive tightening of band diameters (below 4 mm diameter) increased turbulence and caused AVF blood flow rates below the theoretical optimal range of 600 ml/min [1]. Since the clinical symptoms experienced by patients with high-flow fistulae differ, this novel technique allows clinicians to tailor the ideal band diameter based on symptomatology rather than absolute flow rates. Although not formally tested in this technique, the authors' computational model could further consider patient-specific variations in blood pressure and thus adjust band diameter to accommodate for resultant fluctuations in flow rates.

Furthermore, Lee et al. demonstrated the proximity of the band to the anastomosis minimized turbulent flow and aneurysmal formation. At 1 year follow-up, the DYBAND procedure recorded no recurrence of high-flow fistulae manifestations, thrombosis or rupture. Similarly to the Miller procedure, this novel banding technique did not investigate patients with symptomatic low flow steal syndrome, as access thrombosis was likely to result [3, 7].

Analogous with other modified banding techniques, the DYBAND procedure requires further evaluation with a larger clinical cohort and long-term follow-up. However, given the efficacy of this novel banding technique in the population studied, the DYBAND procedure proves to be an exciting new development in managing symptomatic high-flow fistulae.

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