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List of abbreviations

PHT	Pulmonary hypertension
VSD	Ventricular septal defect
ASD	Atrial septal defect
TGA	Transposition of great arteries
CHD	Congenital heart diseases
PA	Alveolar pressure
Ppa	Pulmonary artery pressure
Ppv	Pulmonary venous pressure
PVR	Pulmonary vascular resistance
PDA	Patent ductus arteriosus
TAPVC	Total anomalous pulmonary venous connection
PAPVC	Partial anomalous pulmonary venous connection
CTs	Cor triatrium sinister
CHF	Congestive heart failure
COP	Cardiac out put
HPV	Hypoxic pulmonary vasoconstriction
ACE inhibitor	Angiotensin converting enzyme inhibitor
PG	Prostaglandins
NO	Nitric oxide
EN	Endothelin
5HT	5- hydroxy tryptamine
CPB	Cardio pulmonary by pass.

Introduction

Pulmonary hypertension is a simplified name for a complex health problem. This disease is met with in many patients whether undergoing cardiac surgery or non-cardiac surgery,

The pulmonary circulation is normally a low pressure, low resistance circulation. In patients with pulmonary hypertension, altered vascular endothelial and smooth muscle function lead to a combination of vasoconstriction, localized thrombosis, and vascular growth and remodeling. These processes increase pulmonary vascular resistance, resulting in right ventricular failure, inadequate oxygenation, and ultimately death.

(Trenton & steven 2001)

Pulmonary hypertension markedly increases morbidity and mortality among patients undergoing surgery. Understanding the Pathophysiology and etiology of pulmonary hypertension in the individual patient allows accurate risk assessment, optimization prior to surgery and rational intraoperative and postoperative treatment. ***(Trenton & steven 2001)***

الملخص العربى

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إن ارتفاع ضغط الدم فى الدورة الدمويه يؤثر سلبا على وظائف الرئة وعلى وظائف البطين الأيمن مما قد يؤدى الى قصور فى وظائف البطين الايمن .

ومن أهم أسباب ارتفاع ضغط الدم فى الدورة الدمويه الرئويه وجود عيوب خلقية فى القلب. المعالجة التخديرية للمرضى المصابين بارتفاع فى ضغط الدورة الدمويه الرئويه ليس مقصورا فقط على المعالجة أثناء العمليات الجراحية ولكن أيضا على الفترة التى تسبق إجراء العملية من حيث التشخيص الدقيق للسبب المؤدى لهذا الارتفاع والعلاج الملائم لهذا السبب وتقييم الآثار السلبية لهذا الارتفاع على وظائف عضلة القلب.

ثم تأتى المعالجة أثناء العملية الجراحية من خلال تصليح العيوب الخلقية فى القلب لتشمل أيضا المعالجة التخديرية على الفترة التى تلى العمليه لتفادى حدوث اى مضاعفات أو معالجة هذه المضاعفات إن وجدت .

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قسم التخدير والرعاية المركزة

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Ain Shams University
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Perioperative Management of Pulmonary Hypertension in Pediatric Patients Undergoing Cardiac Surgery

An Essay submitted for Partial Fulfillment
of Master Degree in Ansthesiology
by

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جامعة عين شمس
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كلية الطب – جامعة عين شمس

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2007

بسم الله الرحمن الرحيم

"الْحَمْدُ لِلّهِ الَّذِى هَدَانَا لِهَذَا وَمَا كُنَّا
لِنَهْتَدِى لَوْلاَ أَنْ هَدَانَا اللّهُ"

صدق الله العظيم
الإعراف (٤٣)

Chapter 1:

Pulmonary circulation

Embryology anatomy, histology and physiology

Embryology:

The heart is formed by fusion of two tubes (two ventral aortae) in the middle line to form a single tube (heart tube) which is connected cranially to the first pair of aortic arches &caudally to the two vitello-umbilical trunks.

The heart tube bulges into the pericardial cavity, it becomes surrounded by the pericardium except dorsally where a fold of the mesoderm persists for a time. Then, a constriction divides the heart tube into two chambers: the bulbs cordis cranially & atrioventricular chamber caudally. A second constriction appears caudal to the first one, this constriction divides the atrioventricular chamber into the ventricle cranially & the atrium caudally. This second constriction marks the site of the atrioventricular (a-v) canal. The atrium receives the vitello-umbilical trunk on each side. (*Saladin,2003)*

The atrium shows a dilatation into right & left halves which refer to right & left atria.

