

Case Report

Emergency atrial septostomy with nasogastric tube through umbilical venous route in neonates with critical congenital heart defects

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ABSTRACT

Neonates born with critical duct dependent congenital heart diseases acutely deteriorate in first few days after birth when physiological conduits which allow for mixing blood close. Balloon Atrial septostomy is performed on emergency basis in such neonates to create a right to left intracardiac shunt, until a definitive surgery is performed, but requires a cardiac intervention setup. In settings where advanced cardiac interventions are not available, we propose an alternative approach for atrial septostomy using nasogastric feeding tube through umbilical venous route, under echocardiographic guidance. Feeding tube gradually inserted into the umbilical vein, reaches the right atrium, following which it is thrust into the atrial septum at the location of foramen ovale, perforating it to create an emergency conduit between the atria. We performed the above procedure in a neonate with dTGA at our NICU setup, with partially successful outcome. We propose this method as an alternative, safe, simple and cost effective procedure, though not definitive, in resource limited settings for emergency stabilisation of neonates with critical duct dependent heart defects.

Keywords: Feeding tube, Atrial septostomy, Umbilical vein, Congenital heart disease, Neonates

INTRODUCTION

Neonates born with critical duct dependent congenital heart diseases require emergency balloon atrial septostomy for survival.¹ This procedure needs a cardiac intervention setup, which is unavailable in resource limited settings. We propose an alternative approach for atrial septostomy using nasogastric feeding tube, through umbilical venous route under echocardiographic guidance as a low cost, emergency alternative until stabilisation and transport of neonate to higher cardiac intervention centre.

CASE REPORT

A three-days old late preterm neonate was brought to our NICU from postnatal wards with sudden onset respiratory distress, cyanosis and reduced consciousness. The

neonate's four limbs saturation was below 50% and did not improve with supplemental oxygen. He had hypoxic seizures with worsening sensorium and had to be mechanically ventilated. Saturation remained persistently low below 60%, even with higher ventilatory settings. Presentation of the neonate was in concurrence with a critical congenital heart disease and a bedside echocardiogram was done, revealing d-TGA, requiring emergency cardiac surgery.

Our NICU setup not equipped with cardiac procedural setup weighed against the perils of transport in an unstable status, the neonate continued to remain under our care. Intravenous prostaglandin infusion was initiated, without any desirable results. After obtaining parental consent, a 6 Fr nasogastric feeding tube was inserted through the umbilical vein under echocardiography of the cardia and inferior vena cava. The catheter was advanced through the

IVC to reach the right atrium, abutting the inter atrial septum. Multiple, targeted thrusts were given to the foramen ovale, perforating it, finally creating a conduit between the atria. Position of the feeding tube in left atrium was confirmed by agitated saline push, viewed on transthoracic echocardiography (Figure 1). Increase in the

four-limb oxygen saturation upto 70% was noted following the procedure. The neonate was planned for transport to higher cardiac intervention centre the following day for definitive surgery, but succumbed prior to relocation.

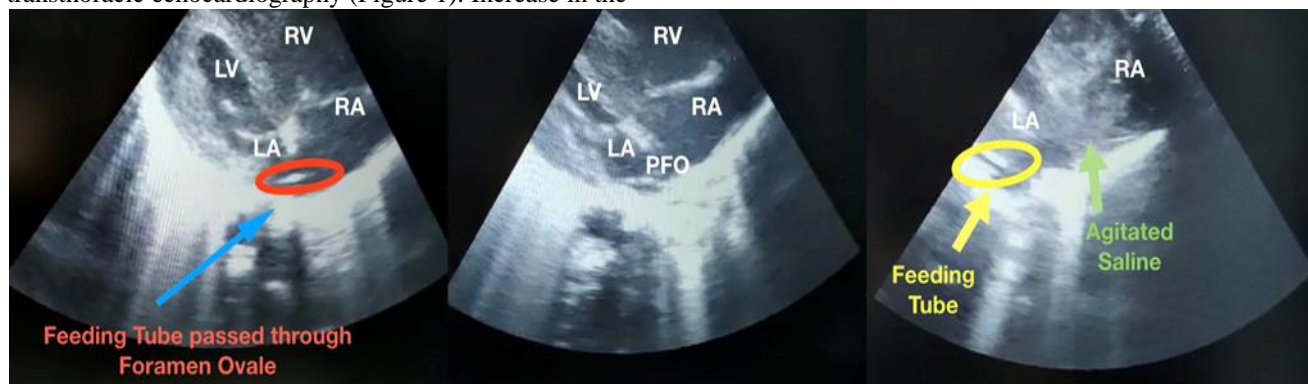


Figure 1: 2D echo demonstrating the position of feeding tube inside Left atrium introduced from right atrium via a punctured foramen ovale. Agitated saline passing from left atrium to right atrium, confirming position of feeding tube inside left atrium.

