Section: Radiodiagnosis

Case Series

RARE CASE OF TWIN REVERSED ARTERIAL PERFUSION IN PREGNANCY: A CASE SERIES

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ABSTRACT

Twin Reversed Arterial Perfusion (TRAP) sequence is a rare and potentially fatal complication of monochorionic twin pregnancies resulting from abnormal placental vascular anastomoses, where a structurally normal "pump twin" supplies blood to a severely malformed, non-viable "acardiac twin" through reversed arterial perfusion. The primary objective of this case series is to describe the diagnostic approach, imaging findings, risk assessment, and clinical outcomes of TRAP sequence encountered at a tertiary care center. This study presents a retrospective case series of two TRAP pregnancies diagnosed in the Department of Radiodiagnosis, JNIMS, Imphal, between 2023 and 2025. Both cases were evaluated using detailed antenatal ultrasonography and color Doppler imaging to demonstrate reversed arterial flow, umbilical artery characteristics, placental vascular anastomoses, and morphological features of the acardiac twin. Serial ultrasound assessments were performed to monitor the growth of the acardiac mass, amniotic fluid volume, Doppler indices, and signs of cardiac compromise in the pump twin. Risk stratification was carried out using Doppler resistive indices and acardiac-to-pump twin weight ratios. Clinical management decisions were made in coordination with obstetric teams based on gestational age and fetal condition. One case resulted in preterm vaginal delivery with neonatal demise of the pump twin, while the second case, diagnosed at term, underwent emergency caesarean section with a favorable neonatal outcome. Through this case series, we aim to highlight the role of radiological evaluation in early diagnosis, ongoing surveillance, and prognostication of TRAP sequence. The paper emphasizes the importance of timely identification, appropriate monitoring, and multidisciplinary collaboration to improve maternal and fetal outcomes in this rare condition.

INTRODUCTION

Twin Reversed Arterial Perfusion (TRAP) sequence is a very rare anomaly that occurs in monochorionic twin pregnancies sharing one placenta. The condition is characterized by an abnormal connection of blood vessels on the placenta. It may be that, one twin, the pump twin or donor twin, has a normal heart and pumps blood to both itself and malformed twin. The other twin, acardiac twin (or recipient twin) is severely malformed, often lacking a functional heart, upper body, and head structures. TRAP sequence occurs in approximately 1 in 35,000 deliveries.[1] Among monochorionic twins, the incidence is much higher, with rates as high as 2-3%.[2]

The pump twin's heart works overtime to perfuse its own body and the acardiac twin. Deoxygenated blood from the pump twin's umbilical arteries flows into the acardiac twin's umbilical arteries thus, resulting to reverses arterial perfusion. The malformed acardiac twin is perfused with the deoxygenated blood thereby causing severe malformations. Malformed twins morphologically are of four types (a) acardiac acephalus (b) acardiac aceps (c) acardiac acornus and (d) acardiac amorphous. The acardiac twin receives blood via its umbilical arteries and drains via its umbilical vein—the reverse of normal fetal circulation.

The primary concern is the pump twin's well-being. High-output cardiac failure can occur due to pumping for two bodies. It may also lead to polyhydramnios and pre-term delivery. The mortality rate can be as high as 50-75% without any intervention.[3,4]

The acardiac twin may manifest malformations, often as torso and lower limbs with little or no cephalic/upper body and are not viable.

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CASE PRESENTATION

Here we present a case series of two cases of TRAP encountered in the Department of Radiodiagnosis, JNIMS, Imphal during the period 2023-25.

The first lady aged 27 years with G3P2, and 24 weeks by period of gestation, presented with acute symptoms suggestive of a Urinary Tract Infection. The obstetric diagnosis made as "Confirmed Monochorionic Diamniotic (MCDA) twin pregnancy". Emergency ultrasonogram (USG) revealed TRAP Sequence at 12 weeks of gestation (Reversal flow). [Figure 1] At 24 weeks of gestation, acardiac twin shows arterial perfusion and blood flow in acardiac twin. [Figure 2 & 2A]. The parasitic twin was threatening the life of the normal pump twin and resulted to an acardiac acephalus [Figure 3 & 3A].

