

## DISCUSSION

DR. JESSE E. THOMPSON (Dallas): I would like to congratulate Dr. Foster for this excellent and detailed analysis of a well-studied series of patients with renovascular hypertension. This is the sort of data that we have needed.

I shall comment on the technic of renal artery reconstruction, since technics vary depending on the side involved, the nature of the lesion, and its location.

[Slide] For most cases of fibromuscular hyperplasia I have used a saphenous vein patch graft. This has worked quite well without complications over many years.

Some fibromuscular cases and most of the other lesions require bypass. [Slide] We formerly used a Dacron bypass, sutured end-to-side from the aorta and end-to-side into the renal, but in recent years have given up this technic.

[Slide] Our present method of bypass utilizes the saphenous vein most of the time, sutured end-to-side to the aorta, and then end-to-end to the divided distal stump of the renal artery. The renal artery is ligated flush with the aorta, and its distal end is brought up into the wound for anastomosis to the vein bypass. This technic gives excellent exposure for the crucial part of the operation, the anastomosis. We have used 5-0 and 6-0 Ethiflex sutures as a rule. This anastomosis is convenient, simple, expedient, and this technic facilitates the procedure greatly.

[Slide] Here is a right renal artery reconstruction. Everything is out in the breeze, and the anastomosis is very easy.

[Slide] Here is the aortic end of a left renal bypass using a vein. [Slide] Here is the renal artery anastomosis done end-to-end. I recommend this technic to you.

DR. CALVIN B. ERNST (Lexington): Dr. Foster indicates in his manuscript that a cooperative, multidiscipline effort is essential to optimal treatment of renal vascular hypertension. While at the University of Michigan, I had the good fortune to be associated with the renovascular hypertension group, consisting of surgeons, internists, and radiologists. Our experience closely paralleled that of the Vanderbilt group. With discriminating preoperative studies indicating functional as well as hemodynamic significance of a renal artery lesion, cure and improvement rates total greater than 90%. We place great reliance on renal arteriography also. Angiographic demonstration of collateral vessels is strongly indicative of a hemodynamically significant lesion.

It is becoming increasingly evident, however, that even though by current evaluation technic, a renal artery stenosis may be significant, patients respond differently to technically successful revascularization. From 1961 through 1970, 158 patients underwent renal revascularization. Young individuals with fibromuscular dysplasia benefited most. Patients with atherosclerotic lesions fared less well, but in a predictable fashion.

[Slide] We studied the fate of 68 patients undergoing renal revascularization for arteriosclerotic renal artery lesions. Patients with clinically manifest, overt cardiovascular disease, such as previous myocardial infarction, transient ischemic attacks, intermittent claudication, and the like, had an attrition rate of 31% over the follow-up period, which averaged 41 months. Those without clinically overt cardiovascular disease, except focal arteriosclerotic renal artery lesions associated with hypertension, had a 16% attrition rate over the follow-up period, which averaged 55 months. In addition, the postoperative hypertension status for these two groups differed. Those with overt generalized disease had a cure-improvement rate of 53%, while those with only focal renal artery disease had an 87% cure-improvement rate. It would appear that the prognostic implication of the absence or presence of advanced arteriosclerosis provides a basis for predicting the success of renal revascularization for arteriosclerotic renovascular hypertension. Dr. Foster, have you seen such a contrast in your arteriosclerotic patients?

We prefer autogenous saphenous vein, as you do. However, over a period of time changes may occur in the vein graft. A small number may stenose or dilate over the follow-up period.

[Slide] This is an example of progressive aneurysmal dilatation of an autogenous saphenous vein aortorenal graft. Ten days after operation this graft was 7 mm in diameter. Eight months later the graft measured 11 mm, and 18 months after operation it measured 17 mm in diameter. Late evaluation of 100 grafts at the University of Michigan has disclosed six stenoses and six aneurysmal dilatations to date.

Autogenous saphenous vein is an ideal graft material which lends itself to precise anastomoses, even to renal artery branches. This factor extends our ability to save kidneys which in the past may have been needlessly sacrificed. Nevertheless, late vein graft changes give us cause for thoughtful concern. Dr. Foster, have you seen similar changes?

