

References

- Colombo J. Predictors of outcomes after pediatric cardiac surgery: a proposal to improve the vasoactive-ventilation-renal score (letter). *Ann Thorac Surg* 2016;102:1413.
- Miletic KG, Delius RE, Walters HL III, Mastropietro CW. Prospective validation of a novel vasoactive-ventilation-renal score as a predictor of outcomes after pediatric cardiac surgery. *Ann Thorac Surg* 2016;101:1558–63.
- Flori HR, Glidden DV, Rutherford GW, Matthay MA. Pediatric acute lung injury: prospective evaluation of risk factors associated with mortality. *Am J Respir Crit Care Med* 2005;171:995–1001.
- Hazle MA, Gajarski RJ, Yu S, Donohue J, Blatt NB. Fluid overload in infants following congenital heart surgery. *Pediatr Crit Care Med* 2013;14:44–9.

Preoperative Three-Dimensional Valve Analysis to Predict Recurrent Ischemic Mitral Regurgitation After Mitral Annuloplasty

To the Editor:



Bouma and colleagues [1] present interesting data to try and predict mitral valve repair failure. Their work raises several important issues that need to be resolved before the introduction of complex three-dimensional echocardiographic analysis.

A recent randomized trial has identified poor outcomes in patients undergoing mitral repair for severe ischemic regurgitation [2], potentially indicating that complex preoperative assessment is not necessary, just transthoracic echocardiography. Previous work has identified replacement as preferable to repair in patients with poor left ventricular function [3]. In the series by Bouma and colleagues, 54% of patients in the failure group had basal aneurysm/dyskinesis, compared with 3% of patients in the nonfailure group, confirming this finding. This implies that transthoracic preoperative echocardiography could be used to predict repair failure. With a total of 50 patients in the study, a multivariate analysis is underpowered [4]. In addition, no receiver operating curve value was quoted for the multivariate analysis, just one for the univariate analysis.

The rate of atrial fibrillation was significantly higher in the repair group, regardless of outcome, indicating that the duration of mitral regurgitation was probably chronic. Acute and chronic mitral regurgitation are different clinical entities. Additional variables not included in the work by Bouma and colleagues, such as regurgitant volume, regurgitant velocity, systolic blood pressure, heart rate, regurgitant orifice area, and cardiac output are important variables in evaluating the severity of mitral regurgitation [5]. Unfortunately, the analysis by Bouma and colleagues fails to identify what should be done in patients with moderate ischemic regurgitation undergoing concomitant coronary artery bypass operations.

We recommend evidence-based practice, which has identified that failure occurs more frequently after repair for severe ischemic mitral regurgitation, resulting in more adverse events related to heart failure and in cardiovascular admissions.

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References

- Bouma W, Lai EK, Levack MM, et al. Preoperative three-dimensional valve analysis predicts recurrent ischemic mitral regurgitation after mitral annuloplasty. *Ann Thorac Surg* 2016;101:567–75.
- Goldstein D, Moskowitz AJ, Gelijns AC, et al. Two-year outcomes of surgical treatment of severe ischemic mitral regurgitation. *N Engl J Med* 2016;374:344–53.
- Lorusso R, Gelsomino S, Vizzardi E, et al. Mitral valve repair or replacement for ischemic mitral regurgitation? The Italian Study on the Treatment of Ischemic Mitral Regurgitation (ISTIMIR). *J Thorac Cardiovasc Surg* 2013;145:128–39.
- Poullis M. eComment. Impact of clopidogrel on bleeding complications and survival in off-pump coronary artery bypass grafting. *Interact Cardiovasc Thorac Surg* 2012;14:277–8.
- Pullan M, Chalmers J, Poullis M. A bioenergetic assessment of mitral regurgitation: a new tool to assess severity? *Med Hypotheses* 2013;81:1100–3.

Reply

To the Editor:



We appreciate Dr Poullis's [1] interest in and careful reading of our article [2].

Our study was primarily a three-dimensional geometric study of the mitral valve leaflets. We also discovered that the functional (two-dimensional) parameter of basal aneurysm/dyskinesis has a predictive value, but it was not included in the multivariate model because our analysis was focused on leaflet tethering. We are currently working on a new analysis, which does incorporate this functional parameter.

With 50 patients, our study was relatively small, which can be considered a limitation. To reduce the chance of overfitting the models in our study, we fit "reduced" models that included only variables whose univariate tests of associations with outcome, based on χ^2 or t tests, were less than 0.10 for the outcome of ischemic mitral regurgitation (IMR) recurrence after 6 months. Our data set was too small to be partitioned into a "training" set to fit the model and a "validation" set to evaluate generalizability. In our study we did not use cross-validation with a bootstrap approach to assess generalizability, which might be considered a limitation. However, the models in our study are preliminary and represent a "proof-of-concept" finding that must be further validated in additional larger studies, which we are currently conducting. We support Dr Poullis' recommendation for an evidence-based approach. Further refinement and validation of our models is indeed required for the development of evidence-based risk scores.

Dr Poullis is in error; we do show a receiver operating characteristics curve for the multivariate analysis in Figure 5.

Dr Poullis emphasizes that acute and chronic mitral regurgitation (MR) are different entities. We agree; our study was of patients with chronic IMR. A higher incidence of atrial fibrillation in these groups with chronic IMR (compared with normal patients) is to be expected. The baseline characteristics show that the presence of AF is similar across recurrent IMR and non-recurrent IMR groups.

Dr Poullis proposes the use of additional functional variables in the multivariate analysis. We would like to emphasize again that our study was a geometric study. Adding functional parameters to our geometric models will be the subject of future studies. Interestingly, some of the functional