inefficacy of current medical regimens in this scenario. In addition, CHB is an autoimmune process that can be associated with damage to the myocardium itself. Thus, an underlying cardiomyopathy affecting cardiac output may play a primary or secondary role in developing hydrops. The impact of fetal inotropic support in our case highlights this point. Our case also illustrates the limitation of altering the pacemaker rate in the postoperative period with current technology. Further, our case demonstrates the limitations of serial weekly fetal echocardiograms and the potential for rather precipitous development of hydrops. Indeed, the findings of chronic multiorgan failure in the postmortem study of our patient highlight the importance of early intervention in these babies, that is, at the very first signs of hydrops.

CONCLUSIONS

Future research aimed at earlier, noninvasive detection of cardiac failure and organ-system compromise will improve

outcomes. Controversial ethical issues and questionable medical indications of open fetal surgery, significant morbidity to the mother, and risks associated to the pregnancy, as well as to future fertility and pregnancies, need to be recognized.

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Norwood procedure using modified Blalock–Taussig shunt: Beware of the circle of Willis

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Neonates undergoing complex cardiac surgery are at high risk of developing cerebral damage.¹ In the past decades, surgical and cardiopulmonary bypass strategies have been modified to improve neurodevelopmental outcome. One example is the introduction of antegrade cerebral perfusion (ACP) during aortic arch repair, instead of deep hypothermic circulatory arrest. Although it is not yet known whether this indeed is a superior strategy, ACP is now widely used in congenital heart surgery.² This case report shows that when ACP is performed, cerebral near-infrared spectroscopy

(NIRS) can provide important information about the circle of Willis, which may influence the surgical strategy.

CLINICAL SUMMARY

A term infant presented with double inlet left ventricle, transposition of the great arteries, and obstruction of the aortic arch. He was scheduled to undergo the Norwood procedure. According to our standard protocol, cerebral magnetic resonance imaging was performed the day before surgery and NIRS electrodes were placed on both sides of the forehead, showing similar values on the right and left hemispheres (mean regional oxygen saturation 76% on the right and 72% on the left).

During surgery, a modified Blalock–Taussig (BT) shunt was placed on the brachiocephalic artery, just distal of the bifurcation, to perform ACP (43 mL/kg/min). During this period (50 minutes), right NIRS was continuously 20% higher than left NIRS (mean right, 92%; left, 72%). After arch repair, full cardiopulmonary bypass was resumed and right and left NIRS values approximated each other. However, when the patient was weaned from bypass, asymmetric NIRS values emerged again, but now with lower NIRS values on the right hemisphere. NIRS was monitored until 48 hours

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Disclosures: Authors have nothing to disclose with regard to commercial support. Received for publication May 25, 2010; accepted for publication June 28, 2010; available ahead of print July 26, 2010.

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J Thorac Cardiovasc Surg 2011;141:837-9
0022-5223/\$36.00

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doi:10.1016/j.jtcvs.2010.06.049

FIGURE 1. Magnetic resonance angiography of the cerebral arteries. A, Right carotid artery. B, Left carotid artery. C, Basilar artery.

postoperatively; right NIRS continued to show a 15% to 20% lower value than left NIRS (mean right, 41%; left, 55%). Continuous electroencephalography showed no abnormalities or asymmetries during the entire perioperative period.

Cerebral magnetic resonance imaging performed 1 week after Norwood palliation showed no ischemic or hemorrhagic lesions. Magnetic resonance angiography revealed that there was no flow through the right carotid artery (preoperatively 71 mL/min), opposed to a flow of 50 mL/min and 27 mL/min through the left carotid and basilar arteries, respectively. The circle of Willis was incomplete because there was no left posterior communicating artery (Figures 1 and 2).

Three weeks post-surgery, the asymmetry was reassessed by NIRS and ultrasound of the carotid arteries. Both showed no differences between the right and left sides. Neurologic follow-up at 3 and 9 months of age did not reveal any abnormalities.

DISCUSSION

The modified BT shunt is frequently used for the Norwood stage I procedure. In the literature, it has been suggested that this may result in a reduced flow through the right carotid artery, but this has not been confirmed using modern vascular imaging techniques.³ The present case demonstrates a reduced perfusion of the right cerebral hemisphere using multiple modalities.