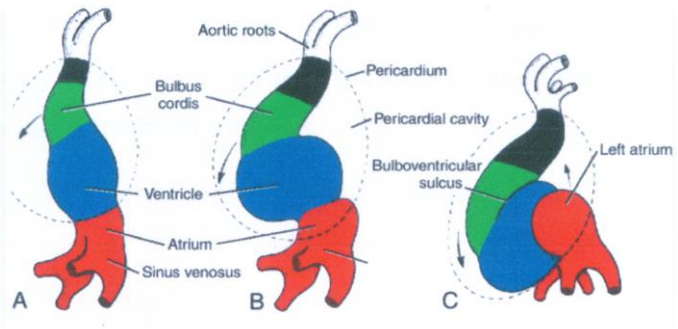

Fig. 1: Formation of the cardiac loop. Forntal view of the heart tube undergoing looping in the pericardial cavity. The primitive ventricle is moving ventrally and to the right, while the atrial region is moving dorsally and to the (arrows). *(Langman's Medical Embryology, 2003)*

As the heart tube grows at a higher rate than the pericardium, the heart tube is forced to lose its straight shape and under goes bending The heart tube at first form a simple bend ;but soon it forms a spiral shaped tube. The atria acquire a dorsal position. The bulbus cordis&the ventricle form a U shaped loop ventral to the atria and a notch is formed between the bulbus cordies (bulboventricular notch).

Another result of the bending of the heart tube is shifting of the atrioventricular (a-v) canal to the left of the middle line.

The fourth chamber to appear in the heart tube is the most cranial chamber, this is the truncus arteriosus and lies cranial to the bulbus cordies. (*Saladin,2003)*

The cranial part of truncus arteriosus is dilated to form the aortic sac which is connected to the dorsal aorta by six aortic arches on each side.

After formation of (a-v) canal, two endocardial cushions are

developed on the ventral and dorsal walls of the canal .As a result of continued growth, the two cushions fuse to form the septum intermedium. The (a-v) canal is thus divided into right & left atrioventricular orifices.At a later stage , the tricusped & mitral valves are developed in relation to the two orifices.(*Saladin,2003)*

The two atria are formed by the growth of a cresentic fold from the roof of the common atria (septum primum). The two horns of this septum reach to the growing (a-v) endocardial cushions. The septum primum bounds a formen called the ostium primum .With more growth of the septum primum, the ostium primum is gradually obliterated .At the same time, the cranial part of the septum primum is broken to form a new opening between the two atria (ostium secodum).(*Saladin,2003)*

Another cresentic fold appears on the right side of the septum primum (septum sccondum). The anterior horn of the septum secodum reaches to the septum intermedium (a-v) septum; but the posterior horn ends short of the septum intermedium. The septum secondum bounds an opening which is the formen ovale.

This arrangement leads to a valvular mechanism which permits the passage of blood from Rt to Lt atrium and not vice versa. After birth the septum primum fuses with the septum secondum to form the interatrial septum. The inner margin of the septum secondum forms the annulus ovalis (limbus fossa ovalis).The floor of the fossa ovalis is formed by the septum primum. (*Saladin,2003)*

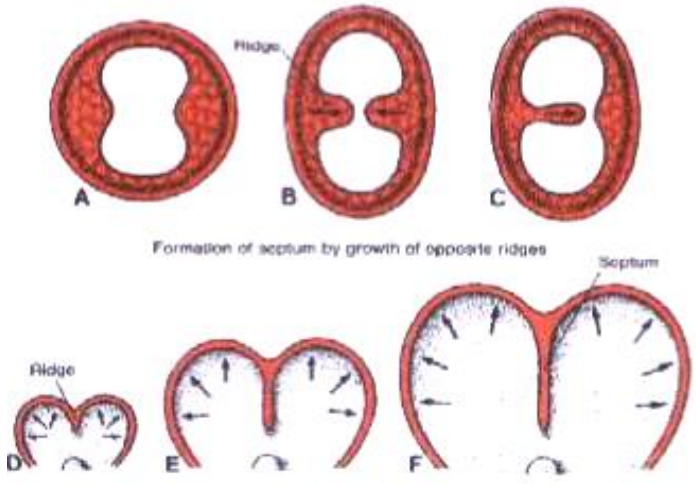

Fig. 2: Septum formation by two actively growing ridges that approach each other until they fuse. *(Langman's Medical Embryology, 2003)*

The bulboventricular chamber is divided into Rt&Lt ventricles by the development of three structures: ventricular septum, extension from the atrioventricular endocardial cushions (septum intermedium) & proximal bulbar septum.

The ventricular septum begins its development as a projection from the base or the inferior wall of the ventricle. As it enlarges .the septum forms two horns which reach up to the corresponding (a-v) endocardial cushions. The upper crcsentic border of the septum bounds a temporary connection between the two ventricles (interventricular formcn) .The ventricular septum forms the muscular part of the interventricular septum (septum musculare). (*Saladin,2003)*

With more growth, a downward extension occurs from the Rt margin of septum intermedium to close the interventricular formen.

This extension form the membranous part of the interventricular septum (septum membranaceum).

The proximal bulbar septum develops as two ridges which fuse