Truncus Arteriosus Survival Outcomes: Does 22q 11.2 Deletion Matter?

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Abstract

The authors of "Outcomes of truncus arteriosus repair and predictors of mortality" carried out a retrospective analysis of more than 3000 infants with truncus arteriosus using the National Inpatient Sample dataset of the Healthcare Cost and Utilization Project database. Logistic regression was used to identify factors associated with in-hospital mortality. The authors also identified a seemingly protective effect of 22q11.2 deletion. But do these findings offer a complete understanding of surgical risk factors for patients with truncus arteriosus?

Truncus arteriosus is a conotruncal anomaly resulting from complete failure of septation of the common arterial trunk. In the 1950s and 1960s, it was managed by pulmonary artery banding. In 1967, McGoon first used a valved allograft conduit to repair truncus arteriosus.[1] Initial results of repair in early infancy were generally poor, with over 50% mortality. However, results of repair of truncus arteriosus in older infants, who were managed medically for the first 6 months of life before surgical correction, were equally poor due to development of pulmonary vascular disease. During the last 50 years, neonatal surgical correction of truncus arteriosus has become routine. Improved surgical techniques, conduit materials, and postoperative care have made such operations possible at an operative risk less than that previously reported for banding.

The authors of "Outcomes of truncus arteriosus repair and predictors of mortality" carried out a retrospective analysis of more than 3000 infants with truncus arteriosus using the National Inpatient Sample dataset of the Healthcare Cost and Utilization Project database. Logistic regression was used to identify factors associated with in-hospital mortality. These included prematurity, stroke, necrotizing enterocolitis, venous thrombosis, and need for ECMO or cardiac catheterization during the index hospitalization. The database design of the study allowed for an impressively large, national cohort. The ability to report on race and insurance type and outcomes is also quite interesting, and unfortunately, their findings are consistent with what has been widely observed in pediatric cardiac surgical outcomes.[2-5] The authors should be praised for their thoughtful discussion of these findings.

The study's major limitations are due to the administrative nature of their database. This database did not provide specifics regarding patients' pre/post-operative anatomy (coronary anomalies, truncal valve insufficiency, etc.) or the surgical repair. Timing of diagnosis, cardiopulmonary bypass time, concomitant truncal valve or interrupted aortic arch repair, and conduit size are all factors that have been previously associated with adverse post-operative outcomes; and none of these could be included in this analysis.[6-8] The cause of death, i.e. withdrawal of support due to poor neurological prognosis versus residual disease and progressive cardiorespiratory or multiorgan failure, also could not be clearly ascertained. Consequently, this analysis provides an incomplete picture of mortality risk factors in neonates with truncus arteriosus.

Interestingly, more than 30% of the study sample underwent repair at >28 days of age. This seems incon-

gruent with today's practices and is especially notable since these patients seem to have a lower mortality. Further, the authors didn't seem to find the size of the hospital (possibly correlating with surgical volumes of congenital heart surgeries) to be a factor in outcomes. This also is at variance from currently published literature and thinking.

Perhaps the most intriguing finding is the seemingly protective effect of 22q11.2 deletion, which affected 27.2% of the cohort. Subjects with 22q11.2 deletion had a lower risk of mortality (aOR= 0.54, CI 0.34-0.87, p=0.011) on multivariate analysis. DiGeorge syndrome was originally identified in the 1960s, and subsequently linked to a chromosome 22q11.2 microdeletion in 1982 by a multi-disciplinary team, including Dr. Angelo DiGeorge (Figure 1). Today, 22q11.2 deletion is recognized as the most common microdeletion syndrome, with a prevalence of more than 1:6000 live births.[9] It is present in up to 5% of children with congenital heart disease, and much more common among those with conotruncal anomalies like truncus arteriosus.[10,11]The effect of 22q11.2 deletion on peri-operative morbidity and mortality remains somewhat uncertain.

Interestingly, the protective effect seen in this cohort does not seem to be mediated through the identified mortality risk factors. Patient factors such as prematurity and low birth weight, and perioperative events such as ECMO, cardiopulmonary resuscitation, mechanical ventilation, and cardiac catheterization, were similar in the 22q11 and non-22q11 groups. Lower mortality was observed even though the 22q11.2 deletion group had a higher incidence of non-white race and lower rate of private insurance. It's difficult to reconcile this result in the context of the paper's broader findings. As the authors point out, the association between prematurity, lower socioeconomic status, and non-white race is complex and the contribution of each is difficult to tease out. As the mortality benefit does not seem related to measured baseline characteristics or post-operative complications, the authors suggest that the anatomic details of patients with 22q11.2 deletion such as potentially lower rates of significant truncal valve insufficiency may account for their improved post-operative survival.[12] However, additional work will be necessary to more clearly understand this finding.

Finally, those patients with 22q11.2 deletion had longer hospitalizations and higher rates of tracheostomy and gastric tube placement. Perhaps it's worth pondering then, that although we may offer these patients a similar chance at life, the quality of life we offer may be quite different.

Figure 1.

From left to right, Hope H. Punnett, Ph.D., Angelo M. DiGeorge, M.D., James B. Arey, M.D., Ph.D., and Harold W. Lischner, M.D. taken 1997.

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