Summer 7-22-2017

Anomalous Coronary Artery Disease

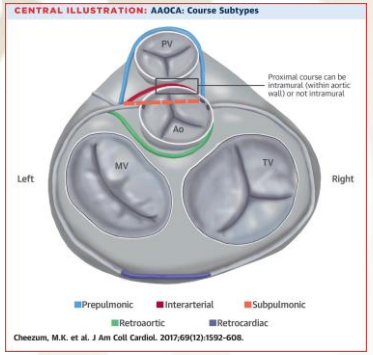
Margaret Hueckel
hueckel.4@gmail.com

Anomalous Coronary Artery Disease

Margaret Hueckel CCRN, BSN
Otterbein University, Westerville, Ohio

Presentation of Process

- Coronary artery anomalies (CAA's) are classified according to the origin, course, destination, and size of the vessel.
- The various types and subtypes of this condition are anomalous left coronary artery (ALCA) arising at or above the right sinus of Valsalva, and anomalous right coronary artery (ARCA) arising at or above the left sinus of Valsalva.
- The subtypes of these conditions include interarterial, subpulmonic, pre-pulmonic, retroaortic, or retrocardiac (Cheezum et al, 2017).
- The highest incidence of sudden death occurs when the ALCA or ARCA course between the aorta and the pulmonary artery, or the course is interarterial causing an acute angle with the coronary artery and the aorta (Brothers et al, 2015).
- Since many anomalies are asymptomatic, most are diagnosed incidentally during coronary angiography or at autopsy.



This image shows the 5 subtypes of anomalies arising from the inappropriate sinus (Cheezum et al., 2017).

Signs and Symptoms

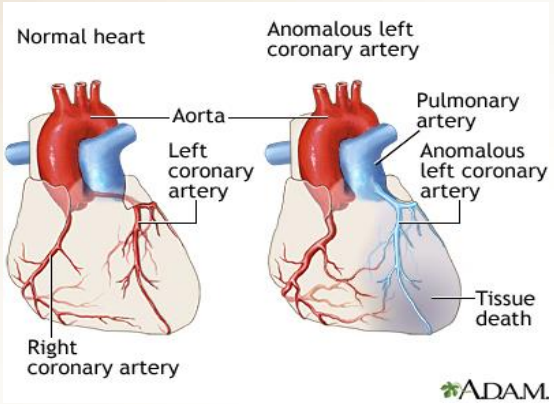
- Crushing chest pain
- Diaphoresis
- Palpations
- Dyspnea on exertion
- Tachypnea
- Failure to thrive
- Sudden death (Chigurupati et al, 2016).
- Mitral regurgitant murmur or gallop
- Chest x-ray possibly revealing cardiomegaly.
- An elctrocardiography (ECG) may also reveal ST-elevation or Q-waves present (Chigurupati et al, 2016).
- An echocardiogram remains the primary test for diagnosis and often shows left ventricle dilation and mitral valve regurgitation.
- Many patients with condition are asymptomatic.

Underlying Pathophysiology

- Pathophysiology of CAA is unclear and not well understood.
- It is a rare congenital condition meaning individuals are born with an alternate blood flow of their coronary arteries.
- valve like ridges in the vessel and slit-like coronary orifices cause acute angulation of the artery as it travels from left to right.
- This can cause stenosis and obstruction to blood flow leading to myocardial ischemia, causing patients to have clinical manifestation of Angina (Suranarayana, Lee, Abidov, & Lotun, 2015, p. 363). I
- In the instance of the anomalous origin of the left coronary artery from the pulmonary artery (ALCAPA), blood flow through the coronary arteries moves in the direction of a pressure gradient along the path of least resistance.
- With the anomalous coronary arteries, the lower pulmonary artery pressure favors blood flow from the normal right coronary artery through collateral vessels to the left coronary artery system.
- Blood flow then continues through the pulmonary arties creating a steal of coronary blood flow across the myocardium.
- The diversion of blood flow away from the myocardium causes ischemia and myocardial dysfunction (Fahy et al, 2012).

Introduction

- Anomalies of the coronary arteries are not well understood and are extremely rare in the general population (Suryanarayana, 2015).
- Coronary artery anomalies (CAA) are rare conditions that may be associated with myocardial ischemia, lethal ventricular rhythms, and sudden death.
- The current population affected is estimated to be from 0.1 to 0.7 percent (Brothers et al, 2015) and affect approximately 1 in every 300,000 live births (Fahy et al, 2012).
- Many are considered benign, but identifying those that can be fatal is an on-going challenge in the medical field.
- Although research is on-going with this rare condition, there remains several unknown aspects of this disease (Brothers et al, 2015).
- This topic was chosen because of personal experience with a family member who was recently diagnosed with an anomaly.



(MedlinePlus, 2017)

Significance of Pathophysiology

- This condition can cause sudden death without symptoms.
- If these anomalies can be identified earlier in life, the patient can be monitored or surgical treatment can take effect.
- The pathologic process indicates how the arteries maintain alternate blood flow. This is significant to any healthcare provider when it comes to providing treatment or giving medication because these patients may have decreased cardiac output and increase oxygen demand due to the ischemia that may be present in the myocardium.
- According to research listed previously, many cases present with myocardial infarction symptoms. As healthcare providers, it is important to recognize that an anomaly of the coronary artery could be the pathophysiology behind the individual's signs and symptoms.

