

Neonatal aortic thrombosis: A life threatening complication of umbilical artery catheterisation

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SUMMARY

Umbilical artery catheterisation is considered the standard of care for arterial access in neonatal intensive care unit. It is routinely used for blood sampling and blood pressure monitoring. Unfortunately, an indwelling umbilical catheter have been associated with thrombotic complication which may result in either partial or complete occlusion of the aorta. We report here our experience in the diagnosis and treatment of a neonate with this condition.

CASE REPORT

A term baby boy was delivered via an emergency caesarean section for a late foetal heart rate deceleration with presence of meconium stained amniotic fluid. Other than a previous history of abortion, his mother had no history of gestational diabetes or antenatal risk of sepsis.

The baby was vigorous at birth, but soon developed respiratory distress which required invasive respiratory support. Chest radiograph showed features compatible with meconium aspiration syndrome. Haematological indices were normal (total white cell count 18,300/ μ L, haemoglobin 17g/dl, platelet 268,000/ mm^3) and blood sample was sterile. Despite mechanical ventilation, refractory hypoxemia and hypotension developed. Echocardiography revealed a small secundum atrial septal defect with persistent pulmonary hypertension. He was given fluid boluses (normal saline and fresh frozen plasma), intratracheal surfactant and commenced on inhaled nitric oxide. He also required inotropic support (dopamine, dobutamine, and noradrenalin) with intravenous crystalline penicillin-gentamycin combination via an umbilical venous catheter. An umbilical artery catheter was also placed for regular monitoring of his haemodynamic status and blood gases with the catheter position confirmed by a non-contrast imaging study. However, five days after the insertion of umbilical catheters, a "marble" white skin discolouration was noted over his periumbilical region which resolved after removal of the catheters. Inotropes were continued via a peripherally inserted central catheter. His condition gradually improved and inotropic support was tapered off within the next 10 days.

At day-18 of life, the baby's lower limbs were noted to be pale, poorly perfused, and associated with diminished

bilateral femoral pulses volume. A considerable difference in the mean arterial pressure of both upper and lower extremities were also noticed. An urgent abdominal ultrasonography and Doppler revealed a short segment echogenic pedunculated thrombus measuring 2.2cm in length within the proximal abdominal aorta just above the level of the coeliac axis (Figure 1). An intravenous heparin bolus (75units/kg/dose) was started followed by a maintenance dose which was initiated at 28units/kg/hr, and titrated based on activated partial thromboplastin time. The baby showed a steady clinical recovery with improvement of both femoral pulses over the subsequent five days and heparin infusion was discontinued. A repeat imaging study showed resolution of the thrombus. No side effects were documented and the thrombophilia screening (anti-thrombin III, prothrombin, protein C and protein S) were normal.

He was extubated at 24-day-old, however remained oxygen dependant on 2L/min via nasal cannula for the next four weeks. A direct laryngoscopy demonstrated a significant laryngomalacia. Following an epiglottomy, he was successfully weaned off oxygen at 3-month-old and continue to do well on follow up.

DISCUSSION

Aortic thrombosis is a rare but catastrophic occurrence associated with the use of umbilical artery catheters in the neonatal period. The prevalence of symptomatic neonatal thrombosis is 5.1 per 100 000 livebirths, with aortic thrombosis reported in only 2.5% of the cases.¹ The prevalence is higher among critically ill neonates, at 2.4 per 1000 admission with 12.4% documented aortic thrombosis and 21% mortality rate.²

Due to its rarity, knowledge on the pathogenesis of neonatal thrombosis is limited. A potential explanation is the relative pro-thrombotic nature of the haemostatic system in neonates. A physiologically lower plasma concentration of pro and anticoagulant factors and components of the fibrinolytic pathway in neonates compared to adults, predisposing them to a relatively increased risk of thrombosis.³ As such the risk is higher especially in the presence of blood flow disturbances related to indwelling catheters.

This article was accepted: 08 January 2020

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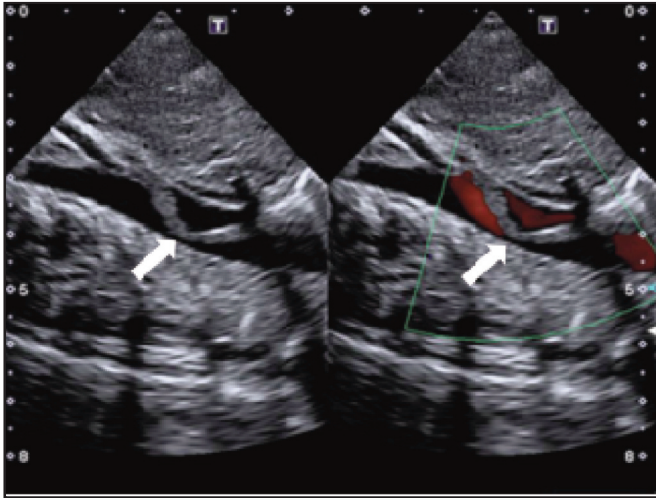


Fig. 1: Ultrasound Doppler performed on day 18 of life revealed a short segment echogenic pedunculated thrombus measured 2.2 cm in length within the proximal abdominal aorta just above the level of coeliac axis.

Umbilical arterial catheterisation has emerged as one of the most important predisposing factor for aortic thrombosis in neonates, regardless of the catheter type or position. About 78% to 89% of all reported cases of neonatal aortic thrombosis had an associated history of umbilical vessels catheterisation.^{2,4} Factors such as dehydration, polycythaemia, sepsis, a low cardiac output state, perinatal asphyxia and maternal diabetes also favour thrombus formation. Inherited thrombophilia as a result of a deficit in anti-thrombin, protein C, protein S or presence of factor V Leiden is also a considerable risk factor.^{2,4} Our patient had no inherited thrombogenic risk however he had a history of umbilical arterial catheter placement associated with a period of low cardiac output that exposed him to a higher chance of thrombosis.

A sudden onset of absent femoral pulses associated with poor skin perfusion and systolic gradient between the upper and lower limb, as seen in our case, is the classical manifestation of aortic thrombosis that resembles the presentation of severe coarctation of aorta or interrupted aortic arch. Fortunately, the cardiac assessment performed in the first 72 hours of life excluded the possibility of congenital cardiac anomalies. In other cases, an urgent echocardiography may be warranted.

Doppler ultrasound is the most popular imaging modality used for the detection of neonatal aortic thrombosis.^{2,4} Though its validity has not been rigorously established, it provides a rapid, non-invasive and accurate diagnosis. Aortography is considered to be the gold standard procedure for verification of large vessel thrombosis particularly before any therapeutic intervention, however it is rarely feasible in neonates.^{2,4}

Management of neonatal arterial thrombosis is still controversial. There is little evidence to support the appropriate treatment as there are only few randomised control trials in neonates. The American College of Chest Physicians recommends the use of anticoagulant (unfractionated heparin) as extrapolated from adult practice.⁵ For more severe cases or cases that show no response to unfractionated heparin, the use of a thrombolytic agent (tissue plasminogen activator) is proposed. Surgical intervention is limited to those with contraindication to tissue plasminogen activator.⁵

CONCLUSION

This case highlights the classical features of aortic thrombosis in the neonatal period. A high level of clinical awareness is fundamental for early diagnosis and treatment to avoid potential life-threatening complications.

ACKNOWLEDGEMENT

We thank all the staffs of Neonatal Unit of Hospital Serdang for their assistance in the management of our patient.

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