EDITORIALS

Mortality in Transfemoral Coronary Arteriography

Is there an acceptable mortality in coronary arteriography? In a recent editorial, Judkins and Gander stated: "It is the little things that count." Nowhere is this of more importance than in the performance of coronary arteriography. The article in this issue of Chest by Page and Campbell (see page 221) is an excellent example of how attention to the little things can improve catheterization technique.

Adams, Frazier and Abrams have reported that mortality and morbidity during coronary arteriography is related to the number of procedures performed per year. If one compares year-by-year mortality rates in the article by Page and Campbell, there is a striking similarity with the percentages reported by Adams and associates. Thus, in their first year, Page and Campbell had one death in 45 procedures which resulted in a mortality rate of 2.22 percent. In those institutions reporting less than 50 procedures in two years, the mortality rate by the femoral route was 2.37 percent. However, in 1970, when Page and Campbell performed 357 procedures, the mortality rate fell to .28 percent, which is similar to that of the study by Adams and co-workers which showed that institutions performing over 550 cases in two years had mortality rates from .00 percent to .37 percent. By careful attention to the many small events concerned with transfemoral coronary arteriography, Page and Campbell have experienced only one death and one myocardial infarction in their last 1700 procedures.

However, it is not necessary to perform such a great number of procedures to insure a low mortality rate. Further analysis of the report by Adams and associates shows that institutions performing 350 to 359 procedures in two years had a mortality rate of .33 percent, which was not significantly different from one institution performing over 1000 procedures in two years, three institutions performing over 500 and one institution performing over 550 in two years. Obviously, the fact that a particular institution performs 1000 procedures in two years does not guarantee the patient a safer study than with an institution doing 350 in two years. Clearly, attention to detail, individual concern, and skill of the operator are of utmost importance.

Perhaps the most important little thing described by Page and Campbell is the presence of back bleeding during exchange of catheters. This is an absolute necessity and if one does not obtain vigorous, spontaneous back bleeding, the catheter must be removed. In addition, they emphasize that after observation of back bleeding, the catheter should be vigorously aspirated and then flushed, all of this being performed with the tip of the catheter below the arch of the aorta. In addition, contrast material should be injected prior to advancing the catheter over the arch. Heparinization also is helpful in reducing thrombotic complications. One cannot over-emphasize the importance of being gentle in manipulating catheters in the coronary arteries. Also, small injections are important in visualizing the right coronary artery, where excellent visualization may be attained with but 2 to 3 ml of contrast. Small injections in the right coronary artery clearly reduce the risk of arrhythmias.

As pointed out by Judkins and Gander, having submitted the patient to the risk of introduction of catheters and their manipulations, one must have good imaging and proper panning to define not only the major vessel being injected, but collaterals. The importance of multiple views cannot be over-emphasized, in that a single-view of the left coronary artery may miss critical lesions.

It has been suggested that physiologic studies should not be combined with arteriographic studies. However, in this observer's opinion, it is unjustified to submit the patient to the risk of two catheterizations when the necessary information can be obtained within a few minutes through the same catheters. Thus, the left ventricular angiogram provides significant ventricular function data. This angiogram should be done in such a manner that one can analyze segmental wall motion and calculate the ejection fraction. In this regard, biplane imaging is...
important, in that a single RAO view neglects the very important posterolateral wall and the anteroseptal wall, which frequently are major sustaining walls. It has been shown that the systolic ejection fraction, calculated from the RAO projection, is frequently falsely low, because walls visualized in that view, ie anterolateral, apical, posterior-medial and inferior, are frequently damaged, whereas the posterolateral wall, seen on the LAO view, is frequently preserved.4,5 The posterolateral wall might well be called "the forgotten wall," in that it is usually not assessed, but obviously is of utmost importance.

If the systolic ejection fraction is to be used as an indicator of risk in bypass surgery, it should be calculated from biplane studies. However, it is important to realize, as Gault4 has pointed out, that the systolic ejection fraction is dependent upon heart rate, inotropic state and afterload. It has been suggested that two single plane shots would suffice for a biplane study, but if a second, single plane LAO study is done, the volumes and ejection fraction will be altered due to the effect of the contrast media injected in the first study.

Left ventricular pressure and rate of development of pressure may be measured during the study, but must be recorded prior to injection of contrast media, in that contrast media may elevate LVEDP. Also, pressures should be recorded prior to dilators, which may decrease LVEDP. If a catheter has been placed in the pulmonary artery prior to entering the femoral artery, it is a simple matter to obtain routine cardiac output, at rest and during a few minutes of stress, such as with hand grip. Thus, within five to ten minutes one may obtain cardiac output, pressures and derivatives, both at rest and during stress. Surely, this amount of time does not justify a second catheterization. What constitutes a satisfactory physiologic study is open to debate. If one considers it necessary to do extensive pacing and metabolic studies, two separate studies should be considered. However, it is clear that physiologic studies at rest and during stress, followed by biplane LV cineangiography and visualization of the coronary arteries can be performed in 30 to 60 minutes.

In the final analysis, for any cardiovascular center, total risk is the important measure for justification of study and surgery. Thus, Adams, Frazier and Abrams5 have emphasized that the mortality of the diagnostic procedure must be added to the mortality for coronary surgery when defining the risk versus yield of surgical bypass procedures in individual hospitals. Although the mortality may be less than .3 percent for the diagnostic procedure, if the risk of bypass surgery is 10 percent to 12 percent, is this different from the institution that has a 1 percent risk of cardiac catheterization, but a 2 percent risk with surgery? As with coronary arteriography, a wide range of mortality rates for bypass surgery in pre-infarction angina has been reported.

The article by Page and Campbell is an excellent effort to clearly define the small points that are important in helping to reduce the mortality and morbidity from percutaneous coronary arteriography. Every person doing coronary arteriography should read their article. I am certain the observations of our readers would be of interest to the authors and to the Department Editor.

John H. K. Vogel, M.D., F.C.C.P.
Santa Barbara

Reprint requests: Dr. Vogel, 5333 Hollister Avenue, Santa Barbara, California 93105

REFERENCES


Mitral Valve Prolapse-Click Syndrome in Atrial Septal Defect

The association of secundum atrial septal defect and mitral valve prolapse-click syndrome (MVP-CS) has been stressed in several recent reports.6-9 Altogether about 70 cases have been incorporated in these reports including seven of ours.

Analysis of left ventricular cineangiogram by Betriu et al8 in 54 patients with atrial septal defect gave evidence of MVP in 30 (37 percent). This report confirmed the frequency of "silent" MVP which we had reported in 31 percent of our 39 patients (12 of 39) with angiographically proved prolapse.1 On page 230 of this issue, Miller, Salcedo and Bahler report on the association of prolapsed mitral valve, secundum atrial septal defect and Holt-Oram syndrome. This interesting case bridges two common associations: Holt-Oram syndrome and atrial septal defect with MVP and atrial septal defect. No click and no late systolic murmur were