



## EDITORIAL

# Surgical strategies in pediatric tracheobronchomalacia: tailoring solutions by understanding the problem★

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I read with great interest the manuscript entitled “Surgical treatment for severe pediatric tracheobronchomalacia: The 20-year experience of a single center” by Barreto et al.<sup>1</sup> from Hospital de Clínicas, Porto Alegre, Brazil in the current issue of *Jornal de Pediatria*.

This summary of the surgical management of severe pediatric tracheomalacia (TBM) highlights the evolution of their center's experience with their approach to an often poorly understood entity such as TBM. Way too often is TBM considered something there is nothing one can do about it, that the child will “outgrow” it, or that tracheostomy is the only option for those with severe phenotype. Yet, I applaud the authors for striving to understand the problem and provide solutions that directly address the problem that is TBM for these children.

First things first, the diagnosis of TBM. The authors make an excellent point about the importance of understanding the underlying airway anatomy, as well as the severity, location, and characteristics (static or dynamic) of the airway collapse, intrusion, or deformity. For this, in addition to a thorough history and physical exam, a three-phased dynamic tracheobronchoscopy is essential. Cross-sectional imaging with or without dynamic protocols is complementary and relevant for surgical planning, yet the endoscopic airway exam is the cornerstone of the TBM evaluation. One can debate the pros and cons of flexible versus rigid bronchoscopy, yet these are truly complementary, and one must be well versed with both techniques to harness the benefits of each technique and have the flexibility to provide a tailored approach to each child's needs.<sup>2</sup>

Next, surgical management of TBM is not a one-size-fits-all approach. Treatment must be individualized to the underlying

anatomy, the need for concomitant interventions, and unique patient features. Surgical approaches are varied as exemplified in this manuscript. Surgical procedures for TBM can be classified as primary procedures that directly address the tracheal collapse or adjunctive or secondary procedures that indirectly improve airway patency.

It appears that the authors' most common procedure was an anterior aortopexy which depends on relieving pressure from the aortic arch on the trachea and indirectly improving airway patency by relying on the natural attachments between the aortic arch and the trachea. Unfortunately, over time these natural attachments can loosen, and initial improvements in airway patency tend to dissipate (sometimes rather quickly), for which long-term results of just an anterior aortopexy strategy have shown mixed results, as exemplified by the authors' 68 % success rate with anterior aortopexy, and all four failures in their cohort occurring with an anterior aortopexy. Hence, if an anterior approach is being considered, it is important to consider inclusion of direct anterior tracheopexy sutures or suspension struts at the time of an aortopexy such that the airway itself is supported or suspended from the sternum and does not rely just on the ligamentous tissue between the aorta and the trachea. With such an approach, the anterior aortopexy/tracheopexy strategy tends to be a more robust repair.<sup>3</sup> Yet data directly comparing these two approaches do not exist and represent a fertile research opportunity. Despite the appeal of an anterior surgical approach to TBM, our group believes that in most circumstances, the posterior approach is more effective as it directly addresses the main pathophysiology of TBM which is the excessive posterior membranous intrusion. By directly stabilizing the posterior membrane to the spine, the posterior tracheopexy is by design a better upfront surgical strategy for TBM that is associated with significant

\*See paper by Barreto et al. in pages 250–5.

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posterior membranous intrusion,<sup>4</sup> even in instances of innominate artery compression, as it can shift the trachea posteriorly such that there is less anterior compression. Nonetheless, it is still important to recognize that some children may need support from a posterior and an anterior approach to fully optimize their airway patency.<sup>5</sup> Which approach to perform first, and whether they should be performed concurrently versus staged is up for debate and needs further research.

The authors propose a descending aortopexy via a left thoracotomy as an adjunct procedure to address left mainstem bronchial compression. Though the left chest can provide easy access to the descending aorta, it is fairly limited in terms of its access to the main trachea (in the setting of a left aortic arch), for which our group prefers a descending aortopexy via the right chest which can offer access to the entire trachea, as well as proximal and mid left mainstem bronchus.<sup>6</sup> Given that TBM is rarely just isolated to the left mainstem bronchus, our group believes the right thoracotomy approach offers more versatility in its ability to include a posterior tracheopexy, descending aortopexy, and possible bilateral mainstem bronchopexies if needed.

Select circumstances of significant distal tracheal or mainstem bronchial compression secondary to a descending aorta, particularly a midline or circumflex descending aorta, which can sometimes be seen in the setting of great vessel anomalies such as vascular rings, may need the consideration of more radical approaches to off-load pressure entirely from the area. Such approaches can include aortic uncrossing or descending aortic relocation via sternotomy on cardiopulmonary bypass.<sup>7,8</sup> These vascular decompressive procedures can significantly improve the space in the posterior mediastinum and allow for additional tracheobronchopexies (anterior/posterior) or airway splints<sup>9</sup> as needed to fully optimize airway and or esophageal patency.

In conclusion, this manuscript provides invaluable insights and outcomes from the authors' experiences, shedding light on alternative interventions for children grappling with severe TBM. Reports of this nature are pivotal in raising awareness about potential solutions beyond tracheostomy, which does not address the underlying malacia and poses its own set of challenges. As the field of surgical management for TBM progresses, it becomes imperative to disseminate

results, delineating successful strategies and learning from shortcomings. Collaboration and mentorship, exemplified by Dr. Rusty Jennings and his legacy of the posterior tracheopexy, remain integral to advancing our collective understanding and proficiency in this domain.

## Conflicts of interest

The author declares no conflicts of interest.

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