Cardiology in the Young

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Brief Report

Cite this article: Krasemann T, van Beynum I, van de Woestijne P, Bogers Ad. (2019) Transthoracic access for pulmonary artery stenting. *Cardiology in the Young* **29**: 222–224. doi: 10.1017/S1047951118001841

Received: 16 February 2018
Revised: 10 August 2018
Accepted: 23 September 2018
First published online: 4 December 2018

Key words:
Transthoracic access; stenting pulmonary artery; CHD

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Transthoracic access for pulmonary artery stenting

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Abstract

Pulmonary artery stenting may not be possible transcutaneously because of anatomic features. Although intraoperative stenting has been well described, we present a case in which stenting of the left pulmonary artery was performed transthoracically in a separate procedure. Unusual anatomic conditions may require a multi-disciplinary hybrid approach to achieve the desired results.

Access for interventional treatment of native or treated CHD can be challenging. We report a complicated case in which rescuing of the left pulmonary artery was performed by stenting through a right thoracotomy and direct hilar access to the right pulmonary artery in a hybrid procedure.

Case report

A male infant with hypoplastic left heart underwent atrial septectomy and mitral commissurotomy on day 2 of life, followed by bilateral pulmonary artery banding and stenting of the arterial duct on days 8 and 10, respectively. The situation was converted to a Norwood/Sano palliation 2 months later. At the age of 5 months, the Sano-shunt was removed and a partial cavopulmonary anastomosis was created. This was not tolerated, and hence was taken down to a central aortopulmonary shunt. In addition, a re-coarctation needed stenting. He was discharged with saturations of ca. 80% in room air.

Four months later the child appeared progressively cyanosed with oxygen saturations of 70% measured transcutaneously. On CT the left pulmonary artery appeared narrow (Fig 1a). The CT scan was used for planning cardiac catheterisation, in particular, to plan necessary angulations of the X-ray tubes. Ballooning or stenting the left pulmonary artery was not successful from a femoral approach.

Through a right thoracotomy the hilus of the right lung was carefully prepared, a purse string suture prepared, and through this an 8 F Terumo sheath inserted directly into the right pulmonary artery. As the child was kept in an oblique position during the intervention, X-ray tube angulations were adjusted accordingly, to achieve the best possible imaging of the pulmonary arteries. Angiography confirmed the severe stenosis of the left pulmonary artery and proximal right pulmonary artery that is left from the shunt (Fig 2a). After balloon interrogation with a Tyshak II 6 × 20 mm balloon; NuMed, Hopkinton, United States of America, three open cell stents with a diameter of 6 mm were introduced and positioned sequentially, beginning distally in the left pulmonary artery extending into the proximal right pulmonary artery, but not covering the shunt. The three stents were Cook Formula stents 6 × 12 mm and 6 × 20 mm, and a Bard Valeo stent 6 × 18 mm. Angiography showed a satisfactory result (Fig 2b). Because the sheath was introduced close to the shunt, the most proximal part of the right pulmonary artery could not be covered with a stent, as the balloon shoulder would have pushed the sheath out of the vessel. After stenting, the sheath was removed and the purse string suture closed.

The child recovered clinically. Chest X-ray before discharge showed more vascular markings on the left side than pre-procedurally. A further CT angiogram confirmed good position of the stents and patent flow to the left pulmonary artery branches (Fig 1b).

A bidirectional Glenn was performed at the age of 14 months, after cardiac catheterisation was carried out to dilate the aortic stent and evaluate pulmonary vascular resistance, which was low with 2.3 Wood units/m^2. Intraoperatively, the most proximal stent was removed and the remaining ones were longitudinally opened. The cavopulmonary anastomosis was extended with a pericardial patch into the left hilus. After the operation, the child needed prolonged respiratory and inotropic support due to a parainfluenza

