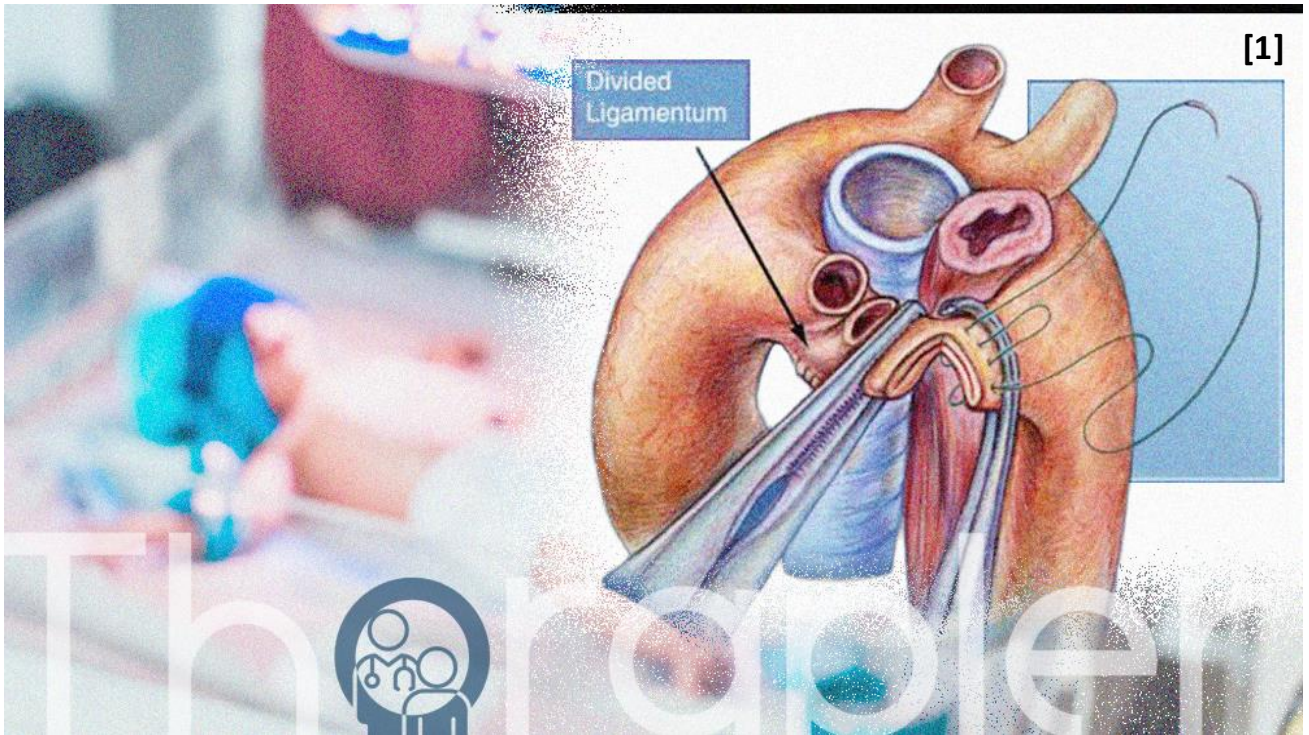




## THORAPLER (35mm staple line) in the Surgical Correction of Double Aortic Arch in an Infant

February 5, 2026



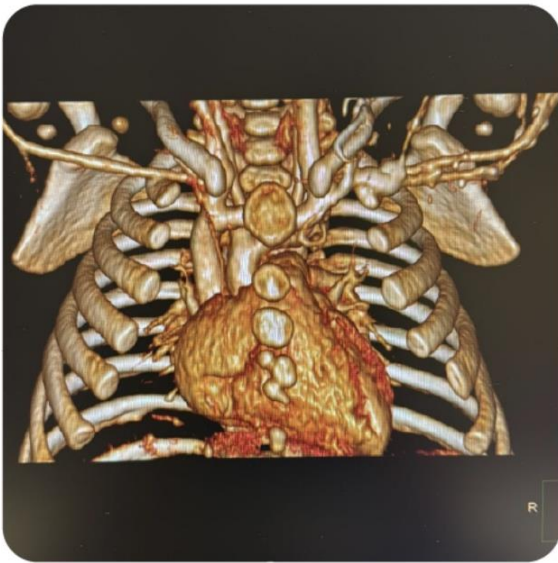
### I. Case Background

The patient, a **4-month-old infant**, presented with **progressive respiratory distress**. Imaging evaluation with **computed tomography angiography (CTA)** and **three-dimensional reconstruction** revealed a double aortic arch forming a complete vascular ring, resulting in significant compression of the trachea and esophagus. This presentation is characteristic of **airway obstruction secondary to a vascular ring**.

