THE STUDY OF CORONARY ARTERY ANATOMY IN CONGENITAL CYANOTIC AND ACYANOTIC HEART DISEASE BY CINEANGIOGRAPHY

A THESIS
SUBMITTED IN PARTIAL FULFILMENT FOR
THE MASTER DEGREE OF CARDIOLOGY

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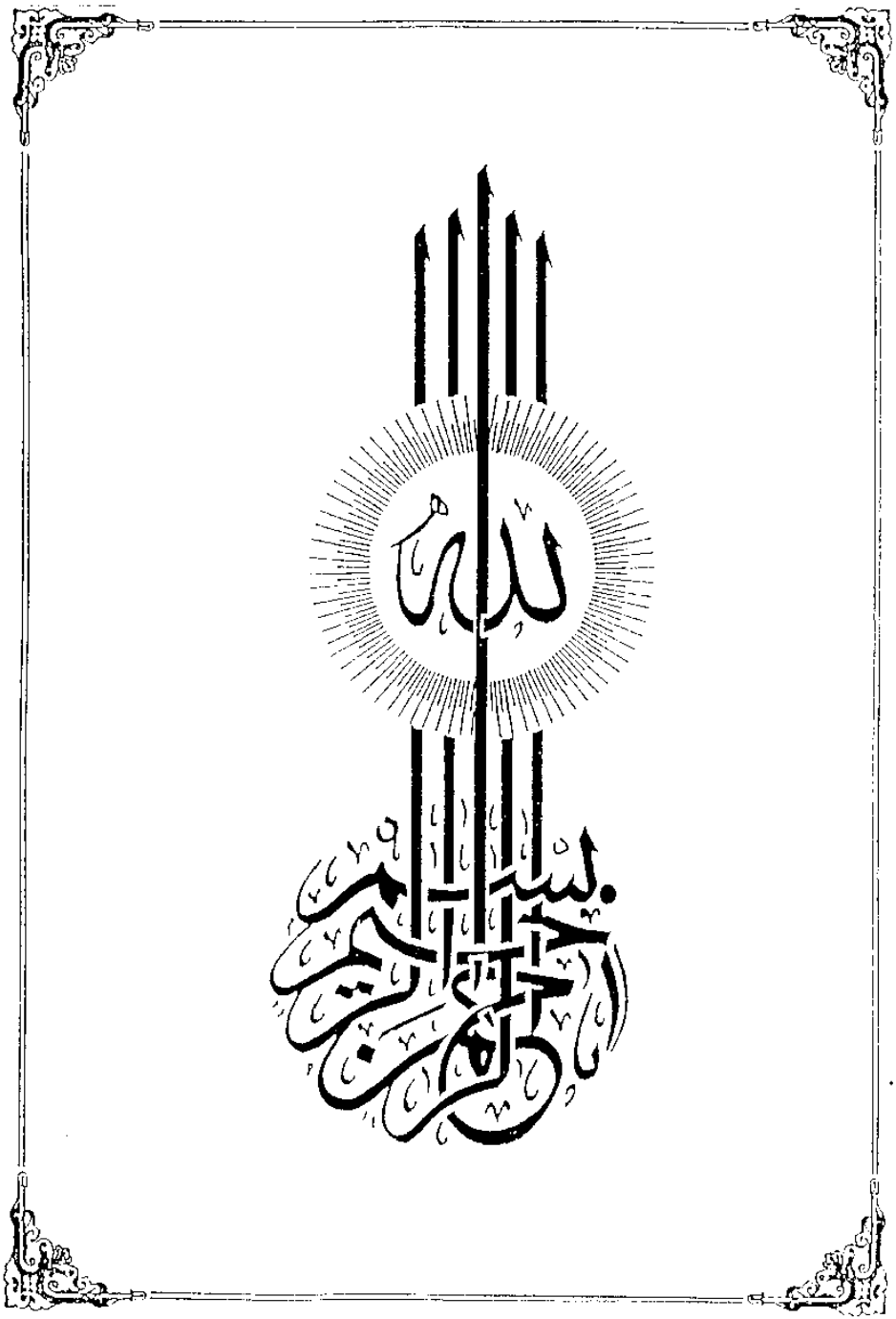

TITLE

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TO MY PARENTS AND BROTHER

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INTRODUCTION
AND
AIM OF THE WORK

INTRODUCTION AND AIM OF THE WORK

Anomalies of coronary artery origin, structure, course, or distribution are reported to occur in roughly 1 to 2 percent of the population catheterized.(29,57) Coronary anomalies are frequently incidental findings, in which anatomy is altered but physiology is normal; that is coronary blood flow is normal. However, certain anomalies are associated with myocardial ischemia or infarction, heart failure, and sudden death. In some of these cases, modern cardiac surgical techniques may relieve patients' symptoms and offer improved longevity.(57)

Anomalies cause technical problems in coronary arteriography due to unusual positions of coronary artery ostia. Failure to cannulate and opacify an anomalous coronary artery may lead to the false conclusion that the missing artery is occluded. Anomalies of the coronary arteries may increase the risk of coronary arterial insult during cardiac surgery, serve as a site for development of endocarditis or thrombus formation, and in the case of coronary arterial venous fistulas, produce striking murmurs and significant left-to-right heart shunts.(57)

An understanding of these anomalies is essential to those performing coronary arteriograms in order that a safe, complete initial study may be carried out even when the anomaly is encountered unexpectedly for the first time.(57) This point is emphasized by reports that almost 40 percent of patients with coronary anomalies have required a second angiographic procedure to elucidate the anomaly clearly.(285)

