Angiography with Epinephrine and Beta Receptor Blocker in Diagnosis of Sigmoid Lesions*

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Various sigmoid lesions, seen on barium enema of 39 patients, were investigated with angiography of the inferior mesenteric artery using three series. The first was performed with contrast medium only, the second after use of epinephrine, and the third after a beta-blocking agent (propranolol) combined with epinephrine. The patients were followed for more than three years. Eleven carcinomas were detected, all diagnosed angiographically. Carcinoma, radiation fibrosis, and diverticulitis with fibrosis may appear similar on pharmacoangiography, but the inflammatory reaction seen, for example in diverticulitis, is different. These findings are important because they can have an influence on the indications and selection of the most suitable operation to be performed. [Key words: Angiography; Beta blocking agent (propranolol); angiography; Carcinoma, sigmoid; Propranolol; Epinephrine; Diverticulitis; Endometriosis; Radiation fibrosis]

The preponderance of the different receptors determines whether constriction or dilatation of the artery by epinephrine will occur. The beta-adrenergic effect of epinephrine can be blocked by so called beta blockers. The constriction effect of the alpha receptors is, however, still maintained and, as a result, there is constriction of normal arteries after epinephrine.

Epinephrine had been used to demonstrate tumor vessels more clearly. In renal carcinoma, normal arteries are constricted by epinephrine whereas neoplastic arteries are not. In intestinal angiography, however, epinephrine has not been extensively used because the arteries to the bowel and pancreas are hardly affected by epinephrine. In carcinoma of the colon the tumor was more clearly demonstrated in about half the cases. In some there was constriction of the arteries to the tumor which Kahn et al. called a "false negative epinephrine test."

The reason epinephrine has so little effect on the arterial supply to the bowel is that these vessels contain the same number of alpha and beta receptors. Thus, its administration results in both beta and alpha stimulation causing vasoconstriction and vasodilatation, respectively. So the net effect is very small. However, it is possible to block beta receptors by drugs such as propranolol. Thus the administration of propranolol followed by epinephrine results in constriction of normal vessels, but not those to neoplastic tissue. This difference has been used to facilitate the diagnosis of neoplastic disease. Arteries to inflammatory lesions in different organs constrict after epinephrine alone: pancreas, bowel, and kidney. As a consequence of these findings, the information seen in Table 1 has been postulated and has been used to differentiate between inflammatory and malignant lesions of the small and large bowel.

Diverticular disease is increasing in frequency in Sweden, as in many other Western Countries. While barium enema will show the presence of diverticula, inflammation therein (i.e. diverticulitis) cannot be thus demonstrated. Physical signs of tenderness and raised temperature, raised leukocyte counts and sedimentation among various conditions causing sigmoid stenosis seen on barium enema, such as carcinomas, diverticulitis, and radiation fibrosis. A diagnostic aid in the differential diagnosis is angiography, especially with vasoactive drugs.

The effect of epinephrine on the arteries is different in various regions of the body. The renal, hepatic, and splenic arteries, for instance, are constricted, whereas the coronary arteries are dilated, and the arteries supplying the bowel and pancreas are hardly, or not at all, affected by epinephrine. To explain these different effects, the terms alpha and beta receptors have been used. Alpha receptors, are believed to be responsible for vasoconstriction and beta receptors for vasodilatation, but so far it has not been possible to demonstrate these receptors histologically.

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Material and Methods

Patients: Patients with colonic symptoms and lesions in the sigmoid colon demonstrated on barium enema were further examined with pharmacoangiography in order to try to differentiate between carcinoma and diverticular disease.

There were 39 patients, 24 women and 15 men. The age distribution was 37–76 years, with a mean of 62 years.

The final diagnoses are shown in Table 2 and were based on clinical examination, laboratory tests, and patho-anatomic examination of the resected specimen. Those who were not operated upon were followed for between three and six years.

Angiographic technique: Selective angiographies of the inferior mesenteric artery after puncture of the femoral artery were performed. In the first series no pharmacodynamic substances were used. A second series was performed with 5 mcg of epinephrine administered about 20 seconds before the injection of contrast medium. Finally, a series was taken with epinephrine and beta blockers combined. Beta receptor blocking was obtained by slowly injecting 5 ml of Inderal® (5 mg propranolol) intravenously 5 minutes before the injection of epinephrine and contrast medium.

For each angiography 8–12 ml of Isopaque coronar® were injected at a rate of 4–5 ml/s in the series without drugs and with epinephrine. In the series with epinephrine and beta blockers combined 6–8 ml contrast medium were injected at a rate of 2–4 ml/s.

Recording of Observations:

Barium enema

The observed lesion of the sigmoid colon was graded according to the amount of diverticula and degree of stenosis. The malignant picture of the stenosis was estimated and classified in degrees of 1 to 3, from slight to prominent and the amount of diverticula was also classified in degrees of 1 to 3.

Pharmacoangiography

The pharmacoangiographic reaction was principally divided into three groups, malignant, inflam-