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Anesthesia Management for Patent Ductus Arteriosus-Device Closure in Patient with Congenital Rubella Syndrome- Case Report

Dr. Riya J Shah[(1)] ; Dr. Ramprasad Chavan[(2)]; Dr. Sanjeeta Umbarkar[(3)]; Dr. Maya R.[(4)]
[(1)]Senior Resident (Fellow), [(2)]Assistant Professor, [(3)]Professor and Head of the Department, [(4)]Senior Resident

Abstract:- Patent ductus arteriosus (PDA) is an extracardiac left to right shunt. PDA is seen in 50 % of the patients having congenital rubella syndrome (CRS). CRS is a combination of multisystem abnormalities. Patients with CRS pose challenges for an anaesthesiologist in way of small infants, difficult airway, underlying cardiac lesions, low birth weight etc. We report successful anaesthesia management of a paediatric patient having CRS with global developmental delay(hypotonia) posted for PDA- Device Closure (PDA-DC).

Keyword:- *Anaesthesia, Patent Ductus Arteriosus, PDA-Device Closure, Congenital Rubella Syndrome, Sedation, Entropy.*

Abbreviations:
PDA= Patent Ductus Arteriosus
CRS= Congenital Rubella Syndrome
ETCO2= End tidal Carbon Dioxide

I. INTRODUCTION

The incidence of patent ductus arteriosus in pre-term neonates is 20-60%[1] and it increases in congenital rubella syndrome(CRS).[2] Usually ductus arteriosus' anatomical closure happens by the end of 2-3 weeks and persistence of it beyond 3 months after full term birth is called persistent PDA. PDA should be corrected either surgically or by endovascular device closure at an early age to prevent pulmonary hypertension like complications.[3] CRS triad is sensorineural deafness, congenital cataract and congenital cardiac disease. Anaesthetic management is challenging in these rubella infants in view of LBW, small infants. [2]

During search for references we came across transcatheter PDA-DC in children with CRS being done under general anaesthesia. Whereas, here we used procedural sedation for this case hence, we decided to publish this case report.

II. CASE REPORT

A child 20 months of age, 6 kg by weight, admitted with history of failure to thrive, delayed milestones and recurrent URTI (upper respiratory tract infection). Pre-operative evaluation was done one day prior. The child was born at 38 weeks weighing 3.5 kg with history of NICU admission and mechanical ventilation for 6 days. PDA was an incidental finding at 18 months of age when mother brought the child to the hospital for an ophthalmic examination. On physical examination there was global developmental delay (no gross motor skills, no neck holding, no roll over, no fine motor skill, no palmar grasp, no finger holding, no social smile present), bilateral congenital cataract, microcephaly. Vitals on general examination : afebrile, heart rate was 118 beats/min, respiratory rate was 32 /min and room air saturation of oxygenation 96%. Chest x-ray showed cardiomegaly. 2d echo showed EF= 60%, CHD, No PH, PDA size= 6 mm, which had shunt of Left to right.

After taking consent from the patient's parents and confirming nil per oral status, patient was taken inside the cathlab. For sedation Inj. Ketamine 1 mg/kg along with Inj. Glycopyrrolate 0.005 mg/kg was given. All the ASA standard monitors were attached-ECG, SpO2, NIBP, skin temperature probe, ETCO2 and Entropy. Once the parts were prepared and fluoroscopic guided arterial and venous access were about be taken Inj. Ketamine 0.5 mg/kg, Inj. Fentanyl 2 mcg/kg, Inj. Dexmedetomidine 0.1 mcg /kg and Inj. Ondansetron 0.1 mg/kg were administered and for maintenance, Infusion of Inj. Dexmedetomidine 4 mcg/ml + Inj. Ketamine 1 mg/ml was kept at Inj. Ketamine 1 mg/kg/hour + Inj. Dexmedetomidine 0.4 mcg/kg/hour. Paediatric Hudson mask was utilised for continuous oxygen supplementation from the start of the case. Entropy was maintained between 50-70 value for SE and RE both throughout the case. There wasn't a need to give anymore top up doses as maintenance infusion dose was going on and there wasn't any more surgical stimuli. PDA device size of 6 mm Amplatzer duct occlude device was put. Once the PDA device was deployed Dexket Infusion was stopped. 5% DRL(dextrose + Ringer lactate) was going on at 10 ml/kg throughout the procedure. Under fluoroscopic guidance arterial and venous access were removed once the procedure was completed. The child was shifted to ICU once he regained consciousness.

