Fifteen Years of Saving Young Hearts: Surgical Outcomes of Anomalous Left Coronary Artery from Pulmonary Artery (ALCAPA) Repair at Malaysia's National Heart Institute (IJN)

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Purpose:
Anomalous Left Coronary Artery from the Pulmonary Artery (ALCAPA) is a rare congenital anomaly associated with high morbidity and mortality if untreated. Surgical repair is the mainstay of management but outcomes vary depending on timing of diagnosis, ventricular function, and perioperative care. This audit aimed to review the 15-year surgical experience for ALCAPA at the National Heart Institute (IJN) from 2008 to 2023, assessing demographics, perioperative variables, complications, and survival outcomes.

Methods:
We conducted a retrospective review of 62 consecutive patients who underwent surgical correction for ALCAPA between January 2008 and December 2023. Data were extracted from operative records, echocardiographic assessments, and institutional databases. Variables collected included patient demographics, pre and postoperative left ventricular ejection fraction (LVEF), mitral valve pathology and surgical intervention, extracorporeal membrane oxygenation (ECMO) use, complications, duration of mechanical ventilation, ICU and hospital stay and mortality. Continuous variables are presented as means, while categorical variables are reported as counts and percentages.

Results:
A total of 62 patients underwent surgical repair for ALCAPA during the study period. The median age at surgery was 0.4 years, with a mean of 2.9 years (range 0.14–49.5 years). The majority were infants, with three-quarters younger than one year at the time of operation. There was a female predominance, with 37 females (60.7%) and 24 males (39.3%).

Preoperative ventricular function was significantly impaired in a large proportion of patients. Using an EF threshold of <40% to define poor function, 28 patients (45.2%) presented with severely depressed systolic function. Surgical repair resulted in measurable improvement, with a mean postoperative increase in LVEF of 13.1%.

Mitral valve regurgitation was observed in 19 patients. Of these, 14 (73.7%) underwent surgical intervention: 12 mitral valve repairs and 2 replacements, reflecting a preference for valve-preserving strategies whenever feasible.

Postoperative mechanical circulatory support was required in 8 patients (12.9%) who underwent ECMO. The mean ICU stay was 13.3 days, and the average duration of mechanical ventilation was 5.5 days. Complications occurred in 42 patients (67.7%), including pleural effusion, ventilator-associated pneumonia, and other perioperative morbidities. Mortality included 4 in-hospital deaths (6.5%) and 1 out-of-hospital death (1.6%), giving an overall mortality rate of 8.1%.

Conclusion:
This 15-year single-centre audit demonstrates that surgical repair of ALCAPA is associated with favourable outcomes, even in a high-risk population. Most patients presented in infancy with markedly reduced ventricular function, yet surgical repair yielded significant improvements in systolic performance. Mitral valve regurgitation was a frequent associated lesion, with repair strategies prioritised over replacement.

Although postoperative complications were common and ICU stays were prolonged, the majority of patients survived with meaningful functional recovery. The overall mortality rate of 8.1%, comprising 4 in-hospital and 1 late death, remains acceptable given the severity and rarity of the condition.

These findings underscore the importance of early recognition and timely surgical intervention in ALCAPA. Restoring a two-coronary system not only improves ventricular recovery but also enhances long-term survival. Continued refinements in perioperative care and durable valve-preservation techniques will be essential to optimise outcomes in this rare but life-threatening anomaly.