Case Report

NIH catheter induced RV perforation in a patient of tetralogy of fallot

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Using a side-hole catheter for RV angiogram is a standard protocol. Perforation of RV during this procedure caused by the power of injection is a very rare complication and not well reported in literature. Here we are reporting a case of free wall perforation during RV angiogram induced by a NIH catheter. A 5 year girl (10 kg) with a diagnosis of tetralogy of fallot was planned for preoperative cath study. RV was catheterized with a 5F NIH catheter (Cordis, Cashel, Ireland) with 4 side-holes. Angiogram was obtained with Iohexol contrast (15 ml, at 10 ml / second, 700 psi pressure limit). Immediately after the injection there was a perforation of RV free wall with resultant spillage of blood and contrast into pericardial cavity. The baby became hemodynamically unstable and ultimately developed cardiac arrest. Probably one of the side holes lied firmly against the endocardium. We started cardiopulmonary resuscitation, withdrawn the catheter, reversed the heparin with protamine sulfate introduced a 5 F sheath into pericardial cavity and 90 ml of blood was evacuated. After the pericardiocentesis the baby's hemodynamic parameters started improving gradually. We kept the pericardial sheath overnight and there were no further complications. In tetralogy of fallot, generally the RV is very much hypertrophied. Encountering a perforation of RV free wall by a side-hole angiography catheter is an extremely unusual circumstance.

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In the era of interventional cardiology, catheter-based diagnostic and therapeutic procedures are rapidly advancing. However, catheter related complications are still there[1]. It occurs more frequently with debulking devices and often as a consequence of guide wire migration and injury[2]. Acute hemorrhagic pericardial collection secondary to iatrogenic inadvertent cardiac perforation often leads to fatal tamponade. Echo-guided pericardiocentesis has been shown to be effective and primary management[3]. In tetralogy of fallot (TOF), the RV is hypertrophied. Using a side-hole catheter for RV angiogram is a standard protocol. Perforation of RV of patient of TOF during this procedure caused by the power of injection is a very rare complication and not well reported in literature. Here we are reporting a case of free wall perforation during RV angiogram induced by a NIH catheter.

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Case Report

A 5-year-old baby weighing 10 kg, having Tetralogy of Fallot, was posted for preoperative diagnostic catheterization study. On examination, there was central cyanosis, grade IV clubbing, pulse rate 110/min, NIBP 90/60mmHg, ejection systolic murmur over pulmonary area. In chest X ray, there was cardiomegaly and boot shaped heart with oligemic lung fields. SpO_2 in room air was 86%.

In the catheterization laboratory, intravenous cannula was put after prior application of prilox patch. Premedication was given with glycopyrrolate (0.1mg), fentanyl (20mcg), and midazolam (1mg) intravenously 5 minutes before induction. Induction was done with sevoflurane (6%) and LMA (size 2) was inserted. Patient was kept in spontaneous ventilation. Local infiltration with 1% lignocaine was given and femoral artery and femoral vein were cannulated. A 5F NIH catheter (Cordis, Cashel, Ireland) with 4 side-holes was inserted to RV. At that time, ECG showed different types of ill-sustained arrhythmia, although blood pressure was stable. Angiogram was obtained with Iohexol contrast (15 ml, at 10 ml / second, 700 psi pressure limit). Immediately after the injection there was a perforation of RV free wall with resultant spillage of blood and contrast into pericardial cavity (Fig 1). Probably one of the side holes lied firmly against the endocardium. Gradually the contrast material was evenly distributed within the pericardial sac (Fig 2). NIBP suddenly dropped to 40/30mmHg and heart rate decreased (50/min). Inj atropine (0.2mg) was administered immediately and patient was resuscitated with intravenous fluids. We withdrawn the catheter, reversed the heparin with protamine sulfate and waited for few minutes prior to any further intervention. But, unfortunately,

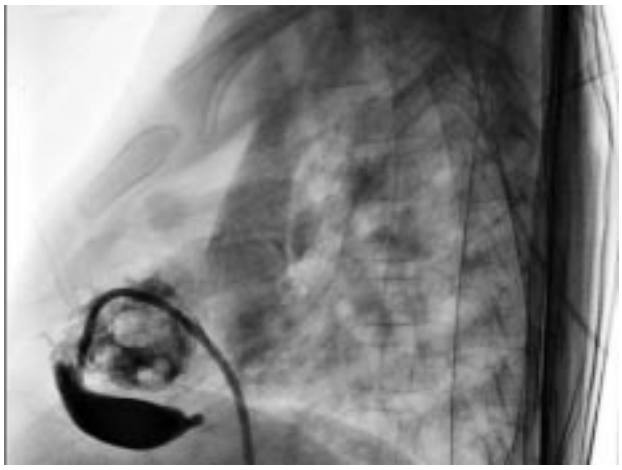

Fig 1 — RV angiogram in lateral view showing both pulmonary artery (confluent) and ascending aorta with overriding. It is also showing the RV perforation and leakage of blood with contrast material into pericardial cavity