Implications for Nursing Care

- Vital that healthcare providers be able to identify the anomalies that have a higher risk of sudden death (Brothers, Gaynor, Jacobs, Poynter, & Jacobs, 2015).
- This means more education and awareness of signs and symptoms and knowledge of diagnostic tests and treatments is required.
- The gold standard for diagnosis is an echocardiogram, however further tests to evaluate the condition include: intravascular ultrasonography to evaluate the mechanisms of ischemia, nuclear stress tests to examine effort induced ischemia, and coronary angiographs (Yildiz, Karabay, Akman, & Aytekin, 2015).
- These tests mean further education for staff and nurses, more funding, and more awareness of the treatments.
- Surgical treatment for these cases also means more post-surgical treatment, more patient education by the nurse and physicians, and improved technology for these surgical interventions (Bradley, 2015).
- Beta blockers are prescribed for medical management (Yildiz, Karabay, Akman, & Aytekin, 2015).
- Precautions such as exercise restrictions need to be reinforced with patients with CAA (Cheezum et al, 2017).
- With the pathophysiology being unclear for this condition, this means there is more opportunity for continuing research on this topic for nurses and physicians.

Conclusions

- In conclusion, this rare and poorly understood disease presents an opportunity for healthcare providers to learn and continue researching this interesting topic.
- With this condition being congenital, perhaps in the future there can be further testing on infants, or new treatments identified for each subtype of anomaly.
- With the current research, it is known that this condition can cause sudden death so it is vital that we continue to gain knowledge of this topic, and increase our awareness of this condition as healthcare providers.
- Medical providers will need to work in conjunction with congenital heart specialist in the management of this condition
- This disease can affect a wide spectrum of patients including infants up to older adults, so awareness and education of this disease is important in any field of medical practice whether it is pediatrics, primary care, or anesthesia.

OTTERBEIN UNIVERSITY

References

Bradley, S. M. (2015). surgery for anomalous aortic origin of a coronary artery: More is better? The Journal of Thoracic and Cardiovascular Sugery, 150, 425-426. http://dx.doi.org/10.1016/j.jtcvs.2015.05.060

Brothers, J., Gaynor, W., Jacobs, J., Poynter, J., & Jacobs, M. (2015). The Congential Heart Surgeons Society Registry of Anomalous Aortic Origin of a Coronary Artery: an update. Cambridge University Press, 25, 1567-1571. http://dx.doi.org/10.1017/s1047951115002061

Chigurupati, K., Gadhinglajkar, S., Sreedha, R., Karunakaran, J., Dharan, B.S. (2016). Anomalous origin of the left coronary artery from the pulmonary artery in an infant and adult: intraoperative echocardiographic comparison. Journal of Cardiothoracic and Vascular Anesthesia. 30, 1353-1357.

Cheezum, M. K., Liberthson, R.R., Shah, N. R., Villines, T.C., O'Gara, P.T., Landzberg, M. J., Blankstein, R. (2017) Anomalous aortic origin of a coronary artery from inappropriate sinus of Valsalva. Journal of the American College of Cardiology. 69, 1592-1605.

Fahny, C. J., Ing, R.J, Kern, F.H., O'Hare, B., Redmond, J.M., Jaggers, J. (2012). The anesthetic management and physiologic implications in infants with anomalous left coronary artery arising from pulmonary artery. Journal of Cardiothoracic and Vascular Anesthesia, 26, 286-290.

Marler, A.T., Malik, J.A., Slim, A.M. (2013). Anomalous left main coronary artery: case series of different courses and literature review. Case Reports in Vascular Medicine. 2013, 1-5.

MedlinePlus. (2017). Anomalous left coronary artery from the pulmonary artery. Retrieved https://medlineplus.gov/ency/article/007323.htm.

Mosca, R.S., Phoon, C.K.L. (2016). Anomalous aortic origin of a coronary is not always a surgical disease. Seminars in Thoracic and Cardiovascular Surgery: Pediatric Cardiac Surgery Annual. 19, 30-36.

Silverman, N. H. (2015). Echocardiographic presentation of anomalous origin of the left coronary artery from the pulmonary artery. Cambridge University Press, 25, 1512-1523. http://dx.doi.org/10.1017/s1047951115002565

Suranarayana, P., Lee, J., Abidov, A., & Lotun, K. (2015). Anomalous right coronary artery: case series and review of literature. Cardiovascular Revascularization Medicine, 16, 362-366. Retrieved from https://journals-ohiolink-edu.ezproxy.otterbein.edu/pg_99?1123145085 45421::NO::P99_ENTITY_ID,P99_ENTITY_TYPE :35590301,MAIN_FILE&cs=32560Ch7m9bkuSA tP7pnO5cqyHeuZEug6_v30kBQf1dUmuUlRKQc 6IAHfJE51n4vaj0pECMTFoaX5IBKiLPBEOQ

Yildiz, O., Karabay, K. O., Akman, C., & Aytekin, V. (2015). anomalous origin of the left main coronary artery from the right coronary artery. Texas Heart Institute Journal, 42, 243-245. http://dx.doi.org/10.14503/thij-14-4563