

SPONTANEOUS AORTIC RUPTURE IN TURKEYS AND THE VASCULARIZATION OF THE AORTIC WALL

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Since Durrell *et al* (4) described an internal haemorrhage in young turkeys due to aortic rupture, mostly in its abdominal segment (1, 2, 3, 5, 6, 9, 12, 13, 16), many factors have been considered to explain the pathogenesis of this condition.

In the following study we have sought to explain the frequent occurrence of aortic rupture at this site, and its connection *inter alia* with the vasa vasorum patterns of the aortic wall.

MATERIAL AND METHODS

Sixteen White Nicholas turkeys, 15 males and one female, with a history of sudden death, were submitted for necropsy. Internal haemorrhage due to aortic rupture was found in each.

Histological examinations of the aortae were carried out. Paraffin sections were stained by Gomori's trichrome, Verhoeff's elastica, alcian blue and von Kossa's staining methods.

The aortic vasa vasorum network in normal turkeys of the same breed was investigated by the injection method, as suggested by Williams (18), and in histological sections stained by haematoxylin and eosin.

RESULTS

The vasa vasorum network of the normal aorta

The aorta of the turkey histologically is divided into two segments: a thoracic segment with a media of an elastic structure and an abdominal segment of a muscular type. These two segments are connected by a transitory segment one to two mm in length. This is a hybrid type of artery, in which the intimal half of the media is muscular and the adventitial half is of an elastic structure. This segment is situated near to the emergence of the a.coeliaca.

The visualisation of the vasa vasorum network by injection and the results of the histological sections revealed that only the thoracic



FIGURE 1. Male turkey. Adventitial vasa vasorum network of the thoracic aorta. William's injection method. $\times 9$.

segment is vascularized in contrast to the abdominal segment which is avascular.

The thoracic aorta shows two vasa vasorum plexuses: adventitial (Figure 1) and intramural (Figure 2). The vessels of the adventitial plexus originate from the bifurcation of the two a.brachiocephalica and from the four a.intercostalis. These vessels penetrate the media and nourish its adventitial third, whereas the internal two-thirds remained avascularized.

The ruptured aorta

In 14 of the 16 turkeys the rupture was found in the abdominal aorta and only in two birds was the rupture located in the thoracic

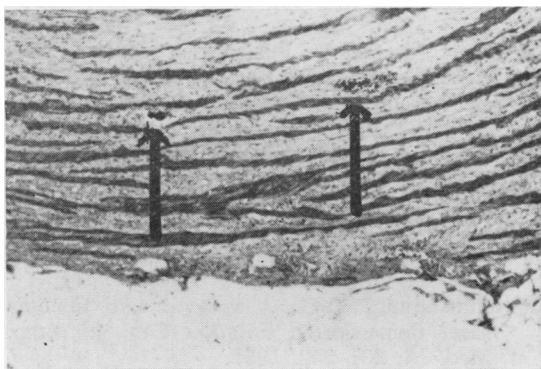


FIGURE 2. Male turkey. Intramural vasa vasorum in the adventitial third of the media. H.E. $\times 23$.

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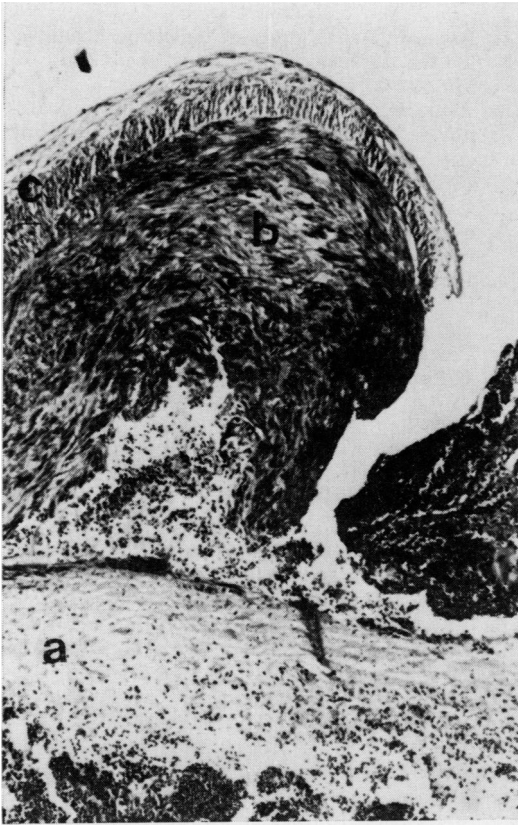


FIGURE 3. Male turkey. Dissecting aneurysm in the adventitial third of the abdominal aorta. Gomori's trichrome stain. $\times 25$.

a. adventitia b. media c. intimal cellular plaque

segment. In birds in which the abdominal segment of the aorta was involved the rupture was longitudinal on the ventral or dorso-ventral sides, situated between the a.coeliaca and the two branches of the a.ischiadica.

