

Title: EVALUATION OF MITRAL VALVE OPERATIONS USING INTRAOPERATIVE 2-D CONTRAST ECHOCARDIOGRAPHY(2DCE)

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Introduction. The intraoperative evaluation of mitral regurgitation (MR) by left atrial V-wave pressure tracing, direct visualization or palpation can be inaccurate and potentially underestimate the degree of regurgitation. Furthermore, by the administration of vasoactive drugs or light anesthesia, the anesthesiologist can modify arterial impedance and thus alter the forward and regurgitant flows. The surgeon's decision to choose between a repair procedure, such as commissurotomy or annuloplasty, versus valve replacement can be influenced by the intraoperative findings of residual MR. A more accurate technique to diagnose intraoperative mitral regurgitation is therefore desirable. Two dimensional contrast echocardiography (2DCE) images spontaneous "microbubble contrast" generated by rapid infusions of fluid (usually via a peripheral vein) as they enter cardiac chambers. We have utilized 2DCE to evaluate the results of mitral valve operations in an effort to assess the presence and degree of mitral regurgitation intraoperatively.

Methods. We studied 29 patients undergoing open heart surgery using 2DCE: 14 patients with predominant Mitral Stenosis (MS), 9 with predominant Mitral Regurgitation (MR), and 6 control patients without any mitral valve lesions (3 with aortic stenosis, 2 with coronary disease and one with a left atrial myxoma). Following sternotomy, pericardiotomy and intracavitary pressure recordings, a sterily prepared 5MHZ transducer (ATL Mark III system) was placed directly on the heart, to obtain a long and short axis view of the heart. During dextrose water injections via a transseptal pressure needle in the left ventricle, mitral regurgitation (MR) could be detected by observing contrast microbubbles entering into the left atrium from the left ventricle. MR was graded on a 0-4 scale, similar to that utilized during cardiac catheterization.

Following the baseline study the operative procedure was undertaken based upon the pre- and intra-operative findings. After the procedure and before decannulation of the heart, a second 2DCE study was performed. Patients with significant mitral regurgitation post-procedure were placed back on cardiopulmonary bypass and the procedure revised. A third 2DCE was performed after the revision was completed. The standard methods for evaluating mitral regurgitation: LA pressure curves, visualization of the repair and palpation were also utilized and compared to 2DCE.

Before the patients were discharged a pulsed echo-Doppler study was performed and compared to the final intraoperative 2DCE results.

Results. All baseline 2DCE correlated well with preoperative cardiac catheterization. No control patients (6) had any 2DCE evidence of MR in any of the studies. Sixteen (16) of 23 mitral valve patients had mitral regurgitation (MR) preoperatively; nine (9) with predominant mitral regurgitation (MR) and 7 of the 14 with predominant mitral stenosis (MS). Twenty-three (23) mitral operations were performed: 15 valve replacements, 5 commissurotomies, 3 annuloplasties.

Following commissurotomy, 4 of 5 patients had mitral regurgitation; 2 had 2+ and two had 1+. A second procedure was performed in the two with 2+, resulting in no residual mitral regurgitation. Of the three patients undergoing annuloplasty, two had residual MR and both underwent a second repair. Of the 4 patients with 2D contrast echo mitral regurgitation, none demonstrated significant mitral regurgitation by LA tracing, palpation or intraoperative visualization.

Only two of the 15 valve replacements demonstrated MR by 2DCE. Both were secondary to technical problems: in one patient, the transseptal needle was placed within the cage of a Starr-Edwards valve, and in the second it was due to the slow inertia of a 4M Starr-Edwards valve producing "smoke ring" mitral regurgitation.

Of the 3 patients with 1+ MR post repair, 2 returned within six months for valve replacement. During initial surgery in both patients, the MR was deemed to be clinically insignificant although the 2DCE clearly demonstrated its presence.

Discussion. Two Dimensional Contrast Echocardiography can accurately detect varying degrees of mitral regurgitation following mitral valve operations allowing immediate reconstruction when necessary. 2DCE enables a more aggressive surgical approach towards an initial mitral repair procedure rather than valve replacement since failure of the repair can be detected and corrected intraoperatively.

The 2DCE appears to be more sensitive than presently available methods to detect intraoperative MR. It also eliminates the morbidity associated with an inadequate procedure requiring early reoperation. Moreover, the procedure is safe, rapid and reproducible. The addition of intraoperative 2DCE can greatly enhance the surgeon's ability to be more aggressive in the approach to mitral valve repair operations in an attempt to salvage the native valve.

Reference.

1. Kaplan, JA (Ed.) Cardiac Anesthesia, New York, Grune and Stratton. p. 213-220.