Rational monitoring of intraoperative myocardial ischemia requires a thorough understanding of its pathophysiology. Myocardial ischemia was classically described as a disturbance of myocardial oxygen balance caused by either increased demand, and/or reduced supply. Intraoperatively, increased demand may be caused by tachycardia, hypertension, or increased contractility. Decreased demand may be due to tachycardia, hypotension (especially with an increased wedge pressure), coronary artery spasm, and coronary atheromatous plaque rupture. The concept was that maintaining demand at low levels by strict hemodynamic control would prevent ischemia. However, it was observed that most episodes of intraoperative ischemia occur without preceding hemodynamic disturbance. This means that most intraoperative ischemia is supply-side ischemia. Ischemia may result in stunning (frightened), hibernation (asleep), or infarction (dead).

**Intraoperative Monitoring**

The ideal monitoring modality for intraoperative myocardial ischemia is still elusive. However, knowledge of the advantages and limitations of the available techniques will help increase their diagnostic yield.

1. **Electrocardiography:**

   Change in ST-segment position is one of the most commonly used methods for detection of myocardial ischemia. It was shown that most episodes of electrocardiographic myocardial ischemia were not detected by clinicians, despite on-line ECG monitoring. Automated analysis of the ST-segment of the electrocardiogram (ECG) was recommended in order to increase the vigilance for intraoperative myocardial ischemia. Automated ST-segment analysis is at least theoretically superior to oscilloscopic monitoring, because of its continuous nature, and the ability to monitor multiple leads simultaneously even without displaying all leads on the monitor screen.

2. **Transesophageal Echocardiography (TEE)**

   Wall motion abnormalities have been shown to occur within seconds of the onset of regional ischemia, simultaneously with regional lactate production, but before and even in the absence of changes in the surface ECG. Detection of myocardial ischemia by TEE is based on documenting two changes in segmental function namely a reduction in myocardial thickening and a decrease in the normal inward endocardial motion. The loss of myocardial thickening is the more specific indicator of myocardial ischemia.

3. **Hemodynamic Indicators**
   4. **Pulmonary Artery Wedge Pressure**
   5. **Myocardial lactate production**

**Implications:**

Electrocardiography remains the most robust and commonly used modality for monitoring myocardial ischemia. Understanding of the capabilities and limitations of
computerized ST segment analysis will help in maximizing the benefit gained from its use. TEE is gaining more widespread acceptance. **Myocardial Contrast Echocardiography** may give better information about coronary perfusion and myocardial function.