One of the problems in the early period of open heart surgery in several congenital heart malformations was a lack of knowledge about the coronary arteries.(475)

Surgery of congenital heart disease is at best a risky

procedure. The risks of such surgery should wherever possible be minimized. One risk which can undoubtedly be avoided is that of iatrogenic damage to the coronary arteries. The anatomical integrity of the major coronary arteries is surely an important feature for survival following major cardiac surgery.(476)

It is not known why coronary artery anomalies are so often associated with congenital heart disease, but these anomalies are particularly frequent when the aorta is in an anterior position, as for example in tetralogy of Fallot, double-outlet right ventricle and complete transposition of the great vessels.(460)

A typical problem is faced in the total correction of tetralogy of Fallot. Sometimes it is unclear which vessels could be sacrificed in the outflow area; which vessels have to be tied off during infundibular resection in order to prevent the development of fistulae to the right ventricle. Problems are usually encountered at the time of total correction in patients who had had a previous Brock-procedure. This is because of adhesions and fibrosis within the pericardium which produce total obstruction of the coronary artery pattern at the later procedure.(475)

Other specific problems are related to the cases of complete and corrected transposition of the great vessels with intraventricular lesions that need correction.(475)

Many of these problems of yesteryear are now soluble and preventable with today's knowledge and experience. There have been many approaches to the problem of coronary arteries during the 'learning curve'. From the standpoint of a surgeon confronted with the problems of correction, the approach has been pragmatic. However, it cannot be denied that the possibilities created by the development of cardiac surgery and the many questions that had to be solved in that period pushed many investigators forward in other directions so as to widen and deepen the knowledge in this field.(475)

The topic of coronary arteries in heart disease in

general is very extensive. Coronary arteries in congenital heart disease is a more limited field, but still very extensive.(475)

Thus, the results of surgery for congenital heart disease may be markedly influenced by the presence of coronary artery anomalies. Preoperative recognition of such abnormalities allows the surgeon to plan the most appropriate surgical approach.(460)

AIM OF THE WORK:

The aim of this work is to study the anomalies of coronary artery origin, structure, course, or distribution in congenital cyanotic and acyanotic heart disease by cineangiography, thus emphasising the importance of delineating the anatomy of the coronary arteries preoperatively in patients with congenital heart disease.

This may aid in reducing the mortality and morbidity during surgery and in the postoperative period, since it may guide the cardiac surgeon to plan the most appropriate surgical approach.

REVIEW OF THE LITERATURE

EMBRYOLOGIC DEVELOPMENT OF THE CORONARY ARTERIES

The hearts of very young mammalian embryos have no coronary circulation. Like the adult hearts of primitive vertebrates, their loosely interwoven muscle fibres are bathed in the blood which they pump.(1)

In the seventh week human embryo, shortly after the aorta has been partitioned from the truncus, minute buds appear at the base of the aorta and rapidly mature as coronary arteries.(1) This is the critical event in the formation of the coronary arteries and occurs at the time the truncus arteriosus undergoes partitioning. Proper partitioning of this truncus into aorta and pulmonary artery results in both coronary arteries coming off the aorta.(2)

In an appreciable number of embryos studied at this stage, similar buds were seen in the pulmonary artery.(3) They usually involute, but various patterns of abnormal persistence and involution can explain most of the anomalies of origin of the coronary arteries, other than those determined by more extensive cardiac malformations. Tortuous fistulas between coronary arteries and veins or cardiac chambers which may form the primitive sinusoidal condition of the myocardium.(1)

The right coronary artery bud extends into the groove between the pulmonary conus and right ventricle and the right atrial appendage, then passes along the diaphragmatic surface to end near the crux of the heart. Along its way it gives off branches destined to become muscular branches to the right and left ventricles.(2)

The left coronary artery bud emerges from the aorta and passes behind the pulmonary trunk at its base and beneath the left atrial appendage. It sends one large branch onto the interventricular sulcus, and another branch destined to become the circumflex branch of the left coronary artery,

along the left atrioventricular sulcus.(2)

The branches from these developing main coronary arteries penetrate the myocardium where they make connections with the intertrabicular spaces (sinusoids), which become part of the vascular system of the heart.(2)

ANATOMY OF THE CORONARY CIRCULATION

The coronary arteries are described in relation to certain surface cardiac landmarks. The diaphragmatic surface of the heart is made up of parts of both ventricles. The right cardiac margin consisting of the thin-walled right ventricle, is folded over rather sharply, producing an acute angle. This edge is commonly called the acute margin of the heart. The obtuse margin of the heart is the border, formed by the thick-walled left ventricle, and has a much more rounded edge.(2)

The atria are separated from the ventricles by the coronary atrioventricular sulcus. The anterior and posterior interventricular sulci, overlie the interventricular septum between both ventricles, and are located on the ventral and dorsal aspects of the heart, respectively. The crux of the heart is defined as the location where the atrioventricular sulci intersect posteriorly.(2)

In the normal heart, with exceptions, the blood supply to the myocardium is derived from two coronary arteries: the right and left, which arise from the corresponding sinuses of Valsalva.(2)

These sinuses are localized areas of dilatation found immediately above the aortic valve. There are three such sinuses, and two of them derive their names from the respective coronary artery arising from them. The right coronary sinus is located anteriorly, the left coronary sinus is posterior and to the left, and the noncoronary sinus occupies a position immediately to the right and posteriorly to the right coronary sinus.(2)

The coronary arteries arise from orifices approximately in the middle of the right and left aortic sinuses of Valsalva. They never arise from the posterior sinus. The ostia are round, ovoid, or elliptical.(4)