In infants, double aortic arch is associated with **complex anatomical variations**, densely packed surrounding structures, and a **high surgical risk**.

## II. Preoperative Assessment and Anatomical Considerations

CTA with three-dimensional reconstruction demonstrated the presence of both right and left aortic arches forming a complete vascular ring. Combined anatomical and vascular-focused reconstructions enabled comprehensive preoperative assessment, including evaluation of operative depth and spatial restriction within the thoracic cavity, as well as precise identification of the posterior aortic arch and ductus arteriosus as the key compressive components suitable for surgical division.



Three-dimensional CTA reconstruction incorporating surrounding thoracic skeletal structures illustrates the spatial relationship between the vascular ring and the mediastinum. This view enabled assessment of the depth of the surgical field and the degree of operative space restriction, demonstrating the close proximity of the vascular structures to the thoracic cage and mediastinal contents. These findings supported the feasibility of a left-sided thoracic approach despite the extremely confined operative space and highlighted the technical demands of safe vascular manipulation in this setting.



Vascular-focused three-dimensional CTA reconstruction clearly delineates the morphology and dominance of both aortic arches. The posterior aortic arch, together with the ductus arteriosus, is identified as the principal compressive component of the vascular ring, while the contralateral arch provides dominant systemic perfusion. This detailed visualization allowed precise determination of the arch suitable for division, including definition of the optimal division length and direction, and confirmed the posterior arch as the intended target structure for vascular stapling device application.

### ★ Case Special:

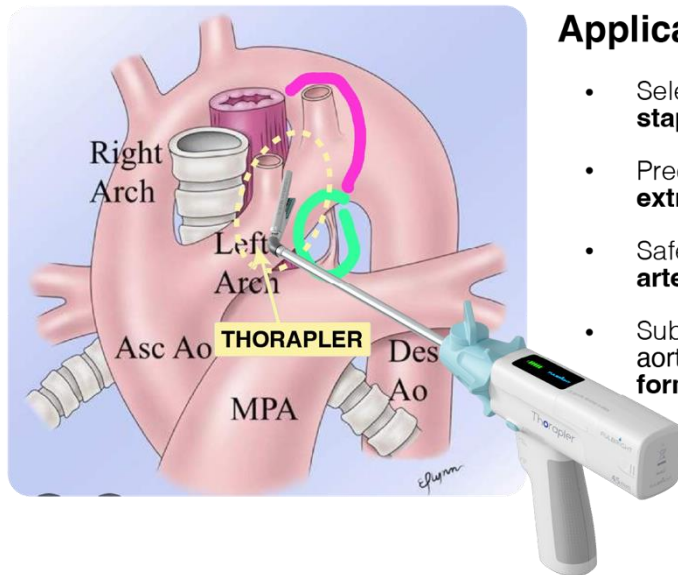
- Very young age and low body weight
- Thin vascular walls with small vessel diameters
- Close proximity to the trachea, esophagus, and recurrent laryngeal nerve
- Any bleeding or improper clamping could result in catastrophic consequences

### III. Surgical Approach and Key Techniques

Through a **left thoracotomy (left posterolateral thoracotomy)** approach, the following steps were performed sequentially:

- Careful dissection and identification of the **double aortic arch anatomy**
- Identification and protection of the **left common carotid artery** and **left subclavian artery**
- Definition of the roles of the **posterior aortic arch** and **ductus arteriosus** within the vascular ring

Throughout the procedure, **continuous pre- and post-ductal oximetry monitoring** was maintained. Once it was confirmed that the target vessels could be safely addressed, the following steps were undertaken:

