Open repair with bad lungs? Don't hold your breath!

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Although there have been important and significant improvements in operative strategies and postoperative results for open thoracoabdominal aortic aneurysm repair,^{1,2} problems undeniably remain, and thus, some still question the value of this therapy. In contemporary practice, however, despite emerging experimental endovascular therapy for thoracoabdominal aortic aneurysms and its potential for widespread adoption after the successful completion of related clinical trials, open repair remains the criterion standard.

Among the problems open surgical repair presents is that of patients with markedly reduced pulmonary function stemming from chronic obstructive coronary disease, emphysema, and other pulmonary conditions, or secondary to tobacco and age.^{3,4} Girardi and colleagues⁵ address this problem in this issue of *The Journal of Thoracic and Cardiovascular Surgery* by reviewing their experience of 711 patients undergoing open descending thoracic or thoracoabdominal aortic aneurysm repair. Notably, this is a large series from a very experienced and well-developed aortic program; their overall mortality was excellent at 5.6% (40/711), and major complications occurred in only 75 patients (10.5%). Unadjusted mortality, as expected, was higher for those patients undergoing hypothermic circulatory arrest (14.8%) during repair as well as for those with extent II aneurysms (13.3%). On logistic regression analysis, patients with a preoperative forced expiratory volume in 1 second (FEV₁) of 50% or less were associated with a 6.99-fold increase in their risk of developing major adverse events, which led to a propensity score analysis of 149 pairs of patients with FEV₁ 50% and below compared with those above 50%. After propensity score matching, Girardi and colleagues⁵ found that operative mortality was nearly twice for those with an FEV₁ of 50% or less than for those with an FEV₁ value greater than 50% (11.4% vs 6.0%, respectively). In addition, for those with reduced preoperative lung function the incidence of major complications was 33.1%, versus 19.5% in those with FEV₁ greater than 50%. In both matched groups the need for tracheostomy was a common major adverse event,

Illustration of extensive open thoracoabdominal aortic aneurysm repair with dissection.

Central Message

The risk of open distal aortic repair is increased in patients with poor preoperative lung function (FEV₁ ≤50%). Alternate strategies, including TEVAR, are necessary in compromised patients.

See Article page S22.

with an incidence of 16.1% among those with poor lung function (FEV₁ ≤50%).

That patients with poor lung function routinely undergo complex open aortic repair is underscored by the fact that in the overall group of 711 patients, more than 40% had chronic pulmonary disease and more than 20% of patients had spirometry testing with an FEV₁ of 50% or less. This certainly justifies the evaluation of additional risk related to open surgery in the current era, because many patients have significant lung pathology. Because significant strides have been made in reducing early mortality, spinal cord ischemic problems, and postoperative renal failure, it is indeed logical to address improving pulmonary function. Girardi and colleagues⁵ clearly point out that in patients requiring total cardiopulmonary bypass with hypothermic circulatory arrest, there is an increased risk of postoperative pulmonary failure as a consequence of not only potentiation of the inflammatory effects of ischemia and bypass but also of the deleterious mechanical impact of retracting the left lung in a fully heparinized patient, which is typically necessitated in open descending thoracic and thoracoabdominal aortic repair.

In contemporary repair, most straightforward descending thoracic aortic aneurysms and some cases of thoracoabdominal aortic aneurysms (with and without aortic dissection) are now managed with endovascular aortic repair,^{6,7} which intrinsically provides less risk from a pulmonary standpoint by obviating both the need to provide cardiopulmonary bypass and the need to retract the left

lung. For patients with descending thoracic aneurysm and reduced lung function—even those who are considered at low risk in all other aspects—endovascular therapy should be the primary consideration unless contraindicated by coexisting connective tissue disorders. In time (and with widespread availability of branched and fenestrated endovascular thoracoabdominal aortic devices), we will have a better understanding of patients with thoracoabdominal aortic aneurysms who may benefit from endovascular repair rather than traditional open repair. All programs pursuing open therapy should regularly review their preoperative evaluation, operative technique, and postoperative care to develop strategies to reduce the morbidity of patients with compromised lung function ($FEV_1 \leq 50\%$). With a population that is increasing in age and all the comorbidities that go along with such aging, particularly lung function, the results of these patients speak to the need to develop alternate aortic repair paradigms in patients with poor lung function, including establishing safe and durable total endovascular therapy.

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