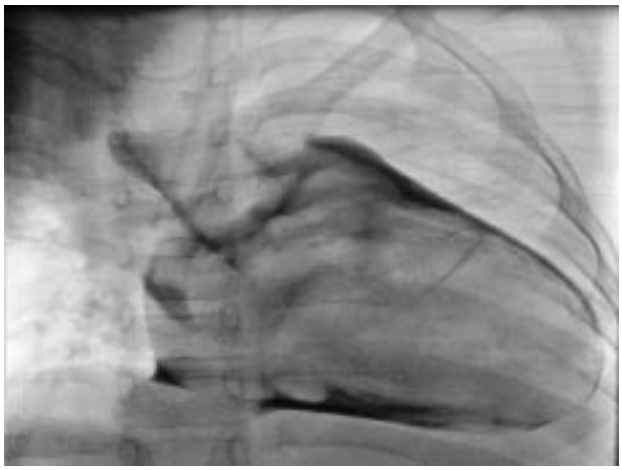

Fig 2 — Fluoroscopic image in AP view showing uniform distribution of blood with contrast material into pericardial sac

the arrhythmia continued and ultimately the patient developed cardiac arrest. Patient was intubated immediately and cardiopulmonary resuscitation (CPR) was started. Transthoracic echocardiography showed features of cardiac tamponade. Urgent pericardiocentesis through sub-xiphoid access was performed and 90mL of blood was aspirated. Fortunately, heart started to contract again, but hypotension still persists for some time. Later 1 unit packed cell transfusion was started and patient's vitals were improved gradually. We kept the pericardial sheath (Fig 3) overnight and there were no further complications.

Discussion

Tetralogy of Fallot is a cardiac anomaly that refers to a combination of four related cardiac defects that commonly occur together.The four defects are ventricular septal defect, overriding of aorta, right ventricular outflow tract obstruction, and right ventricular hypertrophy. In 2%-14% of patients with TOF, there are associated coronary artery anomalies[4]. Diagnostic catheterization study before surgical correction is a usual procedure but is not free from complication. Cardiac perforation is a rare but life-threatening complication of catheterization. The incidence of cardiac perforation has been reported to be 1.5% to 4.7% for valvuloplasty[5,6], 0.2% to 1% for radiofrequency ablation[7,8], 0.1% to 0.2% for electrophysiologic study[9], 0.5% for cardiac biopsy[10], 0.03% for coronary angioplasty[11], and 0.01% for diagnostic catheterization[5].

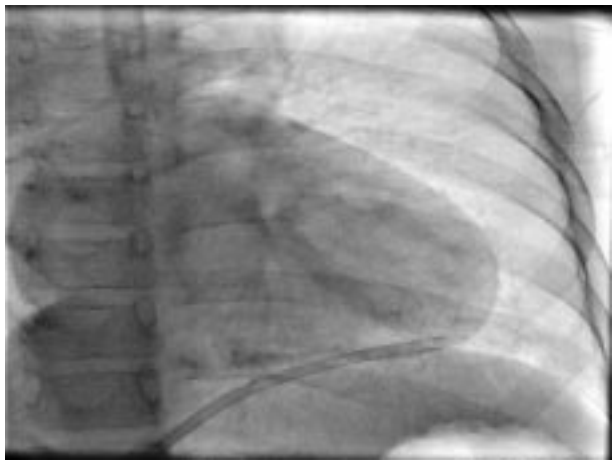

Fig 3 — Fluoroscopic image in AP view showing successful pericardiocentesis with in-situ pericardial sheath

In tetralogy of fallot, generally the RV is very much hypertrophied. Encountering a perforation of RV free wall by a side-hole angiography catheter is an extremely unusual circumstance. NIH catheter is also considered a very safe option for any diagnostic procedure as it has 4 side-holes only. In our case probably one of the side holes lied firmly against the endocardium which created the inadvertent perforation of thick RV wall. Paediatric patient has less cardiopulmonary reserve; moreover, small amount of acute collection can cause the tamponade to impair the contraction of the heart and cardiac output. The only aim of management is releasing the tamponade effect. In our case however coordinated team approach by cardiac anaesthetists and the whole cathlab team led to early diagnosis of the fatal rare complication and step-wise management. As an end result patient was saved in spite of having a cardiac arrest.

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