The histological patterns of these aortae were constant. The rupture took place in the adventitial third of the media (Figure 3). The media in this area was edematous, causing laceration of the smooth muscle cells which were degenerated, with pyknotic nuclei and showing a diminished affinity for dyes. The internal and external elastic membranes were thinner than usual and fragmented. In the vicinity of, and mostly adjacent to the site of rupture, intimal plaques were present (Figure 3). These plaques had various patterns but appeared mostly as cellular plaques composed chiefly of smooth muscle cells or else older intimal plaques which were fibro-cellular or fibrotic. The ground substance of all these plaques was rich in acid mucopolysaccharides.

In two birds in which the rupture was found in the thoracic segment of the aorta the

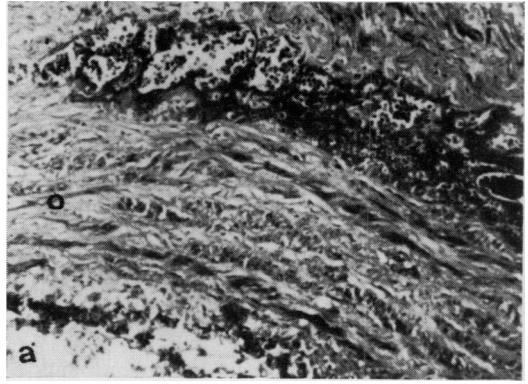


FIGURE 4. Male turkey. Dissecting aneurysm in the midzone of the thoracic aorta. Gomori's trichrome stain. $\times 47$.

a. adventitia o. adventitial half of the media
i. intimal half of the media

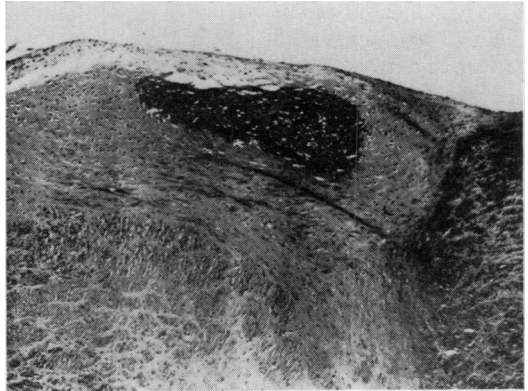


FIGURE 5. Male turkey. Intimal cartilaginous plaque with calcified area in the thoracic aorta. Gomori's trichrome stain. $\times 28$.

tear was located in the midzone of the media (Figure 4). In one bird an intimal cartilaginous plaque with foci of calcification was found adjacent to the rupture (Figure 5). In addition the adventitia was calcified, including the adventitial vasa vasorum plexus. In the second bird four-fifths of the intimal surface at the site of rupture was thickened and had undergone a cartilaginous metaplasia.

DISCUSSION

Even in young turkeys intimal plaques of the abdominal aorta are a common lesion and have been found in 88.2% of turkeys aged two months (14).

The presence and the role of intimal plaques in the pathogenesis of aortic rupture in turkeys have been emphasized (2, 3, 5, 6, 9, 10, 11, 12, 16). However, it seems that two morpho-

logical circumstances concur in the pathogenesis of abdominal aortic rupture, the presence of intimal plaques near the medial laceration and the absence of an intramural vasa vasorum network in this segment. The intimal plaques partially close the sole route of nutrition of the abdominal aortic wall and the diffusion of nutrients is least possible in the adventitial third of the media where dissecting aneurysm appeared. Obviously, the role of high systolic blood pressure in young male turkeys as a precipitating factor can not be ignored (7, 8).

The same location has been noted and a similar interpretation has been suggested in cases of medial cystic degeneration of the abdominal aorta in laying hens and in one to two year old turkeys (15).

In both turkeys in which the aortic rupture took place in its thoracic segment the initial tear was located in the midzone of the media. This aortic segment has a rich adventitial vasa vasorum network and the adventitial third of the media is nourished by this vasa vasorum penetrating into the media. The intimal third receives nutrients through the intima directly from the blood stream. The midzone is nourished by both pathways but remains on the peripheral zone of penetration of the nourishment provided by each source of supply (17). This, therefore, is the arterial zone most likely to suffer degenerative processes.

SUMMARY

Dissecting aneurysm of the aorta in White Nicholas turkeys is reported. The abdominal segment of the aorta was affected in 14 of the 16 cases.

The presence of intimal plaques in the neighbourhood of the medial laceration and the lack of an intramural vasa vasorum plexus in this aortic segment are suggested as the explanation for the predisposition of this area as the site of rupture.

RÉSUMÉ

Les auteurs rapportent des cas d'anévrisme disséquant de l'aorte, chez des dindes "White Nicholas". La condition affectait le segment abdominal de l'artère, dans 14 des 16 cas en cause.

La présence de plaques, au sein de l'intima, dans le voisinage de la laceration de la média, et l'absence d'un réseau de *vasa vasorum* au sein de la paroi, dans cette partie de l'artère, expliqueraient la prédisposition à la rupture manifestée par cette portion aortique.

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