

TABLE 1. Risk of postoperative adverse events in patients who received clopidogrel versus control subjects before coronary artery bypass grafting

Outcome end points	No. of studies	Subjects	Statistical method	Effect estimate	95% CI
Immediate postoperative mortality	13	12,129	Risk ratio (M-H, random, 95% CI)	1.28	0.99–1.66
Reoperation for bleeding	14	10,944	Risk ratio (M-H, random, 95% CI)	1.78	1.28–2.48
Stroke	7	4422	Risk ratio (M-H, random, 95% CI)	1.28	0.61–2.70
Myocardial infarction	11	4084	Risk ratio (M-H, random, 95% CI)	0.64	0.49–0.83
Postoperative blood loss	10	3186	Mean difference (IV, random, 95% CI)	157.77	61.91–253.63
Red blood cell transfusion	9	10,026	Risk ratio (M-H, random, 95% CI)	1.23	1.10–1.37
Transfused red blood cells (units)	7	2369	Mean difference (IV, random, 95% CI)	0.77	–0.05 to 1.59
Transfused fresh-frozen plasma (units)	7	2369	Mean difference (IV, random, 95% CI)	0.31	0.12–0.50
Transfused platelets (units)	6	741	Mean difference (IV, random, 95% CI)	2.41	–0.03 to 4.86

CI, Confidence interval; M-H, Mantel-Henzel method; IV, inverse variance method.

many patients with recent acute coronary syndrome and those in whom percutaneous coronary interventions were likely performed, we believe that patients for whom it was possible to discontinue clopidogrel 5 to 7 days before surgery were those who were in stable condition permitting delay of surgery and therefore not requiring urgent or emergency surgery. Their inclusion would have been a potential source of bias.

Here we take also the opportunity to comment briefly on the differences and similarities of these 2 meta-analyses to get more conclusive results on this controversial issue. In addition to excluding studies in which control subjects were exposed to clopidogrel, we excluded from our analysis those studies in which aprotinin was used in most or all patients, because its use could have had a major effect in reducing the risk of major postoperative bleeding. Importantly, we excluded studies that included patients who underwent valve surgery, which may have significantly affected the results of meta-analysis. The study by Nijjer and colleagues¹ did not share these important exclusion criteria. Despite these methodologic differences, our studies reached similar conclusions. In fact, it seems rather clear that recent exposure to clopidogrel before coronary surgery is associated with increased risk of excessive bleeding and need for reexploration. Furthermore, in both meta-analyses we observed a trend toward increased mortality with recent exposure to

clopidogrel, which is consistent in most of the included studies.

Because excessive bleeding is a major determinant of postoperative outcome,³ we conclude that continuing clopidogrel until the time of coronary artery bypass grafting may expose patients to an increased risk of excessive bleeding and its related complications. These results must be viewed, however, in the light of suboptimal design and analysis of the included studies.

Fausto Biancari, MD, PhD^a

Juhani Airaksinen, MD, PhD^b

^aDivision of Cardiothoracic and Vascular Surgery

Department of Surgery

Oulu University Hospital

Oulu, Finland

^bDivision of Cardiology

Department of Internal Medicine

Turku University Hospital

Turku, Finland

References

1. Nijjer SS, Watson G, Athanasiou T, Malik IS. Safety of clopidogrel being continued until the time of coronary artery bypass grafting in patients with acute coronary syndrome: a meta-analysis of 34 studies. *Eur Heart J*. Epub 2011 May 24.
2. Biancari F, Airaksinen KE, Lip GY. Benefits and risks of using clopidogrel before coronary artery bypass surgery: systematic review and meta-analysis of randomized trials and observational studies. *J Thorac Cardiovasc Surg*. Epub 2011 Jun 22.
3. Biancari F, Mikkola R, Heikkinen J, Lahtinen J, Airaksinen KE, Juvonen T. Estimating the risk of complications related to re-exploration for bleeding after adult cardiac surgery: a systematic review and meta-analysis. *Eur J Cardiothorac Surg*. Epub 2011 Jun 1.

doi:10.1016/j.jtcvs.2011.09.006

EFFICACY OF AWAKE THORACIC SURGERY

To the Editor:

We greatly appreciated reading the simple but clear case report by Noda and colleagues¹ of awake thoracoscopic surgery for intractable pneumothorax. Noda and colleagues¹ demonstrated the benefits of local and epidural anesthesia in treating a particular patient who had right pneumothorax after left pneumonectomy for cancer. The procedure was both well tolerated and successful in completely controlling the air leakage.

We agree with Noda and colleagues¹ that lesions situated next to the hilum may present some difficulties in approach when operating on a breathing lung. Nevertheless, we would first contend that pulmonary tears causing air leakage are more frequently situated in the peripheral surface of the lung and are therefore very well suited to approaches performed with epidural anesthesia. Second, we advocate that even hilar lesions can be reached and treated in an awake modality after adequate training.

