Case report - Congenital
Reimplantation of anomalous right coronary artery from left main coronary artery: a surgical option

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Abstract

Anomalous right coronary artery (ARCA) from left sinus of Valsalva could present in several forms either being intramural or extramural, and most occurring with separate ostium from left coronary system. ARCA originating from the left main coronary artery (LMCA) is very rare and treatments proposed for this type of anomaly are pulmonary artery translocation or coronary artery bypass grafting (CABG) of the right coronary system. There has not been any report in the literature of successful reimplantation of ARCA from LMCA, to the best of our knowledge, as another surgical option for this anomaly. We are reporting a case of successful surgical reimplantation of an ARCA from LMCA.

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1. Case report

This is a 7-year-old male with two episodes of syncope, both of which occurred at school during physical education class. His initial work-up consisted of electrocardiogram and stress echocardiogram which did not reveal any evidence of ischemia or arrhythmia to explain a cardiac cause of his syncope. He had a 2-D echocardiogram with color Doppler flow imaging which revealed anomalous origin of right coronary artery (ARCA) from left sinus of Valsalva (Fig. 1a). A chest computed tomography (CT) with 3-D reconstruction was performed which confirmed the echocardiographic finding and the origin of the ARCA from the left main coronary artery (LMCA).

Operation was performed using moderate hypothermic cardiopulmonary bypass induced with antegrade cold blood cardioplegia and direct intermittent cardioplegia infusion of the coronaries using hand-held olive tip cardioplegia infusers (DLP Arteriotomy Cannula, 2 mm, Medtronic, Inc) through a transverse aortotomy. Intraoperative finding was consistent with ARCA from the LMCA traversing between the great vessels with no separate ostium in the left sinus of Valsalva (Fig. 1b). The ARCA was transected at its origin from LMCA and was reimplanted to the right sinus of Valsalva after complete mobilization in between the great arteries (Fig. 2a). This was performed by spatulating the right coronary artery (RCA) stump and anastomosing it in end-to-side fashion to a punch hole created with 2.5 mm coronary punch in the right sinus of Valsalva using running 8-0 Prolene suture. The stump on LMCA was closed primarily using running 8-0 Prolene suture while making sure not to occlude the lumen of LMCA.

He was separated from cardiopulmonary bypass uneventfully on no inotropic support with intraoperative echocardiographic findings consistent with no wall motion abnormality and patent flow through both coronary systems. He was extubated on the same day of surgery and was discharged home on postoperative day 3, taking only a baby aspirin daily. His echocardiogram on follow-up visit revealed good biventricular function with good flow through both coronary arteries (Fig. 2b).

2. Discussion

Anomalous origin of a coronary artery from the incorrect coronary sinus of Valsalva is a rare congenital cardiac defect that is associated with increased risk of sudden death and cardiac morbidity [1–3]. The most common anomaly of this type is that in which the circumflex coronary artery arises from the right sinus or the RCA, with an incidence of 0.37%–0.6% [4, 5]. The next most common and pathologically significant anomalies are the right coronary artery from the left sinus of Valsalva and the LMCA arising anomalously from the right sinus of Valsalva. The combined incidence of these defects ~0.17% in autopsy series and 0.1%–0.3% in patients undergoing catheterization or echocardiography [1–3, 6]. Most of the anomalies of coronary arteries are relatively benign, but sudden death is associ-
artery and shared source of blood supply from LMCA [8]. There has not been any surgical treatment creating two separate coronary systems for ARCA from LMCA short of MPA translocation or CABG.

In the case presented, the ARCA was transected at its origin from LMCA and was reimplanted to the right coronary sinus using fine suture material. Care needs to be taken to mobilize enough RCA between the great vessels to reach the right sinus without tension and not redundant to cause kinking of the artery when the heart is full. There was no need to sacrifice any conal branches in this case, however, sometimes that is required to mobilize the ARCA for tension free anastomosis. The ostium of the transected ARCA was
slightly spatulated anteriorly to widen the exposure for posterior anastomosis and to create a non-obstructive anastomosis with the opening in the right sinus of Valsalva. Myocardial protection was successfully achieved using intermittent cardioplegia via small hand-held olive tip cardioplegia infusers (DLP Arteriotomy Cannula, 2 mm, Medtronic, Inc) directly into the coronary ostia as well as topical ice slush throughout the repair. There was good flow through the reimplanted RCA after separation from CPB with no wall motion abnormality on post repair echocardiogram. The alternative was to bypass the right coronary with the right internal mammary artery or reverse saphenous vein graft, if there was any evidence of inadequate coronary blood flow after repair.

The choice of preoperative imaging modalities to delineate the anatomy before surgical repair is the key to tailor the surgical planning for the given pathology. Echocardiography is a good tool for detecting the pathology, as the initial investigation for coronary anomalies. However, the anatomical details, including the origin of the coronaries, can be better delineated with multidetector row computed tomography (MDCT) or MRA which would allow three-dimensional visualization of the coronary artery with high spatial resolution.

There are no data available regarding the long-term outcome of this procedure and the patient will be followed-up closely with serial echocardiogram to determine the patency of the reimplanted coronary artery and ventricular function.

A case of symptomatic ARCA from LMCA coursing between the great vessels was successfully reimplanted into the right sinus of Valsalva with good short-term result. Translocation of the MPA and CABG are other surgical options for this type of pathology, but short of creating two separate coronary artery systems. The long-term patency of this innovative approach is yet to be determined by future follow ups.

References