

## KEY REFERENCES

### Exposure, Stabilization, and Hemodynamics in OPCAB

Off-pump coronary artery bypass grafting (OPCAB) for multivessel disease is an important alternative to conventional myocardial revascularization using cardiopulmonary bypass. Since it was reinvented in 1991 and popularized in 1997, OPCAB has been embraced by a small number of surgeons. As experience was gathered around the world, newer stabilization and distraction techniques were developed to allow more consistent bypass grafting of all targets of the heart, especially the topographically difficult posterior vessels. Pioneers such as Ricardo Lima [1995] reported the use of 4 pericardial sutures ("Lima sutures") to expose the marginal/circumflex vessels for bypass grafting; Bergsland and colleagues [1999] modified and simplified this technique into a "single suture," strategically placed in the oblique sinus of the posterior pericardium. Spooner [1999] developed a similar technique, commonly referred to as the "Spooner sutures." Despite intracoronary shunts, carbon dioxide insufflation, and improved anesthetic care, widespread acceptance of OPCAB for myocardial revascularization was limited. Compression devices for coronary stabilization were replaced by suction devices that improved patency rates and surgical outcomes. In addition, devices were developed to distract the heart out of the chest or into the right pleural space, replacing the use of pericardial traction sutures in most centers. This procedure allowed more consistent complete revascularization to be performed by a large number of surgeons around the world. The hemodynamic sequelae of exposure and stabilization in OPCAB are receiving increasing interest in the cardiac surgery literature. This set of KEY REFERENCES provides an overview and background of exposure, stabilization, and hemodynamics in OPCAB. Experimental studies that led to the development of compression and suction devices are presented, as well as the hemodynamic alterations in OPCAB patients from large clinical studies. We provide references for the various pericardial suture techniques as well as the apical suction devices used to distract the heart out of the pericardial cradle for exposure of the difficult posterior vessels. In addition, we have provided references for right heart support and left heart support devices used during OPCAB. The number of centers using these devices is very small, which indicates that these devices may not be necessary in the vast majority of cases. In addition, we provide KEY REFERENCES for the use of the intraaortic balloon pump during OPCAB and very interesting studies looking at 3-dimensional echocardiographic reconstructions of the mitral annulus during the various distraction techniques in OPCAB. The implications of these studies are enormous, as we are presented with data that suggest that alterations of the mitral valve annulus may variably cause hemodynamic disturbances during OPCAB, related mainly to regurgitation or stenosis caused by the

iatrogenic folding of the mitral annulus. Finally, we have presented references regarding hemodynamic collapse and conversion rates to coronary artery bypass graft (CABG) using cardiopulmonary bypass. We hope that these KEY REFERENCES will stimulate the reader to further explore and study this important topic in the lab as well as in the operating room. It is hoped that such information will allow an ever-larger group of surgeons to safely embrace OPCAB as a safe alternative to CABG using cardiopulmonary bypass for myocardial revascularization.

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