

Perioperative Medicine

J. Lance Lichtor, M.D., Editor

Adhesive-enhanced sternal closure to improve postoperative functional recovery: A pilot, randomized controlled trial. *Ann Thorac Surg* 2011; 92:1444–50

Traditional techniques used for sternal closure after cardiac surgery may reduce bone stability and result in complications such as infection or compromised respiration. After a proof-of-concept study, this single-center pilot, randomized clinical trial assessed the effects of adhesive-enhanced closure of the sternum on functional postoperative recovery in 55 patients undergoing primary sternotomy. Postoperative complications such as atrial fibrillation and superficial sternal wound infections were similar between groups. Incisional pain was decreased in the adhesive-enhanced closure group overall ($P < 0.0001$) and during coughing ($P = 0.004$). Patients in the adhesive-enhanced closure group used significantly fewer opioids on postoperative days 3 and 5, when pain scores were highest.

Interpretation

Healing after sternotomy may take as long as 8 weeks. In this study, use of an adhesive-enhanced closure that combined bone adhesive with a standard seven-wire cerclage closure reduced incisional pain, coughing pain, opioid use, and disability scores. Inspiratory capacity and time to return to baseline were also improved with adhesive-enhanced closure. In the future, large randomized clinical trials are needed to confirm these results.

Cognitive and behavioral outcomes after early exposure to anesthesia and surgery. *Pediatrics* 2011; 128:1053–61

Animal studies have demonstrated potential neurologic degeneration after early life exposure to anesthetics. This matched cohort study of children ($n = 8,548$) examined the association between exposure to anesthesia and subsequent measures of neurodegeneration. Of 5,357 children in the cohort, 350 underwent procedures requiring general anesthesia before the age of 2 yr, of whom 64 were exposed multiple times. Children exposed to anesthesia multiple times had an increased risk for developing learning disabilities compared with either a single exposure or unexposed children (adjusted hazard ratio =

2.12). This group also was more likely to receive an individualized education program for speech/language (hazard ratio = 0.92) (fig. 1). Group-administered tests of achievement and cognition also demonstrated that increased anesthetic exposure had a negative effect.

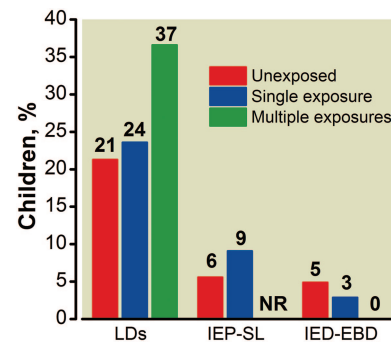


Fig. 1. Multiple exposures to anesthesia before the age of 2 yr were a risk factor for development of learning disabilities (LDs; hazard ratio [HR] = 2.16) and subsequent individualized education programs for speech/language (IEP-SL; HR = 4.76). Exposure to anesthesia was not a risk factor for subsequent individualized education programs for an emotional/behaviors disorder (IEP-EBD; HR = 0). NR = not reported.

Interpretation

This report was similar to a 2009 article by the same group in *ANESTHESIOLOGY*. In the current study, the authors matched those exposed to anesthesia before age 2 yr to control patients who were not exposed to anesthesia. In both studies, they found no difference after a single surgery/anesthetic exposure compared with no anesthesia, although there were differences if children experienced multiple exposures at a young age.

Quality of life in patients undergoing totally thoroscopic closure for atrial septal defect. *Ann Thorac Surg* 2011; 92:223034

Closure of atrial septal defect (ASD) may be done *via* thoroscopic or conventional sternotomy techniques. However, little is known about the effect of these procedures on the quality of life of patients. This nonrandomized study compared quality of life in 96 patients undergoing thoroscopic ASD repair without robotic assistance to 56 patients undergoing conventional ASD closure through sternotomy, all performed by a single surgeon. The mean scores of eight variables on the Short Form Survey were higher in the thoroscopic group compared with the conventional closure group (fig. 2). Total duration of surgical procedures ($P < 0.001$) and hospital stays ($P = 0.024$) was significantly shorter in the thoroscopic group compared with the control group. Patients in the study group reported less moder-

ate to severe incisional pain (11.6% vs. 62.5%; $P = 0.008$). Patients in the study group returned to work or school faster than those in the control group (28 vs. 42 days; $P = 0.003$).

