

struction is a feature, a colostomy is necessary. Whether or not it is permissible to apply this method of treatment to a younger patient, with an operable growth, is a question which we are not in a position to answer at present.

SUMMARY

1. A method of treatment of rectal carcinoma by diathermy fulgurization has been described and the limitations of the method indicated.

2. Fourteen patients who showed no evidence of extension of the growth beyond the rectum have been treated and 13 of these followed for

periods from a few months up to ten years. In 10 the tumour appears to have been controlled by fulgurization alone; in the 3 others it was necessary to combine radiation therapy with fulgurization and the result was then satisfactory. A permanent colostomy was necessary in two patients.

3. There has been no mortality or serious morbidity attributable to the treatment.

REFERENCES

1. STRAUSS, A. A., STRAUSS, S. F., CRAWFORD, R. A. AND STRAUSS, H. A.: *J. A. M. A.*, 104: 1480, 1935.
2. STRAUSS, A. A., STRAUSS, S. F. AND STRAUSS, H. A.: *South. Surgeon*, 5: 346, 1936.

AN EXPERIMENTAL STUDY OF
THE INTIMAL GROUND
SUBSTANCE IN
ATHEROSCLEROSIS*

G. C. WILLIS, M.D., Montreal

WHEN THE EXTENSIVE STUDIES made on the subject of atherosclerosis are reviewed, it is apparent that only the morphologic features form a basis common to all. These morphologic features are first of all a disturbance in the intercellular ground substance of the arterial intima at points of mechanical stress. Stainable lipids are then deposited in this altered ground substance.^{1, 2, 3} Macrophages appear and phagocytose lipid, and capillary sinusoids arising from either the media or the arterial lumen invade the intima and may give rise to intimal hæmorrhage. Finally thrombosis may occlude the artery already narrowed by these processes.

As this earliest morphologic lesion is a disturbance of the intimal ground substance localized by mechanical stress, it seems logical to direct attention to the nature of this stress and then to its effect on ground substance. For this reason I have recently reviewed the physical principles that govern the load upon arteries and correlated them with the sites of atherosclerosis in experimental animals, in the human with vascular anomalies and finally in the common case with atherosclerosis.⁴ I have already made a preliminary report of the experiments devised to selectively injure the ground substance at points where this kind of mechanical stress comes into force.⁵

*From the Departments of Pathology and Medicine of the Montreal General Hospital, Montreal.

THE MECHANICAL FACTORS

From my study of the mechanical principles in atherosclerosis I concluded that the factor of importance is the degree of stretching of the artery.⁶ Burton⁷ has shown that the degree of stretching is related to the following four factors as outlined by Laplace's law: (1) Blood pressure. (2) Surrounding tissue pressure. (3) Radius of artery. (4) Curvature of curved artery. Counteracting this stretching are the structural components of the vessel wall.

EXPERIMENTAL ATHEROSCLEROSIS

The reproduction of atherosclerosis fulfilling the morphologic criteria has centred about increasing either the endogenous or exogenous cholesterol of the experimental animal. In these cholesterol-fed animals the localization of the atherosclerotic lesions may be influenced by the mechanical methods previously described,⁴ or by direct injury to the artery such as freezing⁸ or cauterizing.⁹ These latter methods fail to simulate the circumstances existing physiologically. The same may be said of cholesterol feeding. Although the artery is not interfered with directly, the hypercholesterolemia and the lipid deposits in the reticulo-endothelial system have no counterpart in man¹⁰ except in such conditions as primary xanthomatosis, nephrosis, myxœdema and diabetes.¹⁰

Because the primary changes in atherosclerosis are morphologically of the intimal ground substance at points of mechanical stress, I have chosen experimental scurvy as the ideal means of reproducing these conditions. Wolbach¹¹ demonstrated that scurvy is a disease of the