

SOME OBSERVATIONS ON THE DEVELOPMENT OF SPONTANEOUS ATHEROSCLEROSIS IN INDIAN DOMESTIC PIGS (*SUS-SCROFA*)

By

R.B. ARORA, D.S. KHANNA AND O.P. AGARWAL

Department of Pharmacology, All India Institute of Medical Sciences, New Delhi

Atherosclerosis (2) is a disease of complex etiology and a number of factors have been alleged to contribute in the progress of this disease. Ever since Antischkow (1) produced successful experimental atherosclerotic lesions in rabbit, a number of animal species have been subjected to such study in an attempt to find out a more suitable animal as an experimental model. The pig would seem to be a suitable animal for atherosclerosis studies since it resembles the human in morphology of lesions, lipoprotein spectrum and response to fat (3-7). The present work was undertaken to study the various aspects of spontaneous atherosclerosis in pigs keeping in view the factors influencing the progress of the disease.

MATERIALS AND METHODS

Seventy Indian domestic pigs (*Sus-scrofa*) of both sexes were used for the study. They were bred, raised and maintained at the Central Animal House, All India Institute of Medical

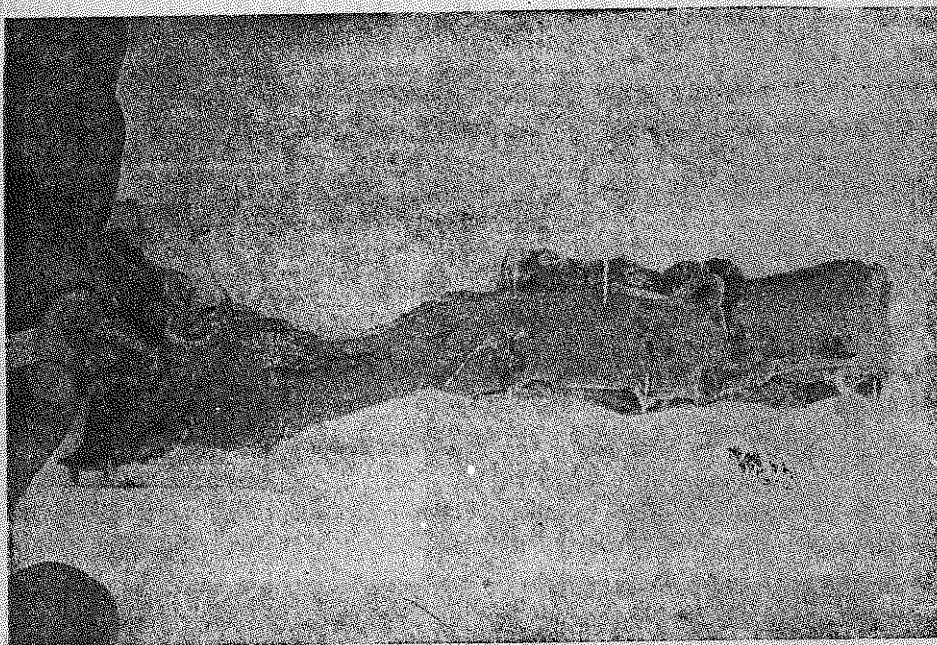


Fig. 1 : Longitudinal section of pig aorta showing fatty streaks

Sciences, New Delhi and their biological data were properly maintained. Optimum temperature for their living conditions was provided. The animals were given standard basal diet* throughout the experimental period and the amount of food given per day was calculated in terms of their age. The age of the animals under study ranged between 1 month and 5 years.

The animals were killed at intervals by overloading doses of saturated solution of magnesium sulphate given intravenously. The aortae were taken out completely as far as possible (from the origin upto little beyond the bifurcation) and examined with naked eyes. Subsequent to staining with Sudan IV, they were re-examined macroscopically for confirming the presence of lesion. The severity and extent of aortic involvement was then graded. Routine histological study was also performed.

RESULTS

Spontaneous atherosclerotic lesions were observed in thirtytwo out of the seventy aortae examined (45%). Following types of lesion were observed:

- (a) Fatty streak representing initial lesion characterized by various degrees of sudanophilia in the intima.
- (b) Raised spot over the intimal surface representing plaque.
- (c) Ulceration of the intima representing advanced lesion.

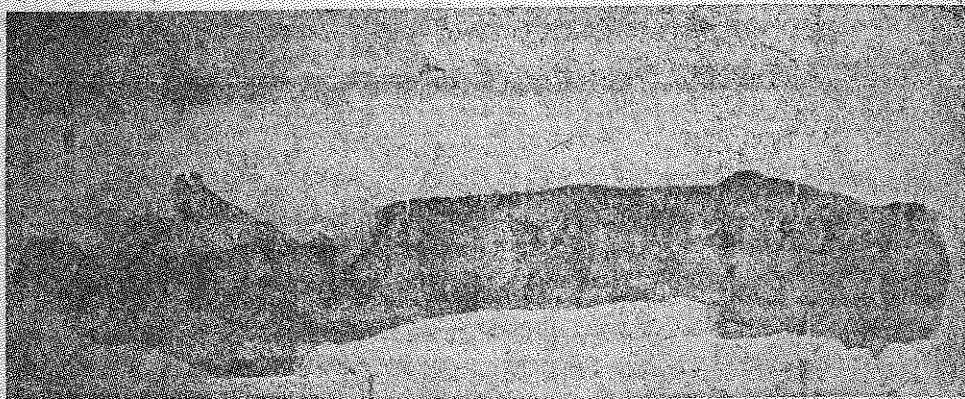


Fig. 2: Pig aorta showing fatty streaks and fibrous plaque

Fatty streaks appeared to be the most frequent and earliest lesion visible with naked eye and were found in twentythree animals. The involvement of arch and thoracic aorta with fatty streaks were most frequent, as compared to abdominal aorta. However, in these specimens of aortae where abdominal portion was involved with fatty streaks, the lesions mostly