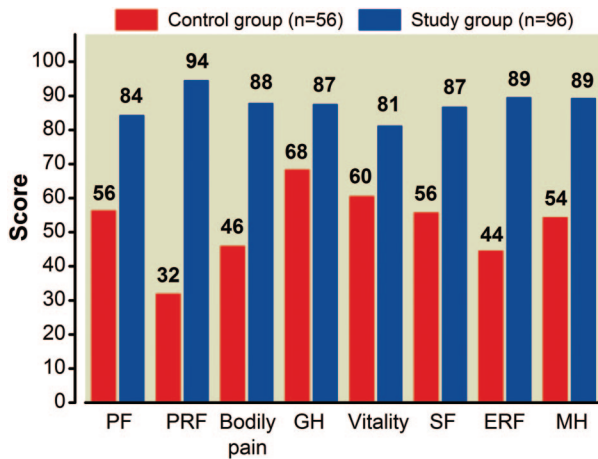


Fig. 2. Thoracoscopic atrial septal defect repair without the aid of a computerized robotic surgical system (study group) resulted in significantly ($P < 0.05$ or 0.001) higher mean scores of eight variables in the Short Form Survey compared with conventional closure through sternotomy (control group). ERF = emotional role function; GH = general health; MH = mental health; PF = physical function; PRF = physical role function; SF = social function.

Interpretation

The authors measured quality of life in 124 patients who underwent either thoracoscopic or conventional sternotomy ASD closure. Total thoracoscopic ASD closure favored faster recovery and improved quality of life compared with conventional closure techniques. The thoracoscopic approach may be used more frequently in the future.

Selective diaphragm muscle weakness after contractile inactivity during thoracic surgery. *Ann Surg* 2011; 254:1044–9

Postoperative inspiratory muscle weakness may lead to postoperative pulmonary complications. To test this theory, serial biopsies from the diaphragm and the latissimus dorsi muscle were obtained from six patients undergoing thoracotomy for tumor resection at the beginning of surgery (t_0) and 2 h later (t_2). Contractile performance was then determined. At t_2 the force-generating capacity was reduced by 35% for the diaphragm muscle fibers, but not for the latissimus dorsi fibers. Fiber size and myofibrillar structure did not differ between t_0 and t_2 . The relative contribution of myosin heavy-chain type 2 was significantly reduced compared with myosin heavy-chain slow isoforms, and messenger RNA levels of MuRF-1 were increased twofold in the diaphragm. Nitrotyrosine levels were significantly reduced by 28% at t_2 .

Interpretation

In serial biopsies taken 2 h after initiation of thoracotomy, diaphragm muscle fiber weakness developed, contractile protein content was reduced, and proteolytic pathways were activated. This study provides a potential mechanism for pulmonary complications observed in patients after thoracotomy.

Critical Care Medicine

Jean Mantz, M.D., Ph.D., Editor

Using laboratory models to test treatments: Morphine reduces dyspnea and hypercapnic ventilatory response. *Am J Resp Crit Care Med* 2011; 184:920–7

There are limited, well-controlled clinical data assessing the effects of opioids on dyspnea. In the current randomized, blinded study, six healthy volunteers received morphine (0.07 mg/kg) or placebo on different days to evaluate the effect of morphine on dyspnea and ventilatory drive. Volunteers were opiate naïve. Morphine treatment significantly reduced breathing discomfort by 65% at the same partial pressure of end-tidal carbon dioxide ($PETCO_2$) that induced dyspnea without drug. Breathing Discomfort Visual Analog Scale ($P < 0.001$) was substantially less at any given $PETCO_2$. Ventilation was also reduced by 29% after morphine treatment ($P < 0.001$) at the same $PETCO_2$. The decrease in ventilation did not correlate with the reduction in dyspnea.

Interpretation

Opioids reduce breathing discomfort, but a previous study failed to show an effect of opioids on a dyspneic challenge that evoked a sense of increased breathing efforts. The current study demonstrates that morphine markedly reduces the sensation of dyspnea corresponding to air hunger. These results are important because they support the clinical relevance of laboratory models for dyspnea and subsequent therapeutic goals (air hunger), and provide confidence in the use of morphine to relieve dyspnea.

