

## An introduction to invasive monitoring during cardiac surgery

### Perioperative Transesophageal Echocardiography

This is a monitoring and diagnostic tool. A probe is inserted into your food pipe (oesophagus), and upto your stomach, after anaesthesia has been induced. It allows us to get images of the heart with which we can assess its structure and function. It assists us to seek further confirmation of diagnosis already made, monitor how the heart performs during the period of anaesthesia, and evaluate the effects of surgical repair and correction. Transesophageal echocardiography is a very useful diagnostic and monitoring tool. There are only few conditions which prohibit us from using it, e.g., any pathology in the oesophagus which may be adversely affected by insertion of a probe, e.g. oesophageal stenosis, stricture or presence of a web. Presence of oesophageal varices may also contraindicate its use. The anaesthetist will enquire of any history and symptoms which may suggest that you have any of these conditions. All diagnostic and therapeutics modalities carry some complications, the common and/or serious ones of which are listed. However, we wish to reassure you that we would exercise every care to avoid such complications, and by and large, this tool is safe and the risk: benefit ratio very favourable.

### Invasive Arterial Blood Pressure and Central Venous Pressure Monitoring

For the kind of surgery that you are about to undergo, it is necessary for us to very closely monitor your cardiac and circulatory status. For this we need to monitor your arterial blood pressure, and/or your central venous pressure every instant, throughout the course of the anaesthetic and surgery and even during the post-operative period.

- For the arterial blood pressure monitoring, we shall insert a small plastic catheter into one of your arteries (at the wrist/foot/groin), most likely before putting you to sleep. To minimize the discomfort during the catheter insertion, we shall first inject some local anaesthetic in the area. This catheter, apart from enabling us to monitor your blood pressure, will also enable us to take blood for a number of investigations, and tests that you may subsequently need to undergo, during and after the operation in the early postoperative period. Thus, it will spare you the discomfort of repeated venous punctures. This catheter will be removed once the need for intensive monitoring is over.
- For the venous pressure monitoring, we shall insert a special catheter into one of your central veins, most likely in the neck, or else in the upper part of your chest, or in the groin. This catheter will enable us to monitor the pressure in your central veins, and indirectly, in the right side of your heart. This pressure will reflect the amount of blood circulating in your heart and circulatory system, thus enabling us to determine whether conditions are optimum or not, and if not, what corrective measures to take. This catheter, will also enable us to administer certain drug which are too painful if given through the smaller peripheral veins. Usually, we shall insert the catheter after inducing anaesthesia, but occasionally, we may need to perform the procedure prior to putting you to sleep. In that case, we shall inject some local anaesthetic to minimize the discomfort. Although quite safe in experienced hands, this being an invasive procedure, carries risks of some complications, most of which are listed. However, the benefits of this monitoring technique greatly outweigh the risk. The large majority of complications can be dealt with quite efficiently and easily and, only very few, may need major intervention and such cases are rare.

### Pulmonary artery pressure monitoring

Given the current condition of your cardiac and/or circulatory status, and/or the type of surgery you are about to undergo, we feel there is a need to monitoring the pressures inside your heart chambers and pulmonary artery (artery carrying blood to the lungs from the right side of the heart) even more closely. The pressure measured from your pulmonary artery allows us to gain some insight of the function of the left side of your heart, whether or not we need to give you more intravenous fluids, and whether we need to aid the function of the heart with some specific cardiovascular drugs. This is quite an invasive procedure, and while we shall exercise every possible care, we would like you to go over the listed complications. The large majority of complications can be either avoided or dealt with quite efficiently and easily. However serious complications can rarely occur.

V.1 (Nov/07)

Group the case notes from 1 to 5.  
Group other forms, chart, etc. in  
Group 5.

Please refer to <http://hkwc.home/webapps/Dept/HIRO>  
for details of full version. Prepared by HIRO QMH

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Complications associated with the following

**Perioperative Transesophageal Echocardiography**

- |                        |                                       |
|------------------------|---------------------------------------|
| lip injuries (13%)     | esophageal/gastric injury or bleeding |
| hoarseness (12%)       | vocal cord paralysis                  |
| dysphagia (1.8%)       | dysrhythmias                          |
| bradycardia (0.2%)     | hypotension                           |
| dental injuries (0.1%) |                                       |

**Central Venous Catheter**

1. During insertion
  - pneumothorax - subclavian ~ 2%
  - IJV ~ 1-2%
  - arterial puncture - subclavian ~ 5%
  - IJV ~ 1-2% haematoma structural damage
  - nerves - vagus, recurrent laryngeal, stellate ganglion, cervical plexus
  - trachea
  - thoracic duct
2. During use
  - i. colonization, infection, bacteraemia
  - ii. venous thrombosis
  - iii. embolism - thrombus, septic thrombus, air, catheter tip
  - iv. venous perforation
  - v. AV fistula
  - vi. accidental removal
  - vii. migration - fluid administration to pleural cavity
3. During removal
  - haemorrhage / haematoma
  - air embolism

**Arterial-line**

- |                        |                                 |
|------------------------|---------------------------------|
| thrombosis             | ischaemia of the limbs          |
| haematoma              | proximal forearm ischaemia      |
| accidental haemorrhage | aneurysm                        |
| sepsis                 | AV fistula                      |
| distal emboli          | inadvertant drug administration |

**Pulmonary Artery Catheter**

1. Early
  - Arrhythmias
  - Misplaced catheter tip
  - Air embolism
2. Late
  - Mechanical problems
  - Catheter entrapment
  - Catheter coiling, knotting
  - Catheter tip migration
  - Introducer sheath problems
  - Balloon rupture

Thrombosis, pulmonary embolism
Thrombocytopenia
Pulmonary infarction
Infection
Endocarditis
3. Structural damage
  - Endocardium, tricuspid valve, pulmonic valve
  - Pulmonary artery rupture, pseudoaneurysm

\_\_\_\_\_  
Signature of Patient

\_\_\_\_\_  
Date