with radionuclide angiography (Circulation 49: 512, 1974).

Its authors make reference to our recent article (Circulation 47: 1049, 1973), among others, as a method to successfully document the presence of left-to-right shunts. We would like to point out, however, that the method that we described not only can document the presence of left-to-right shunts but can also accurately estimate the pulmonary to systemic flow ratio. This method has been successfully applied to more than 300 patients and is being used clinically in our institution.

One question that we have regards the quality of the injection. The authors inject all their patients into an arm vein with a 19 gauge needle. In our experience it has been very difficult and sometimes impossible to inject through a 19 gauge needle in the antecubital vein of infants. In general, we found that about 10–15% of the peripheral injections resulted in a fragmented bolus and that in cases of Valsalva maneuver the bolus was also fragmented. What criteria were used to determine whether or not the injection was appropriate? Data were collected at one second intervals but when one inspects the curves they appear to have more than one inflection per second. Are these analog tracings?

We would also like to ask for more details on the method used to calculate the shunt. How is the peak estimated? In the example given (fig. 1B, fig. 3) it seems that the several points could have represented the peak and that the shunt ratio would have been different for each. Also, how is the exponential decay estimated? The number of points from the original curve used is critical for the determination of the exponential decay, the area under the curve and thus the shunt ratio. We look forward to hearing about the details of this new method for quantifying left-to-right shunts.

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The authors reply:

We were quite delighted that Dr. Treves and Dr. Maltz have asked these questions so that we can clarify our technique and point out an error in the manuscript.

The youngest patient that was included in our series was 22 months of age and fortunately in this age range we have not had a major difficulty in being able to introduce an appropriately sized needle. Then the child is allowed to stabilize after inserting the needle prior to injecting the bolus. If the angiogram demonstrated a descending portion which was well fitted by an exponential the injection was considered a success. Unfortunately, an error in the manuscript which was corrected in the galley proofs appeared again as in the original manuscript. The data were not collected at 1 sec intervals but at 0.1 sec intervals. We appreciated your recognizing this error. The curves that you examined in figure 1 were obtained after carrying out the procedures referenced in the Methods.

As you noted in figure 1B the point which was selected as the peak occurred just prior to the descending portion of the right lung angiogram. The initial wash out slope was then replotted semilogarithmatically and as you can in this figure the exponential curve that was obtained using this technique closely fits this descending portion of the curve prior to the distortion of the angiogram by either recircula-

**Coronary Ostial Stenosis**

To the Editor:

I write to comment on the interesting article by J. E. Yates et al. (Circulation 49: 539, 1974) entitled Coronary ostial stenosis: A complication of aortic valve replacement. I think the title of this article would better read: “Coronary ostial stenosis: A complication of coronary artery perfusion.” The complication that the authors have so nicely documented is related to the insertion and inflation of a semi-rigid tube with balloon catheter in the coronary ostia of patients undergoing aortic valve replacement. I submit that this complication is not a complication of aortic valve replacement per se, but of coronary artery cannulation and perfusion and should be so emphasized. The authors point out that one of their eight patients did not have coronary perfusion and yet developed an ostial lesion. Attempts to insert cannulae in this patient were unsuccessful because of a pre-existent ostial lesion. Slight trauma to an atherosclerotic obstruction may induce edema in the wall of that artery or an intimal injury which may lead to further coronary obstruction.

Clinics1,2 that employ the technique of local cardiac hypothermia for myocardial protection instead of coronary perfusion have not reported this complication following aortic valve replacement.

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**References**


The authors reply:

We appreciate the comments of Doctor Cohn. We agree that the most important factor in the development of this complication is coronary perfusion. This is not exclusively related to balloon catheters and has occurred with silastic cannulas.1 The observation that intimal thickening of the aortic root, with extension into the area of the coronary ostia, occurs in patients with prosthetic heart valves, suggests that this is not always a response to coronary perfusion.2 The coronary ostial narrowing in our patient without perfusion of the right coronary artery was probably of this type. In view of this case we believe that coronary ostial stenosis may...
Quantitating Left-to-Right Shunts: The authors reply:
PAGE A. W. ANDERSON, ROBERT H. JONES and DAVID C. SABISTON

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