Enteral omega 3-fatty acid, γ -linolenic acid, and antioxidant supplementation in acute lung injury (OMEGA study). *JAMA* 2011; 306:1574–81

Previous studies have suggested that administration of n-3 fatty acids, n-6 γ -linolenic acid (GLA), and antioxidants may improve outcomes in patients with acute lung injury (ALI). This randomized, double-blind, placebo-controlled, multi-center trial evaluated if twice-daily dietary supplementation with docosahexaenoic acid, eicosapentaenoic acid, GLA, and antioxidants would increase ventilator-free days compared with an isocaloric control diet in patients ($n = 272$) with ALI. The study was terminated early due to futility. Patients

in the treatment group had outcomes similar to those of control patients (fig. 3). Adjusted 60-day hospital mortality was 25.1% and 17.6% in the treated and control groups, respectively ($P = 0.11$).

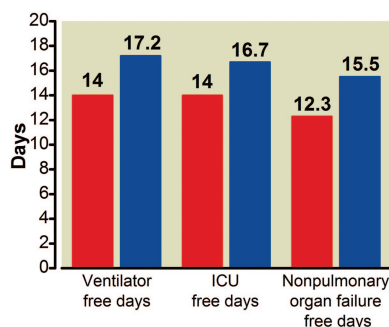


Fig. 3. Twice-daily administration of n-3 fatty acids, n-6 γ -linolenic acid and antioxidants did not significantly improve outcomes in patients with acute lung injury. Treatment group: n-3 supplements (red bar). Control group (blue bar). ICU = intensive care unit.

Interpretation

The results of this randomized controlled study indicate that omega-3 acid enteral supplementation twice daily was neither effective in reducing the number of ventilator-free days (primary endpoint) nor safe. Its use is not recommended in critically ill patients with ALI.

Predictors of successful extracorporeal membrane oxygenation (ECMO) after assistance for refractory cardiogenic shock. *Intensive Care Med* 2011; 37:1738–45

Temporary extracorporeal membrane oxygenation (ECMO) may be a useful rescue procedure for patients with cardiogenic shock of multiple etiologies. However, few studies have demonstrated proper ECMO weaning strategies. The current study evaluated ECMO flow reductions to less than 1.5 l/min under clinical and Doppler echocardiography monitoring in hemodynamically stable patients ($n = 51$) after support for refractory cardiogenic shock. Of 38 patients who tolerated at least one full ECMO weaning trial, 20 were ultimately weaned. Patients who were successfully weaned had higher arterial systolic and pulse pressures, aortic time-velocity integrals (≥ 10 cm), left ventricular ejection fractions (less than 20–25%), and lateral mitral annulus peak systolic velocity (≥ 6 c/s) compared with those who tolerated the trial but could not be weaned.

Interpretation

This prospective cohort study indicates that a protocol based on monitoring by echo-Doppler for weaning patients from ECMO after cardiogenic shock is feasible. The study emphasizes the potential utility of Doppler-echocardiography in predicting successful weaning from ECMO support.

Premorbid statin use is associated with improved survival and functional outcomes in older head-injured individuals. *J Trauma* 2011; 71:815–9

A new database, the National Study on Costs and Outcomes of Trauma now allows for the investigation of the effect of preinjury medication and comorbidity on traumatic injury. This retrospective study analyzed data from 69 hospitals to assess the effect of preinjury statin use on in-hospital mortality and functional outcomes in older patients (older than 65 yr) with Abbreviated Injury Scores ≥ 3 . Statin use was associated with a 76% lower adjusted risk of in-hospital death, and had a 13% higher likelihood of good recovery at 12 months (fig. 4). Sex, β -blocker use, and trauma center treatment were not associated with mortality risk. Cardiovascular comorbidity was a significant predictor of mortality, and negated the benefit of preinjury statin use.

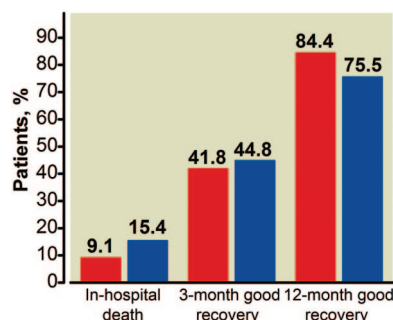


Fig. 4. Preinjury statin use was associated with reduced in-hospital mortality and improved 12-month recovery. Statin users (red bar). Statin nonusers (blue bar).