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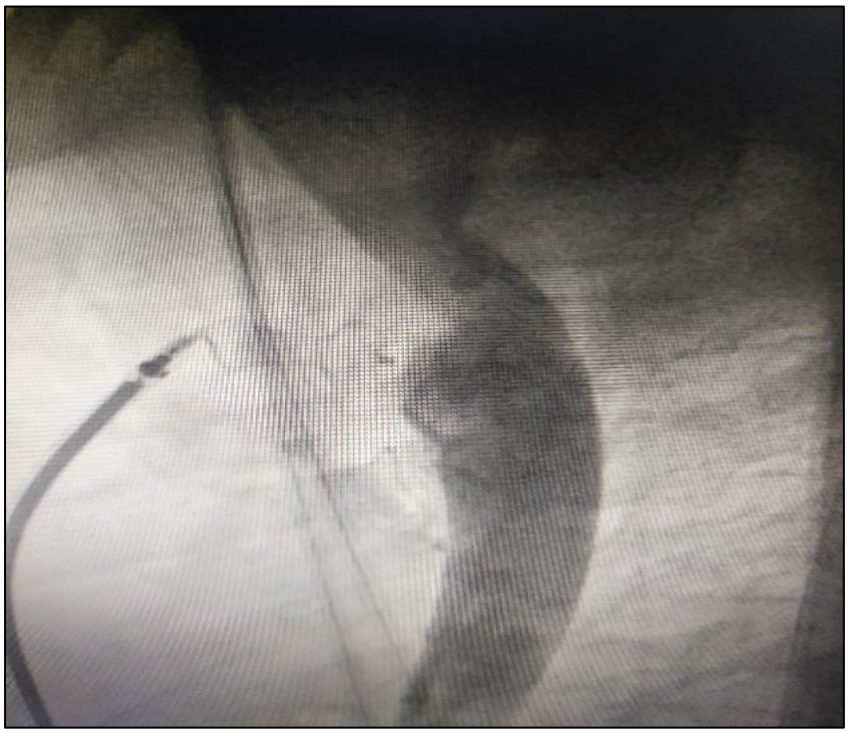

Fig.1 : PDA-Device Deployed under Guidance of Fluoroscopy.

III. DISCUSSION

PDA is a communication between the descending aorta and pulmonary artery.[1] Prostaglandin E2 promotes patency of PDA . Necrotizing enterocolitis, intraventricular hemorrhage, renal failure, congestive heart failure and pulmonary edema are common if the ductus remains patent after birth. Cyclo-oxygenase inhibitor i.e. Indomethacin 0.2 mg/kg or ibuprofen 10 mg/kg should be considered for preterm infants with a symptomatic PDA as pharmacological treatment. It is effective in 80-90% of infants. [4] Transcatheter PDA device closure have become a favourable option over thoracotomy nowadays as it is less invasive. [3]

Rubella virus is also termed as German measles. CRS is a contagious disease which spreads through droplets mode of transmission which is developed in an infant as a result of maternal infection with Rubella virus during first trimester and subsequent foetal infection.[5] CRS has the classic triad of sensorineural deafness, eye anomalies (i.e. microphthalmia, congenital cataract, glaucoma, retinopathy etc.) , microcephaly, cardiac anomalies and other multisystem abnormalities, each of which pose a significant anaesthetic challenge.[2] CRS neonates may have undetected airway abnormality in the presence of other multiple congenital defects which can lead to unanticipated difficult airway during intubation. Hypotension, hypothermia and hypoglycaemia are also reported in low birth weight child with CRS.[2] Central nervous system involvement which may present as mental retardation, microcephaly and meningoencephalitis.[5]

Almost all cases of transcatheter PDA-DC with CRS have been done under general anaesthesia with muscle relaxant. As our patient presented with CRS with failure to thrive, global developmental delay and hypotonia, we planned to avoid giving muscle relaxant and intubating the patient, although difficult airway cart was kept ready throughout the case. Plane of anaesthesia was maintained with Inj. Dexmeditomidine and Inj. Ketamine combination infusion. Entropy was used as evidence of adequate plane of anaesthesia. Entropy values for State entropy (SE) and Response entropy(RE) throughout the cases were maintained between 40-60. SE value of 40 shows low probability of awareness. Also low birth weight children are more sensitive to opioids, barbiturates, muscle relaxant and volatile anaesthetic agents because of an immature blood brain barrier and decreased ability to metabolize drugs which makes them difficult to wean off from anaesthetic drugs and ventilation. Hence we used Inj. Dexmeditomidine(centrally acting alpha-2 receptor agonist) and Inj. Ketamine (NMDA receptor antagonist) which overcome each other's side-effects and maintain adequate depth of anaesthesia without respiratory depression. ETCO2 helped to assess patient's breathing pattern to prevent respiratory depression. Hypoxia, acidosis, hypercarbia, hypoglycaemia and hypothermia were avoided throughout the case.

There are many complications after deployment of device, i.e. dislodgement of device, embolization of device in aorta or pulmonary artery, haemorrhage of major vessels, etc. which is why constant monitoring and vigilance by the anaesthesiologist is required. In case of such complications management of such patients becomes challenging for anaesthesiologist.

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IV. CONCLUSION

CRS is a constellation of multi-system abnormalities with each posing challenges for anaesthesiologist. Transcatheter PDA-DC for such patients can be done under sedation but with multidisciplinary approach and at most care.

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