Noda and colleagues¹ also stated that total lung collapse cannot be obtained in patients who have limited contralateral pulmonary function. In our own awake series,² however, lung collapse was most of the time equivalent to that achieved with single-lung ventilation. In addition, we found that awake video-assisted thoracoscopic management of pneumothorax is particularly feasible for and well tolerated by elderly patients and those with poor

TABLE 1. Ten years of awake thoracic surgery with local or epidural anesthesia

Indications	Year	N	Morbidity (no.)	Mean hospital stay (d)	Mean global operating room time (min)	Shift to general anesthesia (no.)
Pulmonary nodules (median and IQR)	2004	30	1 (3.3%)	2.0 (2–3)	65 (56–72)	2 (6.6%)
Bilateral sympathectomy (mean ± SD)	2005	15	—	1.0	86.5 ± 5.7	—
Nonresectional lung volume reduction (mean ± SD)	2006	12	3 (25%)	7.8 ± 5	88 ± 12	1 (8.3%)
Pneumothorax (mean ± SD)	2007	21	3 (14.2%)	2.0 ± 1.0	78 ± 20	—
Lung metastases (median and IQR)	2007	14	1 (7.1%)	2.5 (2–3)	62.5 (55–70)	—
Decortication (median and IQR)	2010	19	6 (31.6%)	6 (5–7)	50 (40–70)*	4 (21%)

IQR, Interquartile range. *Intraoperative time.

general conditions.² In response to the surgeon's suggestions, the patient can spontaneously regulate the breath, ventilating more slowly in case of the onset of hypercapnia or more deeply when the re-expansion of the lung is required. Although these actions may lengthen the operative time, they favor lung manipulation and ultimately avoid endotracheal intubation.

Since 2001, we have successfully established a structured program of awake thoracic surgery conducted with local or epidural anesthesia.³ Apart from pneumothorax, we have obtained excellent results for such other conditions as pleural decortication in empyema thoracis⁴ and nonresectional surgery for advanced emphysema⁵ (Table 1). We have thus become familiar with procedures performed in hypoxic patients, who represent the optimal candidates for awake surgery as well as the most tolerant of intraoperative hypercapnia.

It is our understanding that operating with a breathing lung can represent a conceptual obstacle for many thoracic surgeons. However, they should consider more often the possibility of working with a lung in movement and gain practice with this new situation. We have found that the learning curve for surgeons well trained in video-assisted thoracoscopic surgery is not longer than that required for any other new endoscopic procedure. Similarly, with the increases in the surgical proficiency, we found increasingly higher postoperative satisfaction levels of both patients and their referring physicians.

In addition, the avoidance of general anesthesia may have significant positive implications for immune response after surgery. We have hypothesized that the lower incidence of postsurgical infections and the attendant lesser rate of morbidity, faster recovery, and shorter hospital stay may be attributable to this condition.⁶ Indeed, a more competent postoperative immunologic response might be considered a useful effect even in surgical oncology, as it would possibly reduce the probability of future relapses. The awake surgical resection of the thoracic neoplasm represents a new and challenging frontier that we have recently undertaken to explore.

To date, we think that surgery performed in awake, spontaneously breathing patients with local and epidural or solely epidural anesthesia may meet all the requirements for a safe and effective use in many procedures of thoracic surgery. We are confident that in the near future it can become part of the routine practice of the thoracic surgeons.

Tommaso Claudio Mineo, MD
 Vincenzo Ambrogi, MD
 University Tor Vergata of Rome
 Department of Thoracic Surgery
 Policlinico Tor Vergata
 Rome, Italy

References

1. Noda M, Okada Y, Maeda S, Kondo T. Successful thoracoscopic surgery for intractable pneumothorax after pneumonectomy under local and epidural anesthesia. *J Thorac Cardiovasc Surg.* 2011;141:1545-7.
2. Pompeo E, Tacconi F, Mineo D, Mineo TC. The role of awake video-assisted thoracoscopic surgery

in spontaneous pneumothorax. *J Thorac Cardiovasc Surg.* 2007;133:786-90.

3. Mineo TC. Epidural anesthesia in awake thoracic surgery. *Eur J Cardiothorac Surg.* 2007;32:13-9.
4. Mineo TC, Pompeo E, Mineo D, Tacconi F, Marino M, Sabato AF. Awake nonresectional lung volume reduction surgery. *Ann Surg.* 2006;243:131-6.
5. Tacconi F, Pompeo E, Fabbri E, Mineo TC. Awake video-assisted pleural decortication for empyema thoracis. *Eur J Cardiothorac Surg.* 2010;37:594-601.
6. Vanni G, Tacconi F, Sellitri F, Ambrogi V, Mineo TC, Pompeo E. Impact of awake video-thoracoscopic surgery on postoperative lymphocyte responses. *Ann Thorac Surg.* 2010;90:973-8.

doi:10.1016/j.jtcvs.2011.08.046

Reply to the Editor:

We read with interest the letter of Mineo and Ambrogi concerning our novel technique for the surgical management with local and epidural anesthesia of intractable pneumothorax after pneumonectomy. We appreciate all the useful comments that we have received in response to the submission of our article.¹

We initially believed that it might be difficult to approach lesions located near the hilum; however, we are now encouraged by the comments of Mineo and Ambrogi stating that hilar lesions can be approached and treated in awake patients after adequate surgical training. In addition, we have highlighted the importance of identifying any potential air leakage sites before performing thoracic surgery on awake patients. In our own recent study, preoperative thoracography with iopamidol (Iopamiron 300; Schering AG, Berlin, Germany) was therefore performed through a double-lumen chest tube. The appropriate treatment