THE AUTHOR’S REPLY

We appreciate Dr. Black’s comments with reference to our article. Since November 1971 our department has done a number of studies similar to those Dr. Black describes (see Staub RT, Meckstroth G: 1972, Proc. Southeastern Chapter, Society of Nuclear Medicine 12th Annual Meeting, Miami, Florida, Nov. 3–6, 1971) and do find them extremely useful although we have not yet detected a lesion of the pancreatic head that was not otherwise obvious over this period of time.

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ARTERIOVENOUS SHUNT MEASUREMENTS


The method is an excellent modification of a much earlier concept of injecting “microspheres two to three times the diameter of capillaries... intra-arterially. The shunted fraction of the dose is carried out of the extremity with the venous blood” and measured. Thus, one can calculate a ratio of blood passing through AV shunts compared with the whole injected amount (“shunt percent”) (1). The way of measurement of microspheres passing through shunts can be made in different ways. Rhodes, et al have measured the radioactivity carried by the microspheres to the lung and trapped there (2,3). Earlier investigators counted the microspheres directly under the microscope (1,4). Which one of the methods is more accurate is yet to be demonstrated. With Kovach and Antal (5) we examined in 1958:

“in 48 dogs the state of the arteriovenous anastomoses of the hind limb... by the agar-agar bead method, under normal conditions, as well as in post-hemorrhagic hypotension and after retransfusion.

It has been found that at a blood pressure level of above 100 mmHg the shunt percent shows only minor variations, its mean value being 5.36%. At pressures between 80 and 100 mmHg 0.9%, under 80 mmHg only 0.02% of the introduced beads were recovered. After retransfusion, some of the anastomoses were opened up and the mean bead recovery rate was 1.6%. The correlation between circulation and resistance, respectively, and shunt percent was less definite.

The experiments indicate that the functional demonstration of arteriovenous anastomoses requires a certain critical arterial pressure below which the shunts do not permit the passage of beads 40 microns in size. Beside the haemodynamical factors, humoral and nervous mechanisms also play a role in the regulation of anastomoses.”

Although my agar beads did not contain radioactive substance, Sherman thought of this approach (6) saying in 1963, “Doby has overcome some of Prinzmetal’s objections (about glass spheres) by making agar spheres which have the same specific gravity as blood. Making agar spheres radioactive may allow studies of the speed and amount of flow through AVAs.” Circumstances did not permit me to do that, although this is why iodine was originally chosen to be incorporated into my microspheres of 1952 (1). Investigators under more favorable circumstances did achieve radioactive tagging (with 32P) of wax microspheres in 1951 (7). These spheres, however, were suitable only for animal experiments. The same approach was used (without radioactive tagging) to quantitate interarterial coronary anastomoses (8) or AV shunts in kidneys (9) in autopsy material.

The recent modifications of the microsphere method makes this type of examination possible in living human beings, and it will bring further important data in this exciting field.

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REFERENCES