Reply to the Editor:

There is no doubt that psychosocial issues and social support systems are appropriate considerations when evaluating potential transplant recipients. Considering social worth, on the other hand, is not justifiable. I have read that the California prisoner in the news stories died within a year after his transplant, in part due to noncompliance. That would not surprise Dr Richenbacher, of course, in light of his comments.

But I wonder if we can make a blanket assumption that no prisoner can be compliant or that every prisoner cannot be adequately available for postoperative follow-up visits. Would not individual consideration be warranted? Nelson Mandela may not be unique as a prisoner who could be seriously considered for listing. The status of prisoner, per se, should not preclude consideration for transplantation, in my view.

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Reply to the Editor:

I thank Dr Richenbacher for his thoughtful letter. In an earlier, more naïve version of my life, I served as the surgeon at Minnesota's maximum-security prison, a rotation for University residents during the tenure of the imaginative Owen Wangenstein. I had a very positive experience with the staff I worked with in the OR; they had learned to be nurse anesthetists and radiologic or surgical technicians while serving life sentences for crimes of passion against unfaithful spouses or their consorts. I asked their advice about whether prisoners should be considered as possible altruistic kidney donors. Then, as a resident member of the transplant advisory committee, I advocated allowing prisoners to donate kidneys as good Samaritans. It worked beautifully, until one day a paroled donor blackmailed the recipient, threatening to take his kidney back! I still advocate individual rather than categorical judgments, so I support the view that we shouldn't accept or exclude all prisoners from the complex social and

medical transaction of organ transplantation. However, the outcome of the California prisoner transplant described in Dr Sade's response and my youthful Minnesota experience argue for cautious conservatism.

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Indications for pulmonary endarterectomy**To the Editor:**

The recent article by Thistlethwaite and colleagues¹ could confuse nonsurgeons caring for patients with chronic thromboembolic pulmonary hypertension,² especially if they become optimistic about pulmonary endarterectomy after reading many articles on the pioneering work from the San Diego group.

Thistlethwaite and colleagues state that the selection criteria for endarterectomy included New York Heart Association (NYHA) classes III and IV. Nevertheless, according to Table 1, 71 of 202 patients (35.1%) were in NYHA class I or II! This deserves explanation. I would never subject asymptomatic or very lightly symptomatic patients to this type of surgery, which carries considerable morbidity and mortality. The same holds true for patients with pulmonary vascular resistance below 4 Wood units (320 dyn · s · cm⁻⁵).

In the 76 patients from group 1, the surgeon found fresh (acute) thrombus in the main lobar pulmonary arteries. In most instances, fresh thrombus undergoes spontaneous lysis in anticoagulated patients; if needed this resolution can be accelerated by therapeutic thrombolysis. Simple embolectomy, if ever, would be the appropriate surgical intervention instead of endarterectomy. Did these patients have *chronic* thromboembolic pulmonary hypertension at all? Were all of them treated with anticoagulants for at least 3 months? In patients adequately anticoagulated for 3 months, the presence of fresh thrombus in their pulmonary arteries must be an abso-

lute rarity.³ The low operative mortality in this group does not alone entitle the surgeon to operate; most probably the long-term prognosis of these patients would be just as good or better without surgery and with anticoagulation alone.²

On the other extreme of the patient spectrum, there are 7 patients (group 4) with microscopic distal arterial vasculopathy but without apparent thromboembolism. In my opinion, this could be easily identified by pulmonary angiography and scintigraphy, and these patients should not be subjected to endarterectomy.³ Why were they operated on? The same probably applies to patients with disease limited to segmental arteries (group 3); even if endarterectomy can be achieved in these vessels (each segment making up only about 5% of the cross-sectional area of the pulmonary vascular bed), many segmental arteries must be operated on to get a clinically relevant result, making the operation very demanding and risky.

Table 4 on perioperative mortality does not correspond to the 1-month survival data in Table 3. Probably morbidity instead of mortality is described in Table 4; nevertheless, the table makes clear that there are frequent and considerable complications of the procedure, which underlies the necessity to restrict endarterectomy only to patients who really need it and who might benefit from it.

Benevolent indications for surgery result in great numbers of operated-on patients, often with statistically good results (probably due in part to operations on less sick patients) but with the dangers of unnecessary morbidity and mortality just in those less sick individuals. We cardiologists know this all too well from coronary angioplasties and stent implantations. Benevolent indications tend to discredit the procedure so that it will not be offered to patients who might really benefit from it. Unless well-documented prospective studies persuade me otherwise, I will continue to restrict the indication to pulmonary endarterectomy to severely limited patients (NYHA class III or IV) without evidence of improvement after 6 months of adequate anticoagulation, who have a resting pulmonary vascular resistance of more than 4 Wood units, resting mean pulmonary artery pressure greater than 30 mm Hg, and bilateral central (lobar and proximal) surgically