Interpretation

Statins exhibit protective properties in patients at high risk of cardiovascular mortality. This study indicates that statin use may also exert brain protective properties in patients older than 65 yr after severe head trauma. The observation that this beneficial effect was suppressed by previous cardiovascular comorbidities warrants further investigation.

Pain Medicine

Timothy J. Brennan, Ph.D., M.D., Editor

Effect of caudal epidural steroid or saline injection in chronic lumbar radiculopathy: multicenter, blinded, randomized controlled trial. *BMJ* 2011; 343:d5278

Epidural steroid injections for low back pain. *BMJ* 2011; 343:d5310

Pronounced symptoms remain after 1 yr for approximately one-third of patients with lumbar radiculopathy. A multi-

center, blinded, randomized controlled trial was conducted to assess the efficacy of caudal epidural steroid injections for patients with chronic lumbar radiculopathy. Patients in three groups received two injections 2 weeks apart as follows: subcutaneous sham injections of 2 ml 0.9% saline ($n = 40$), caudal epidural injections of 30 ml 0.9% saline ($n = 39$), and caudal epidural injections of 40 mg triamcinolone acetonide in 29 ml 0.9% saline ($n = 37$). This study did not detect a clinically significant improvement in Oswestry Disability Index between groups (fig. 5).

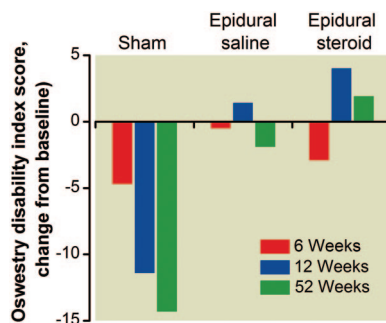


Fig. 5. Significant improvements in Oswestry Disability Index were not observed in any treatment group at any time point.

Interpretation

Caudal epidural steroids are not recommended for patients with lumbar radiculopathy greater than 12 weeks in duration. The accompanying editorial notes the limitations of the study, particularly the caudal route of administration, the duration of symptoms, and unsure nature of the distribution of the injectate.

Tumor necrosis factor- α levels correlate with postoperative pain severity in lumbar disc hernia patients: Opposite clinical effects between tumor necrosis factor receptor 1 and 2. Pain 2011; 152:2645–52

Low back pain is often a result of lumbar disc herniation. This small study compared postoperative pain and inflammatory markers in tissue from 10 patients who underwent

surgery for lumbar disc herniation to markers in 5 patients who underwent surgery for idiopathic scoliosis without a history of pain. Tumor necrosis factor (TNF)- α levels were detected in the annulus fibrosus, ligamentum flavum, and nucleus pulposus of lumbar disc herniation patients only. In nucleus pulposus, TNF- α protein, and TNF receptor 1 protein levels correlated with visual analog scale scores at 6- and 12-month follow-up. TNF receptor 2 protein levels negatively correlated with visual analog scale scores. However, preoperative pain was not related to TNF- α levels.

Interpretation

Surprisingly, the preoperative pain before discectomy was not related to TNF- α levels. Acute postoperative pain was increased in the presence of greater levels of TNF- α in the resected disc. TNF receptor 1 and 2 and their relation to the shift from acute to persistent pain warrant further study. TNF- α levels and prediction of persistent low back pain also require further examination.

Ultrasound-guided lumbar transforaminal injections: Feasibility and validation study. Spine 2011; doi: 10.1097/BRS.0b013e3182340096

Permanent neurologic damage has been reported after lumbar transforaminal injections to treat radicular pain. The authors tested the procedural accuracy of ultrasound-guided lumbar transforaminal injections *via* 50 planned injections into 5 unembalmed cadavers. Fluoroscopy confirmed correct placement for all injections. Based on contrast spread patterns, 91.3% of spread was intraforaminal and 8.7% was extraforaminal (at the nerve root). Intravascular injection occurred in three cases when intraforaminal patterns were detected.

Interpretation

There is increasing interest in the use of ultrasound in chronic pain management. Transforaminal epidural steroid injections should not be attempted using ultrasound guidance alone. Perhaps ultrasound guidance combined with fluoroscopy-confirmed transforaminal placement may be a consideration. Additional work to improve ultrasound imaging for pain management is proceeding.