

definite claims are justified. At the same time there is sufficient evidence to warrant the recommendation that patients with coronary artery disease be assured of an adequate vitamin C intake either by proper diet or by the exhibition of ascorbic acid, an innocuous drug.

ATHEROMATOUS DEGENERATION

The third factor, the rigidity of the supporting stroma, appears to play an important part in preserving the continuity of the walls of intimal capillaries. One of the most striking observations in this series was that intimal hemorrhages had occurred almost without exception into softened plaques. It is assumed that softening, which is a physical character of atheroma, allows the pressure of blood within the capillary to dilate its walls to the extent that rupture eventually occurs. This assumption is borne out by the fact that intimal capillaries are usually of small calibre as they traverse the denser intimal layers, while they are frequently dilated in areas of atheroma. Further, the age incidence of coronary thrombosis and intimal hemorrhage corresponds roughly with that in which atheroma usually develops, i.e., late middle age. Younger persons with characteristically dense and fibrous arteriosclerotic lesions and elderly persons with heavily calcified plaques are not so prone either to intimal hemorrhage or to coronary thrombosis. An interesting example of the protection afforded by calcification was seen in one of my series. In this case, the three main coronary arteries were intensely calcified; they were so hard that it was impossible to cut them with the knife or scissors without causing fragmentation of the walls of the vessels. This condition of calcification was general except for the immediate points of origin of the two main trunks and a distally placed small segment of the right coronary artery. In the latter area the wall of the vessel could be incised cleanly and with ease, and there the intimal hemorrhage and thrombus were found.

The calcification of atherosclerotic plaques appears to be but another manifestation of the general principle that any area of devitalized tissue will become infiltrated with lime salts.¹⁹ The calcification of sclerotic arteries is therefore a protective phenomenon, strengthening weakened areas, and preventing gross rupture of the arterial walls and also the rupture of intimal capillaries. Theoretically, an adequate

calcium intake would appear to be indicated in all patients with coronary sclerosis. One is tempted to go farther and recommend a more rapid laying down of calcium by the exhibition of large doses of irradiated ergosterol (vitamin D). However, this procedure has no experimental backing and cannot be advised in the state of our present knowledge. Harrison²⁰ produced experimental cholesterol atherosclerosis in a series of rabbits, following which he fed them large doses of irradiated ergosterol for six months. Two distinct types of lesions were noted at autopsy; intimal atheromatous foci in which calcification was slight or absent, and medial calcification at the extreme edges of the atherosclerotic plaques.

SUMMARY AND CONCLUSIONS

The evidence supporting the hypothesis that the common cause of coronary thrombosis is an intimal hemorrhage is reviewed. Intimal hemorrhages are shown to result from the rupture of capillaries which are derived from the coronary lumen.

Some of the factors that are concerned in the rupture of intimal capillaries have been studied, and the results reported.

It is shown that increased intracapillary pressure, due to persistent hypertension, is a major factor in the formation of intimal hemorrhages and in the precipitation of coronary thrombi. As transient hypertension due to violent physical exertion or emotion will have a similar effect, these activities should be avoided by patients with coronary artery disease. This conclusion agrees with present day clinical opinion.

The relation of vitamin C deficiency to the incidence of coronary thrombosis has been studied, and from the available evidence it is suggested that increased capillary fragility due to inadequate blood concentration of this vitamin may be concerned in the causation of some cases of coronary thrombosis. It is therefore recommended that patients with coronary artery disease be assured of an adequate vitamin C intake.

Finally, it is suggested that the calcification of atherosclerotic plaques may protect against intimal hemorrhages and coronary thrombosis. An ample calcium intake is therefore also recommended for patients with coronary artery disease.