Figure 1: Showing the reversal flow

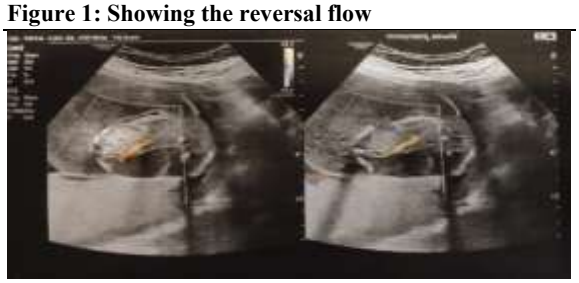

Figure 2: Arterial perfusion and single umbilical artery in the acardiac twin

Figure 2A: Arterial perfusion and single umbilical artery in the acardiac twin

Figure 3: USG showing acardiac acephalus

The pregnancy outcome was a vaginally delivered preterm female baby weighing 800 gm along with an acardiac twin (acardius acephalus) weighing 500gm along with placenta. The pump twin expired on the next day.

Figure 3A: Acardiac acephalus

The second case, 23-years-old primigravida presented at 37 weeks' gestation with features of early labor with an incidentally discovered mass-like fetal tissue on prior ultrasound. Final screening confirmed a TRAP sequence, a normal pump twin with an acardiac acephalus twin (13.3 cmX7.2cm mass, absent cranium/heart/brain) as shown in [Figure 4].

Figure 4: USG showing mass-like fetal tissue

Emergency LSCS was done and delivered a live male baby (2800gm, normal) and the parasitic acardiac

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twin/placenta, with no immediate maternal or post-natal complications. [Figure 5]

Figure 5: Acardius twin with morphological placental blood vessels anastomosis

DISCUSSION

Save the life and preserve the neurological health of the pump twin is the primary goal in TRAP. The primary danger is high-output cardiac failure in the pump twin. Diagnosis is made by ultrasound and Doppler demonstrating the reversed flow. Treatment of choice is fetal intervention (usually radiofrequency ablation) to occlude the blood supply to the acardiac twin, thereby normalizing the pump twin's circulation.

The outcome of TRAP or the risk stratification can be grouped into two (a) Poor outcome if Resistive Index (RI) Umbilical pump twin minus RI Umbilical acardiac twin is less than 0.05 and (b) Good outcome if RI Umbilical pump twin minus RI Umbilical acardiac twin is more than than 0.20.

Based on the ratio of the acardiac twin's weight to the pump twin's estimated weight ratio >0.7 (Acardiac twin weight is measured by measuring the maximum length and is calculated by using the formula 1.2 x (length)2 - 1.7 x length.) or if there is sign of pump twin failure, warrant urgent intervention. In both the acardiac twins we encountered the ratio was less than 0.6.

The intervention strategy for low-risk cases (small acardiac mass, no signs of pump twin distress) consists of serial monitoring weekly or biweekly ultrasound to see the weight ratio, doppler indices and polyhydramnios Maximum Vertical Pocket (which should be more than 8 cm) or Amniotic Fluid Index (which should be more than 24 cm.), and echocardiography to see for pericardial effusion, cardiomegaly and tricuspid regurgitation.

Optimal time is typically 18-24 weeks gestation, before cardiac compromise in the pump twin is severe. Twin Reversal Arterial Perfusion Interventional Study (TRAPIST) recommends it to be done in first trimester or second trimester whereas some studies suggest good outcomes, if done in first trimester in some studies.[5-10]

The most common and effective technique used are (a) Radiofrequency Ablation (RFA): Uses heat to coagulate and block the acardiac twin's umbilical cord/vessels. (b) Laser Coagulation: Uses LASER or an electrical current to coagulate the vessels and (c) Alcohol/Coil Embolization: Less common, involves injecting placing coils to block the flow.

Post-occlusion results to cessation of flow in the acardiac twin, reversal of heart failure and hydramnios in the pump twin, and increased survival rates (>80%) for the pump twin. The main risk is preterm delivery, which is related to the procedure and often the underlying polyhydramnios The surviving pump twin generally has a good prognosis, but surveillance for potential long-term cardiac and neurological issues is important.

Delivery is typically planned at around 37-38 weeks if no complications arise.

CONCLUSION

TRAP is a rare complication of twin pregnancy and diagnosing a TRAP is very important in early pregnancy for a positive outcome in the normal twin. A robust collaboration amongst Radiologist, Interventional Radiologist and Obstetrician is vital for the best outcome for the mother and the twin. The goal is to maximize the survival and health of the pump twin.

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