AORTIC - ILIAC THROMBOSIS IN BOVINE

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Introduction

Blood is maintained in a fluid form within the vascular system by the body maintaining a balance between the clotting mechanism, fibrin and platelets deposition on the one hand and the activity of fibrinolytic enzymes on the other.Thrombosis occurs if the clotting mechanism and the fibrin and platelets deposition within the vascular system become excessive and exceeds the fibrinolytic activity of the fibrinolysin.Three factors known as the Virchow's triads consisting of damage to vessel wall and endothelium, changes in the blood flow and changes in the composition of the blood are generally considered to constitute the main pathogenetic mechanism of thrombosis. Because of the low blood pressure and the nature of the blood flow on the veinous side of the circulation, veinous thrombosis occurs more commonly than arterial thrombosis.

Arterial thrombosis involving either the aorta, cranial messenteric artery, coronary artery or iliac arteries are commonly known to occur in horses infected with Strongylus vulgaris, in cats with idiopathic cardiomyopathy and in man due to atheriosclerosis or atheromas. In cattle most cases of thrombosis reported involved the caudal vena cava (1,2,3,). Thrombosis affecting smaller arteries and arterioles in cattle are known to occur in malignant catarrhal fever as the result of fibrinoid degeneration and arteritis or arteriolitis and in infection with Haemophilus somnus which causes ischaemic septicaemic thrombomeningoencephalitis. Thrombosis affecting larger arterial blood vessels are rare. This paper describes unique cases of extensive thrombosis of the aorta, it's branches and the iliac arteries in three cows examined at postmortem.

Materials and Methods

Postmortem examination was carried out of three cows. They originated from three different dairy farms situated at different distances, ranging from 2 to 5 kilometers from the Faculty of Veterinary Medicine. The cows were aged between one to two years. One of them which was one year old had a clinical history of prolonged illness and intermittent claudication. Towards the terminal stages of the disease, it frequently became recumbent but was able to get up and walk for a while after a period of rest. The lameness first started in the hind limbs but later extended to involve the fore limbs. In the terminal stage of the illness, the animal became very weak and greatly emaciated and was most of the time recumbent.

The course of illness in the other two animals was short, death occuring after about two weeks from the time the animals were noticed sick. Both animals were very anaemic prior to death.

Results

A high degree of aortic thrombosis was observed in all the three cows at postmortem examination.The lesions were well-developed and very extensive. They involved more or less uniformly the whole of the aorta, extending from the aortic sinuses, through the thoracic to the abdominal aorta. However, the lesions were most severe in the abdominal aorta (figure 1). In the cow with the long standing disease, the thrombotic lesions were well-established and involved nearly all the major arterial branches arising out of the aorta including the common brachiocephalic trunk, all the intercostal arteries,the

FIGURE 1: Opened heart and aorta showing extensive thrombotic lesions. Note that the lesions are most marked in the abdominal aorta.

coeliac artery as well as the cranial and the caudal messenteric arteries. Saccular dilations of the abdominal aorta from which the cranial messenteric arteries originate were observed in all the three cases. The thrombosis extended to involve the aortic quadrifurcation with extensive involvement of the iliac arteries (Figure 2). The aorta and all the affected arteries were markedly obdurated. the endothelial lining of the aorta was irregularly covered by a reddish-grey or reddish-brown friable thrombotic mass with apparently unaffected areas of the endothelial lining interspersed between them.Rupture of one of the branches of the cranial messenteric artery with resultant fatal internal haemorrhages in the abdominal cavity was observed in two of the animals. Infarcts affecting one end of the spleen, kidney and a segment of the small intestinal loop as a result of thromboembolism were observed.

Microscopically, the thrombotic mass appeared laminated, consisting of amorphous, pink or grey-staining areas of platelets which alternated with layers consisting mainly of fibrin alone or in combination with leukocytes, or erythrocytes. Focal areas of medial mineralization were observed in the aorta. No significant inflammatory reaction involving the aorta and its branches were seen. In all the three cases, the thrombotic lesions did not involve the veins.