The reduced flow through the right carotid artery after stage I Norwood is likely due to the combination of a “steal”

FIGURE 2. Magnetic resonance angiography of circle of Willis. Absent left posterior communicating artery (arrow).

by the BT shunt and a fetal-type (incomplete) variant of the circle of Willis. This occurs in approximately 25% of the healthy adult population and is even more common in premature neonates.⁴ This need not be a problem if the other (carotid and basilar) arteries are able to compensate. In the present case, the left carotid artery also had perfused the posterior part of the left hemisphere preoperatively. After placement of the BT shunt, perfusion of a major part of the right hemisphere also depended on the left carotid artery. This resulted in a lower perfusion of the right frontal region and subsequently in lower NIRS values on the right. This large strain on the left carotid artery put this child at high risk for cerebral ischemia. Placement of a right ventricle to pulmonary artery shunt may have prevented this situation.

The substantially lower NIRS values on the left hemisphere during ACP were a warning sign of an incomplete circle of Willis in our patient. Asymmetries during ACP in neonatal arch reconstructions have been observed before, however, without vascular imaging studies.⁵

CONCLUSIONS

A more than 20% lower left than right cerebral NIRS during ACP is suggestive of an incomplete circle of Willis. In addition, the placement of a modified BT shunt can cause an arrest of flow through the right carotid artery. The

combination of these 2 is highly undesirable, although this did not have clinical consequences for this patient. Therefore, we propose that when a large asymmetry in NIRS values is noticed during ACP, a right ventricle to pulmonary artery shunt deserves consideration to avoid risk of cerebral damage of the right hemisphere.

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Composite reconstruction with cryopreserved fascia lata, single mandibular titanium plate, and polyglactin mesh after redo surgery and radiation therapy for recurrent chest wall liposarcoma

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Repeated chest wall resections after irradiation often mandate individualized reconstructive strategies. We report a case of a simplified reconstruction with a combination of materials recently used by thoracic surgeons because of their favorable biologic characteristics and user friendliness during implantation.

CLINICAL SUMMARY

A 68-year-old woman was referred from another institution for a biopsy-proved recurrent G2 liposarcoma of the lower right hemithorax at the level of the eighth to ninth ribs after prior incomplete surgical removal of the myocutaneous layers and subsequent irradiation (70 Gy). Redo surgical intervention was performed by removing en bloc the involved chest wall, making sure to maintain the myocutaneous resection line at 5 cm from the palpable tumor mass. Reconstruction was done by using a cryopreserved fascia lata homograft anchored to the remaining rib segments. In addition, a single mandibular titanium plate (Synthes, Solothurn, Switzerland) was used to bridge the bony defect (Figure 1, A

and B). The shorter arm of this single plate was fixed with locking screws to the posterior segments of the uninvolved 2 lowermost ribs while the longer arm was anchored to the remaining anterolateral segment of the eighth rib. Given the absence of the overlying muscle and to avoid direct friction of the plate on the approximated skin edges, a polyglactin mesh was sutured to the muscle edges to cover the plate (Figure 1, C). The postoperative course was uneventful, and the patient was discharged home 7 days after the operation. At the 3-month follow-up, the chest radiograph showed a satisfactory outcome (Figure 1, D).

DISCUSSION

Full-thickness chest wall defects after redo operations and radiation treatment require reconstructive materials warranting structural stability, easy incorporation into the host, and resistance to infection.^{1,2} In this patient, under standard circumstances, a polytetrafluoroethylene patch or a methyl methacrylate sandwich would be used to provide coverage and stabilization with satisfactory results,¹ although these materials would not be incorporated and remain at risk for subsequent infection.^{1,2} In addition, the interposition of viable myocutaneous flaps would have been necessary to protect the superficial dermocutaneous layers.

The use of titanium plates is gaining popularity for the ability to shape them to fit both in the rib or the sternal position, thereby conferring enhanced stability, and to adapt to the desired geometric configuration.³ Recently, several titanium plates were used in conjunction with polytetrafluoroethylene patches in the reconstruction of significant lateral

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Disclosures: Authors have nothing to disclose with regard to commercial support. Received for publication May 15, 2010; accepted for publication June 28, 2010; available ahead of print Aug 5, 2010.

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J Thorac Cardiovasc Surg 2011;141:839-40
0022-5223/\$36.00

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doi:10.1016/j.jtcvs.2010.06.050