Prenatal diagnosis and postnatal outcome of persistent right ductus arteriosus: Report of three cases
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Objective
Three cases of prenatally diagnosed persistent right ductus arteriosus with postnatal outcomes.

Methods
The fetal ductus arteriosus (DA) is a vascular structure, which plays a major role in the fetal circulation. In normal cardiovascular development, the proximal portions of the sixth pair of embryonic aortic arches persist as the proximal branch of pulmonary arteries, and the distal portion of the left sixth arch persists as the ductus arteriosus, connecting the left pulmonary artery with left dorsal aorta. This arch transformation is completed by 8 weeks of human life. Normally, the sixth distal right aortic arch loses its connection and regresses, afterwards the left aortic arch and left ductus arteriosus persist in fetal life. Some congenital anomalies of ductus arteriosus are reported such as ductus arteriosus aneurism (DAA) and absence of the duct. Normal course of left DA is left to the trachea. Right DA can be seen with either LAA or RAA.

Results
Case Presentation
A 30-year-old woman, Gravida 2, Para 1, was referred at 31 weeks 6 days of gestation with a suspicion of agenesis of the corpus callosum. She and her family had both unremarkable medical histories. Neurosonographic anatomy was normal. In 3VT view, right-sided ductus arteriosus was detected with right-sided aortic arch and trachea in-between. V-shaped confluence, was constituted by RAA and rDA, which was placed right side of the trachea. The thymus was detected in 3VT view. At 38 weeks of gestation, a neonate weighing 2, 950 g was delivered with Cesarean section due to maternal desire, with APGAR scores of 8/9. Neonatal echocardiography confirmed the prenatal diagnosis of RAA with rDA. A twenty-two-months-old child was completely normal with no cardiovascular and respiratory symptom. Remaining two cases had both similar prenatal findings. Figure 1: a) Three vessels and trachea view (3VT) of case 2. b) Right ventricular outlet with rDA of case 2. SVC, superior vena cava; T, trachea; L-PA, left pulmonary artery, RAA, Right aortic arch; Ao, Aorta. Figure 2: a) Three vessels and trachea view (3VT) b) Color Doppler imaging of case 3. rDA, right ductus arteriosus; SVC, superior vena cava; T, trachea; L-PA, left pulmonary artery, RAA, Right aortic arch; Ao, Aorta. Three cases are presented with antenatal diagnosis of persistent rDA. All of them had persistent rDA with RAA diagnosis prenatally. Postnatal echocardiographic examination confirmed the prenatal diagnosis in all cases. In all RAA cases, mirror image branching was confirmed with postnatal echocardiography. None of the infants showed any symptoms and all exhibited normal growth. Persistent right ductus arteriosus can easily catch attention if proper 3VT view is obtained during the echocardiographic examination. In case of persistent rDA with LAA, the 3VT view is completely abnormal when compared to the normal 3VT view. Conversely, persistent rDA with RAA needs more attention not to be overlooked. RAA and rDA form V shape configuration as normal fetal anatomy but on the right hand side of the trachea. Furthermore, this configuration is more likely overlooked if there is any loss of awareness during the examination. If the diagnosis is made prenatally, the chance of prenatal genetic investigation for karyotype abnormality and 22q11 deletion (DiGeorge Syndrome), which is possibly associated with cardiac outflow tract abnormalities, is not missed. Thus this point may improve the awareness of 3VT view during the examination.

Conclusion
In conclusion, our report demonstrates even persistent right ductus arteriosus is a rare anomaly of the ductal arch, it can be diagnosed antenatally with obtaining 3VT view. The normal placement of ductal and aortic arches should be checked using the trachea as a reference point. Detailed fetal echocardiographic examination should be performed in suspected cases of aortic arch and ductal arch anomalies.