DISCUSSION

Balloon atrial septostomy was first described by Rashkind and Miller in 1966, as a non-surgical procedure to create an atrial septal defect using a balloon catheter.¹ It is indicated in infants less than 6 weeks with transposition of the great arteries with or without associated cardiac defects, tricuspid atresia with restrictive ASD, pulmonary atresia with intact ventricular septum, total anomalous pulmonary venous connection with restrictive ASD and even hypoplastic left heart syndrome with restrictive interatrial defect.² This procedure may also be utilised as a palliative option for severe pulmonary hypertension.³ The use of two-dimensional transthoracic echocardiography to monitor the procedure and the possibility of using the umbilical vein as an access site have simplified this procedure dramatically, so that it can be performed at the bedside in the neonatal intensive care unit.⁴⁻⁶

Conventionally, the procedure is performed under sedation or general anaesthesia. Through an access achieved via the femoral or the umbilical vein a 4 or 5 F introducer is introduced and then exchanged for a 7 F or 8 F introducer when the Miller catheter is used. The balloon catheter is advanced into the right atrium. Then the foramen ovale is crossed and the catheter is positioned in the left atrium. Correct position is documented two-dimensional echocardiography. The balloon is quickly inflated, locked and then sharply withdrawn into the right atrium down to the junction of the inferior caval vein. The catheter is then advanced into the body of the right atrium, so as not to obstruct inferior caval return, and then deflated rapidly. This maneuver may be repeated two to three times. The efficacy is usually immediately obvious, from the rise in systemic arterial saturation.⁸

In the absence of balloon catheters, especially in resource limited settings of a LMIC, we propose an alternative approach to crudely create an interatrial conduit for emergency stabilisation of neonates with critical, duct dependent congenital heart diseases. Replacing large bore infant feeding tube for balloon catheter introduced via umbilical vein, nearly similar results can be achieved. Umbilical cord is cut transversely, flush with the skin, the vein is identified and the feeding tube is directly inserted into the vessel with the aid of a forceps. The progress of the catheter through the inferior vena cava is monitored by cross sectional echocardiography. After reaching the right atrium, the tube is advanced through foramen ovale and positioned in the left atrium. Position is confirmed via push of agitated saline and flow from left to right side is noted. Multiple sharp thrusts are given to the tube, manoeuvring it between right and left atria to enlarge the conduit created. The feeding tube is then positioned at cavoatrial junction as an umbilical venous access.

The procedure being simple, cost effective, technically less challenging that it may be performed on emergency basis at bedside by treating physician with only aid of transthoracic echocardiography does not come without its downsides. The conduit created is not as effective as a balloon catheter as the edges of the feeding tube are not sharp enough to create a definitive puncture and may close down post procedure, nullifying the effort put in. Similar to balloon septostomy, the procedure may be associated with complications like rhythm disturbances, perforation of the heart, laceration of atrioventricular valves, systemic or pulmonary veins but to a lesser extent as it has a blunt tip.⁸ It still remains only a palliative procedure until a definitive surgery is done. It provides the essential time for neonatal transport to a centre where definitive surgery can be performed on such infants.

CONCLUSION

Atrial septostomy with feeding tube via umbilical venous route under echocardiographic guidance seems to be an exciting alternative option in resource limited settings. Further studies are needed for validation of this emergency procedure in neonates with duct dependent cardiac defects.

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REFERENCES

1. Rashkind WJ, Miller WW. Creation of an atrial septal defect without thoracotomy. A Palliative Approach to Complete Transposition of the Great Arteries. JAMA. 1966;196:991-2.
2. Feltes TF, Bacha E, Beekman RH, Cheatham JP, Feinstein JA, Gomes AS, et al. Indications for cardiac catheterization and intervention in pediatric cardiac disease: a scientific statement from the American Heart Association. Circulation. 2011;123(22):2607-52.
3. Reichenberger F, Pepke ZJ, Neil K, Parameshwar J, Shapiro LM. Atrial septostomy in the treatment of severe pulmonary arterial hypertension. Thorax. 2003;58(9):797-800.
4. Abinader E, Zeltzer M, Riss E. Transumbilical atrial septostomy in the newborn. Am J Dis Child. 1970;119:354.
5. Allan LD, Leanage R, Wainwright R, Joseph MC, Tynan M. Balloon atrial septostomy under two dimensional echocardiographic control. Br Heart J. 1982;47:41-3.
6. Baker EJ, Allan LD, Tynan MJ, Jones OD, Joseph MC, Deverall PB. Balloon atrial septostomy in the neonatal intensive care unit. Br Heart J. 1984;51:377-8.
7. Boehm W, Emmel M, Sreeram N. Balloon atrial septostomy: history and technique. Images Paediatr Cardiol. 2006;8(1):8-14.
8. Parsons CG, Astley R, Burrows FG, Singh SP. Transposition of great arteries: a study of 65 infants followed for 1 to 4 years after balloon septostomy. Br Heart J. 1971;33:725-31.

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