*Wheat crush-20 parts, Wheat bran-10 parts, Gram crush-20 parts, Barley crush-20 parts, Maize crush-20 parts, Lucern grass-adlib., Fish meal-10 parts, water-adlib.

confined to an area around and slightly beyond the bifurcation. In the thoracic aorta, the mouths of intercostal vessels were characteristically involved with sudanophilic spots. Fatty streaks were mostly distributed along the long axis of the aorta. Pale yellow, elongated raised intimal spots of varying size (1mm to 20 mm) representing intimal plaque were observed in seven out of seventy aortae examined (Fig. 2). The characteristics of their distribution were not uniform, and were frequently associated with fatty streaks. Only two out of the total number of aortae examined showed typical atherosclerotic ulcer representing advanced lesion (Fig. 3). The ulcerative lesion was seen in abdominal aorta, a little above the bifurcation of aorta.

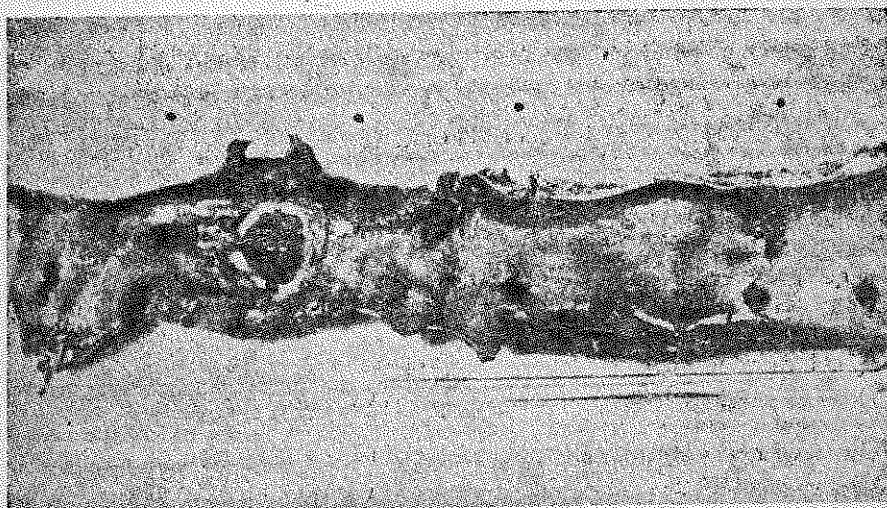


Fig. 3 : *Aorta showing ulcerative lesion*

Histologically, fatty streak presented a picture of thickened intima containing sudanophilic material. The changes were confined to intima only. The more advanced lesion (intimal plaque) showed diffuse accumulation of lipid and connective tissue. Medial calcification was not observed. Fragmentation of internal elastic lamina was occasionally seen.

The aortic lesion was not found in any of the animals between the age group of one month and one year with the exception of one. On the other hand not a single aorta above two years was seen free from lesion and manifested different types of lesion. The type and severity of lesion was found to be in the increasing order with the advancing age of the animal. No significant sex difference was, however, noted with the incidence of spontaneous lesion.

DISCUSSION

The observation made by us in the present study relates to those findings which were obtained under strictly uniform environmental and dietary condition throughout the experimental period. The knowledge of exact age of the experimental animals was one of the important parameters of this study. Under such condition, we have observed spontaneous lesion in aorta in fortyfive per cent of the animals examined. This value is higher as compared to the earlier

report of Gottlieb and Lalich (5). The discrepancies in the percentage of aortic lesion could be due to the absence of some factors which the earlier workers did not much take into account. Our findings are similar to those of Skold and Getty (7) who examined fortyfive aortae of pigs of different breed ranging from one to eight years. However, we have found that it is the arch of aorta and thoracic portion of the aorta which are most frequently involved with initial spontaneous lesion. No correlation between sex and incidence of spontaneous atherosclerosis was observed. Other observations made by us regarding the characteristics of the lesion, their pattern of distribution, and relationship of lesion with sex and age, and histological picture are basically in confirmation with the findings of others.

SUMMARY

Various aspects on the development of spontaneous atherosclerosis of aorta in seventy Indian domestic pigs of both sex ranging between the age of one month and five years have been studied under uniform dietary and environmental conditions. Only fortyfive per cent of aortae showed spontaneous lesion. The incidence, severity and extent of spontaneous lesion increased with the advancing age of the animal. No relationship with sex could be observed.

The result shows that the earliest age at which typical spontaneous atherosclerotic lesion is likely to occur in Indian domestic pig is beyond above years and to eliminate the possibility of superimposed spontaneous atherosclerotic lesion, animal below the age of one year should preferably be chosen for experimental design

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