What is “Structural Heart Interventions”?

Dr Cheung Shing Him, Gary
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Aim of this talk:
To introduce what the ‘Structural Heart Interventions’ is; To review what kind of
diseases or interventions under this sub-speciality; To arouse the awareness
among the general practitioners in the community in this aspect.

What is “Structural Heart Intervention”?
• The Structural Heart Interventions represent a broad category of
percutaneous treatments for patients with both congenital heart
disease and acquired heart disease involving structural and functional
abnormalities of heart valves, cardiac chambers and the proximal great
evessels.

Atrial Septal Defect (ASD) closure
• One of the most common adult congenital heart defects. 1. Secundum ASD
in the region of fossa ovalis (75%); 2. Primum ASD (15-20%) positioned
inferiorly near the crux of heart; 3. Sinus venosus ASD (5-10%) located
either superiorly near superior venous cava (SVC) or inferiorly near
inferior venous cava (IVC); 4. Coronary sinus ASD (<1%).

Indication of Atrial Septal Defect (ASD) closure
• Closure of an ASD is indicated for right atrium (RA) and right ventricular
(RV) enlargement with or without symptoms (class I). Closure of an ASD
is reasonable in the presence of paradoxical embolism or documented
orthodeoxia-platypnea (class IIa). A sinus venosus, coronary sinus, or
primum ASD should be repaired surgically rather than by percutaneous
closure (class I).

Ventricular Septal Defect (VSD) closure
• VSD is the most common congenital heart defect at birth and presents in
approximately 3.0 to 3.5 infants per 1000 live births. Because there is a
high incidence of spontaneous closure of small VSDs, the incidence is
much less in older infants and particularly in adults. Types of Ventricular
Septal Defect: Perimembraneous VSD: 75-80%; Supracristal VSD: 5-7%;
Inlet VSD: ~8%; Muscular VSD: 5-20%

Indications of Ventricular Septal Defect (VSD) closure
• Closure of a VSD is indicated when Qp/Qs (pulmonary–to–systemic blood
flow ratio) > 2.0, and clinical evidence of left ventricle (LV) volume
overload (class I). Closure of a VSD is reasonable when Qp/Qs > 1.5 with
pulmonary artery (PA) pressure < two thirds of systemic pressure, or in
the presence of LV systolic or diastolic failure (class IIa).

Patent Ductus Arteriosus (PDA) closure
• PDA is a persistent communication between the aorta and pulmonary
artery. Unoperated patients may present with a heart murmur or
symptoms caused by a large left-to-right shunt, including dyspnoea and easy fatigability. If the PDA is large, the patient may present with Eisenmenger physiology, including differential cyanosis and clubbing. Patients are at an increased risk of developing endarteritis, heart failure, and pulmonary vascular disease.

**Indications of Patent Ductus Arteriosus (PDA) closure**
- Closure of a PDA is indicated if left atrium (LA) and/or LV enlargement; or if PAH is present, or in the presence of net left-to-right shunting; Prior endarteritis (class I).

**Patent foramen ovale (PFO)**
- At birth, foramen ovale flap will close against atrial septum as LA pressure > RA pressure. In 20% of people, the flap fails to fuse, forming PFO. Normally, the flap is pressed against the atrial septum, but it will open when pressure in RA > LA, e.g. cough, sneeze, laugh or upon release of Valsalva maneuver. Via this way, any paradoxical embolism can go from venous to arterial circulation.

**Indication of Patent Foramen Ovale (PFO) closure**
- PFO closure may be considered for patients with recurrent cryptogenic stroke despite optimal medical therapy (Class IIb).

**Percutaneous para-valvular Leak closure**
- Para-valvular leak (PVL) affects 5% to 17% of all surgically implanted prosthetic heart valves. Patients who have PVL can be asymptomatic or present with hemolysis or heart failure, or both. Reoperation if associated with increased morbidity and is not always successful because of underlying tissue friability, inflammation, or calcification.

**Severe aortic stenosis (AS)**
- AS is an insidious disease with a long latency period followed by rapid progression after the appearance of symptoms, resulting in a high rate of death (approximately 50% in the first 2 years after symptoms appear) among untreated patients.

**Transcutaneous Aortic Valve Implantation (TAVI)**
- TAVI is indicated in patients with severe symptomatic AS who are not suitable for surgical aortic valve replacement, as assessed by a 'heart team' (class I). TAVI should be considered in high-risk patients with severe symptomatic AS who may still be suitable for surgery, but in whom TAVI is favoured by a 'heart team' based on the individual risk profile and anatomic suitability (class IIa).

**Percutaneous Transvenous Mitral Commissurotomy (PTMC)**
- For mitral stenosis (MS), intervention should only be performed in patients with clinically significant stenosis (valve area ≤1.5 cm²).
- PTMC is indicated in symptomatic patients with mitral stenosis (MS) with favourable characteristics; and/or with contraindication or high risk for surgery (class I).

**Severe Mitral Regurgitation (MR)**
When there's indication for surgery for severe MR, mitral valve repair is the preferred technique than replacement, if it's expected to be durable. One surgical leaflet repair approach is the edge-to-edge, or double-orifice repair. The repair is accomplished by suturing the free edges of the mitral leaflets together to form a double orifice.

**Percutaneous mitral valve edge-to-edge repair (MitraClip)**

- MitraClip may be considered in patients with symptomatic severe primary / secondary MR who fulfill the echo criteria, and also inoperable or at high surgical risk by a 'heart team' (class IIb).

**Left Atrial Appendage (LAA) occlusion**

- AF is the most common cardiac arrhythmia in clinical practice. Stroke is a serious complication for patients with AF, with a reported annual incidence of 4.4%. For patients with cardioembolic strokes caused by AF, up to 70% will result in death or significant disability.
- Traditionally, anticoagulation therapy with warfarin or new anticoagulants has been the standard of care for stroke prevention in patients with AF and high risk of stroke. However, it has been underutilized due to poor patient compliance, contraindications, a narrow therapeutic window and potential bleeding complications.
- Several studies have demonstrated that up to 90% of thrombi deriving from LA are formed in LAA. Therefore, LAA occlusion to prevent cardioembolic stroke would be a strategy to minimize cerebrovascular events. For those patients of AF who have high risk of stroke but contraindications for oral anticoagulation therapy, percutaneous occlusion of LAA should be considered as a stroke prevention option.

**Other examples of ‘Structural Heart Interventions’:**

- Alcohol septal ablation for hypertrophic cardiomyopathy,
- Percutaneous pulmonary valve replacement,
- Percutaneous repair for coarctation of aorta,
- Percutaneous repair of pulmonary or coronary arterio-venous malformation (AVM).