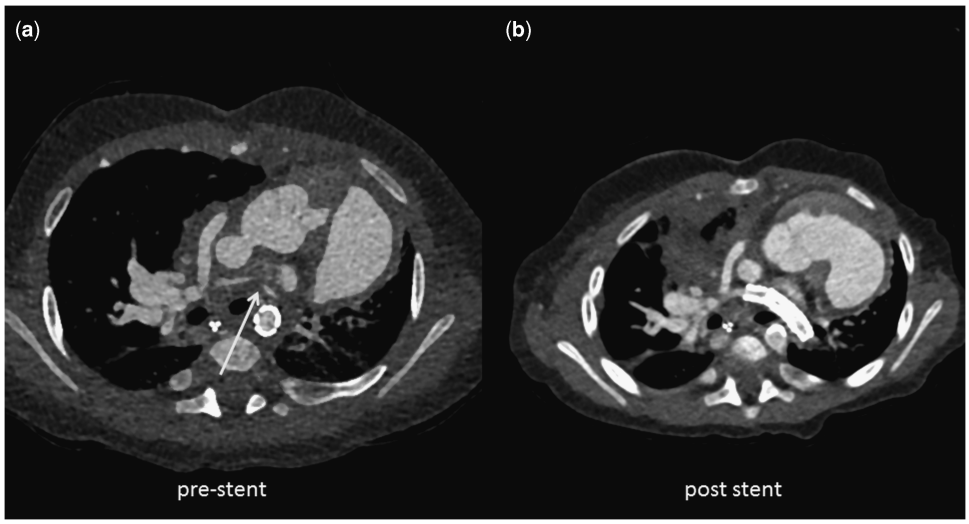

Figure 1. (*a*) CT showing the central shunt, well-developed right pulmonary artery and hypoplastic left pulmonary artery (*arrow*). (*b*) Post-interventional CT confirming increased perfusion of the left pulmonary artery. Note that the proximal part is not covered by the stents.

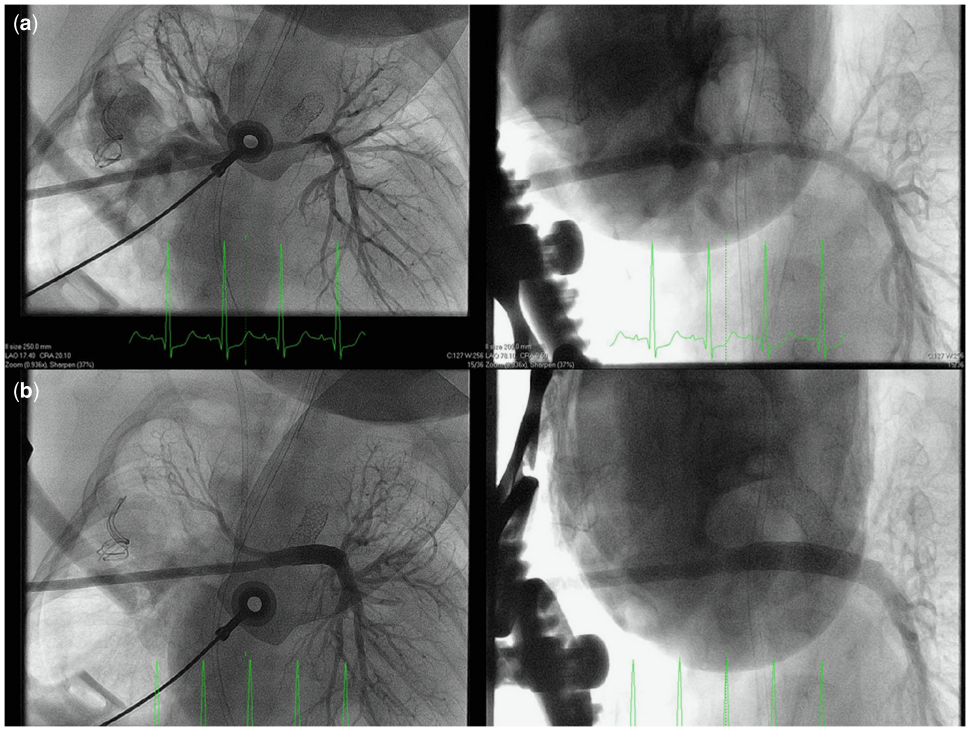

Figure 2. Angiographic findings obtained through a 7 F sheath inserted into the left hilus through a left thoracotomy: (*a*) Pre-procedural small left pulmonary artery. (*b*) Final result after sequential stenting of the left pulmonary artery starting distally.

infection, but eventually recovered and was discharged with saturations of 75%. Five months later, he is doing well and is thriving.

Discussion

Stenting of pulmonary arteries in patients with CHD has been described in the early 1990s and is a part of clinical routine since then.[1] Hybrid approaches to optimise the outcome of patients with complex CHD have been described, including intraoperative stenting of pulmonary arteries.[2,3] This is frequently done during operation of the underlying condition under direct sight.[4]

The usual transcutaneous approach was not possible in our patient owing to the position of the central aortopulmonary shunt. As a bidirectional Glenn was not tolerated earlier, we wanted to minimise the risk and stent the pulmonary arteries before further operations to allow the pulmonary vascular resistance to adapt. CT allowed detailed evaluation of the anatomical situation, and a hybrid approach to open the left pulmonary artery up to the hilus was planned and carried out. We found that this is the first report of transthoracic pulmonary artery stenting.

https://doi.org/10.1017/S1047951118001841 Published online by Cambridge University Press

Conclusion

For unusual situations, multi-disciplinary hybrid approaches can be considered to achieve the desired results. In our case, transthoracic access for pulmonary artery stenting was chosen.

Acknowledgments. None.

Financial Support. This research received no specific grant from any funding agency, or from commercial or not-for-profit-sectors.

Conflicts of Interest. None.

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