DR. PAUL T. DECAMP (New Orleans): We agree with Dr. Foster and his group on their indications for operation: patients with significant arterial stenosis, significant hypertension, and patients in whom functional changes can be demonstrated, either in the perfusion of the kidney or in the urinary production, and then the isolation of elevated renin from the affected kidney.

This, of course, does not ignore the fact that many times with segmental stenoses, with multiple arterial disease, or when only one kidney is present, we have to rely more heavily on the arteriography than we would on the others.

The arteriosclerotics are a real problem, and some people feel, because the results are not as good, that they should not be treated. I am happy to see that the Nashville group are treating arteriosclerotics. We feel that they should be, although we would agree with the author and with some of the discussants that the selection must be carefully done, because if there is a lot of systemic arteriosclerotic disease, then the operation should be performed with caution.

Over the years we have felt that there are two operative observations which are helpful, and we still feel that way. One is the measurement of pressures proximal and distal to the area of stenosis. Dr. Foster and others have shown that this is not an absolute criterion of this disease, but the evidence from the cooperative study is that the prognosis is much better if a significant pressure differential is demonstrable at the time of operation.

We also feel—and I think this has bearing on the matter of arteriosclerosis—that bilateral renal biopsy is worthwhile. We do not dare not to biopsy a diseased liver, for our gastroenterologists, in patients with biliary disease; and I do not see why we do not biopsy kidneys when we are right there, in patients with hypertensive disease.

I have not seen the final data, but Dr. Perani from the cooperative study has indicated that the presence or absence of significant small vessel disease in the kidney also affects the prognosis, as one would expect.

Our preference for reconstruction is saphenous vein aortorenal bypass. Our longest follow-up has been for 10 years. We have studied most of them several years following operation, and have not yet seen any aneurysmal dilatation. I suppose we will get it.

If the vein is of good size in the lower leg, I think that is a better place to get the vein from than the upper thigh, because it is much thicker, it is more accustomed to a high pressure, and I would suggest that that is the preferable site if the vein is big enough. We made a mistake and used a lower leg segment when it was too small. This resulted in thrombosis.

I must admit, I feel that in any postoperative stenosis that appears—we ought to blame the surgeon rather than the saphenous vein of the patient.

DR. JOHN H. FOSTER (Closing): Dr. Thompson has had a lot of experience with renovascular hypertension. His technic of end-to-end anastomosis is worthy of very serious consideration.

As far as Dr. Ernst's presentation is concerned, I could not agree more about the multidisciplinary group. We have not really evaluated collaterals as fully as they have.

We have not divided our atherosclerotic patients into the categories he mentions. Many of these patients carry a high risk, but if

the hypertension is causing serious problems to the heart, the cerebral circulation, and to the other kidney, these patients have a great deal to gain.

We have had dilatation in two of the vein grafts that we have studied 3 to 6 years following implantation. Only one would we call really aneurysmal; but it is fairly common to see a moderate degree of uniform dilatation throughout the saphenous vein graft. We have studied 68 of these, doing 96 follow-up arteriograms on them.

Dr. DeCamp is one of the pioneers in this field. He was one of the first men in this country to operate on patients with fibromuscular dysplasia disease back in the 1950's.

Finally, I was going to show one more slide. This is an excit-

ing technic that is new—not new with us; we heard about it in San Francisco last June—and it is the technic of removing the kidney, putting it on the Belzer perfusion apparatus, repairing the renal artery lesions in the distal renal artery using magnification and microsurgical technic. We took out this aneurysm, repaired the artery, used saphenous vein to restore arterial continuity, and implanted it in the iliac artery. The renal vein was implanted in the vena cava.

Ten days later we did the same thing on the opposite side.

This is the aortogram 2 months later, showing the bilateral reimplanted kidneys, functioning well in this man who is now normotensive.

### Books Received

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Billig, Donald M., Kreidberg, Marshall B.: *The Management of Neonates and Infants with Congenital Heart Disease*. Grune and Stratton, Inc., New York, 1973, 182 pages, \$12.75.

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