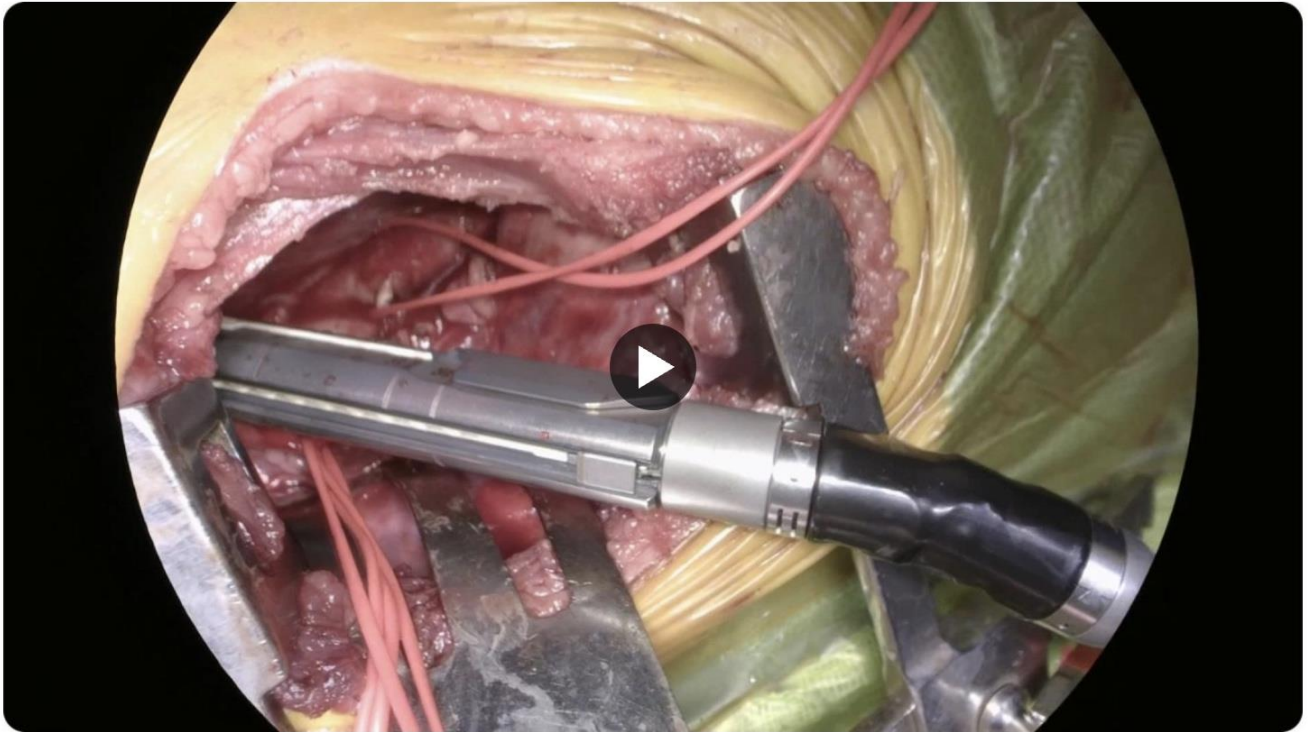


#### Application of THORAPLER Stapler

- Selection of the **THORAPLER with a 35mm staple line**.
- Precise alignment and positioning within an **extremely limited thoracic operative space**.
- Safe ligation and division of the **ductus arteriosus**.
- Subsequent single-step division of the posterior aortic arch using a **3D two-row staple formation**.

The advantages of the **3D two-row staple formation** were particularly critical in the context of posterior aortic arch division in this infant:

- ✓ **Staple height well matched to the thin pediatric vascular wall**
- ✓ **Even distribution of compression, avoiding shear-type vessel tearing**
- ✓ **Simultaneous achievement of reliable hemostasis and structural vessel closure**
- ✓ **Significant reduction in the risk of unstable clamping or staple line slippage**



**CLICK**  to watch the full procedure video

The use of a Thorapler (35mm staple line) in a 4-month-old infant imposed extremely high demands on device stability, firing consistency, and staple line formation quality, all of which demonstrated excellent safety and controllability in this case.

#### IV. Postoperative Outcome

Despite the patient being a **4-month-old infant**, the postoperative recovery was uneventful:

- No bleeding, vascular complications, or neurological injury
- Resolution of airway compression with marked improvement in respiratory symptoms
- Both imaging findings and clinical evaluation confirmed successful release of the vascular ring

## V. Clinical Significance and Technical Value

This case clearly demonstrates the **feasibility and safety limits of THORAPLER (35mm staple line)** in the surgical management of **complex vascular malformations** in infants, particularly in scenarios involving:

- ✓ **Extremely limited anatomical space**
- ✓ **High-risk vascular ring structures**
- ✓ **Situations requiring the highest level of hemostatic reliability**

The **3D two-row stapling technique** provides a **more controllable and standardized solution for vascular division** in pediatric cardiothoracic surgery and holds significant clinical demonstrative value.

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### Contributions:

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