accessible obstructions of more than 50% of the pulmonary vascular bed.³

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References

1. Thistlethwaite PA, Mo M, Madani MM, Deutsch R, Blanchard D, Kapelanski DP, Jamieson SW. Operative classification of thromboembolic disease determines outcome after pulmonary endarterectomy. *J Thorac Cardiovasc Surg*. 2002;124:1203-11.
2. Riedel M, Stanek V, Widimsky J, Prerovsky I. Longterm follow-up of patients with pulmonary thromboembolism. Late prognosis and evolution of hemodynamic and respiratory data. *Chest*. 1982;81:151-8.
3. Riedel M. Pulmonary embolic disease. In: Gibson GJ, Geddes DM, Costabel U, Sterk PJ, Corrin B, editors. *Respiratory Medicine*. 3rd Ed. London: Saunders; 2003. p. 1711-58.
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Reply to the Editor:

We appreciate the attention that Dr Riedel has paid to our article. He brings up several points that deserve clarification.

First, selection criteria for pulmonary endarterectomy are multiple, and determination of candidacy for pulmonary endarterectomy is based on a composite of factors. Our selection criteria for surgery include but are not limited to just New York Heart Association (NYHA) class III and IV patients. We offer pulmonary endarterectomy to patients with NYHA class I and II disease, although only 1 in our series was in NYHA class I. The long-term survival of patients with untreated chronic thromboembolic pulmonary hypertension, irrespective of symptoms, is poor.¹ In our hands, the mortality associated with pulmonary endarterectomy (4.5%) is much less than the published mortality associated with untreated thromboembolic pulmonary hypertension (32.6% in 1 series with an average follow-up of 18.7 months²). In our experience, pulmonary endarterectomy is not only associated with im-

proved long-term survival but also a better quality of life for patients who previously suffered from this disease.³ Furthermore, we have become increasingly aware that the remaining open pulmonary vascular bed after thromboembolic occlusion can become irreparably damaged by prolonged exposure to the flow and pressure changes occasioned by vascular occlusion in other areas.⁴ For these reasons, we believe that pulmonary endarterectomy should be offered to all patients with thromboembolic pulmonary hypertension, including those with less clinical symptomatology.

Second, patients in group 1 of our study were comprised of individuals with chronic pulmonary hypertension who had fibrotic thromboembolic obstruction of their main and/or lobar pulmonary arteries as well as fresh clot that occurred either as a result of recurrent pulmonary emboli or as a secondary consequence of this obstructive process (see Figure 1). No amount of anticoagulation or thrombolytic therapy would have altered the distal fibrotic obstruction that was responsible for the patients' pulmonary hypertension. Incidentally, proximal clot propagation occurs even in the setting of therapeutic anticoagulation, as more than 80% of the group 1 patients referred to us for operation had been on coumadin for a period of longer than 3 months. We do not treat patients with acute pulmonary embolism with pulmonary endarterectomy; this is a different disease.

Third, although we have performed more than 1600 pulmonary endarterectomies in the last 10 years at the University of California, San Diego, we still do not have a completely foolproof method of determining location of pulmonary vascular obstructive disease in all patients. We have found that pulmonary angiography is the imaging modality that provides the best preoperative assessment of thromboembolic obstruction. However, using a combination of assessments, including angiography, angioscopy, ventilation-perfusion scanning, spiral computed tomography (CT) scanning, and 3-dimensional CT angiography, there are still a few patients in whom disease location is not diagnosed with certainty prior to surgery. It is precisely this small group of patients (with distal small vessel

disease, or "primary" pulmonary hypertension, type 4) that represent our treatment failures and in retrospect would not have been operated on. These patients, incidentally, had failed other therapeutic measures to reduce their pulmonary pressures.

Fourth, Table 3 in our paper addresses 1-month survival data, while Table 4 lists complications we have seen in the perioperative period after this operation. We report complications we have seen with this operation, and they represent a rate similar to (or even less than) the complication rates seen for other major cardiovascular operations. Rather than operating upon lower risk patients, in recent years we have expanded the eligible patient population for pulmonary endarterectomy to include older, sicker individuals, often with other concomitant heart disease. In any event, postoperative complications per se are not a reason to exclude patients from a lifesaving operation; rather, they represent an accurate depiction of our clinical experience with the surgical treatment of chronic thromboembolic disease over a wide spectrum of patient age groups and disease severity.

Finally, although comparisons between medically managed chronic thromboembolic disease and pulmonary endarterectomy have not been systematically made in prospective randomized trials, we believe that such trials would essentially be unethical, given the disparity in published survival statistics. The cumulative data from our institution leave no doubt that pulmonary endarterectomy is the superior treatment choice for management of pulmonary hypertension caused by chronic thromboembolic disease to the lungs.

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References

1. Van Beek EJ, Kuijter PM, Buller HR, Brandjes DP, Bossuyt PM, ten Cate JW. The clinical course of patients with suspected pulmonary embolism. *Arch Intern Med*. 1997; 157:2593-8.