Discussion

Thrombosis is a process by which a solid mass is formed in the circulation from the constituents of the streaming blood. It is found much more commonly in veins than in arteries. This is probably because of the low blood pressure and the sluggish flow of the blood in the veinous side of the circulation. Because of the high velocity of the blood flow in the arterial side of the circulation, the most important factor responsible for thrombosis, is damage to the endothelium and vessel walls. This may be due either to the disease of the arterial wall itself or due to mechanical lesion. The damage leads to platelets adherence and agregation at the site. Veinous thrombosis on the other hand can develop in the absence of obvious vascular damage. A sluggish blood flow is often sufficient to significantly contribute to the thrombus formation. Arterial and cardiac thrombosis therefore is usually the result of severe or significant damage to the vascular or cardiac

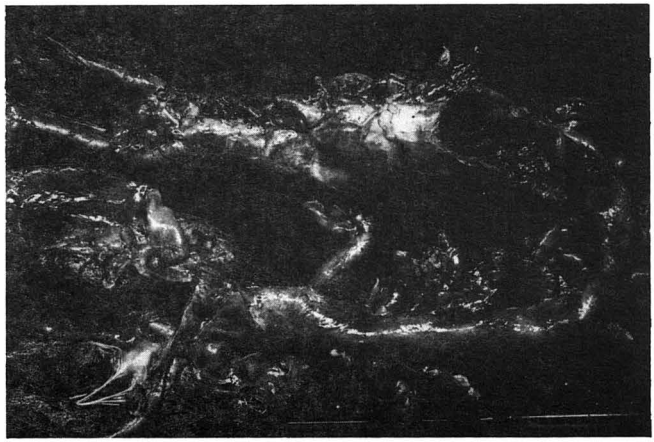

FIGURE 2: Heart and aorta with it's arterial branches and iliac arteries. Note the thrombotic and obdurated aorta, intercostal arteries and iliac arteries as well as the saccular dilation of the abdominal aorta.

endothelium and turbulence in the blood flow. Arterial thrombosis in human is generally regarded to be due to atherosclerosis, aneurysm, arterial fibrillation, endocarditis and damage to the endocardium during cardiovascular surgery. It may also occur in conditions like thromboangiitis obliterans (Burger's disease or primary aortic arteritis (Takayasu's disease).In animals , thrombosis of the aorta and its arterial branches is well documented in horses as a result of Strongylus vulgaris infection and in aortic-iliac thrombosis of horses the pathogenesis of which is poorly understood.

The condition described here resembles to a great extend the vascular lesions observed in horses infected with Strongylus vulgaris. In this condition there was a maeked thrombosis of the aorta and its arterial branches with saccular dilatation of the abdominal aorta at the point where the cranial messenteric artery leaves the aorta. The involvement of iliac arteries at the point of aortic quadrifurcation makes it resemble the aortic-iliac thrombosis reported in horses (4,5). Similar aortic condition has been reported in calf (6). One of the affected animals which had a prolonged illness and which had a well-developed form of the lesions showed the typical expected clinical signs of exercise intolerance, intermittent claudication, involving first the hind limbs and later also the fore limbs with resultant frequent recumbency. Lesions with such similar clinical manifestations has been reported in horses with aortic-iliac thrombosis (4,5), and in dogs with primary arterial thrombosis (7). In two of the affected cows, rupture of one of the arterial branches of the cranial messenteric artery led to fatal internal haemorrhages which shortened the course of the disease.

Attempt to identify the infectious cause of the arterial damage did not yield any positive result. Although cattle do not get infected with Strongylus vulgaris, onchocerciasis and elaeophoriasis are reported to cause parasitic aortitis in cattle and other ruminants(8,9,10,11,12) and this may significantly damage the aorta as to trigger off the process of thrombosis. However, careful examination of the aorta and its branches did not reveal any parasite or evidence of their presence.

Because the histopathological examination revealed no inflammatory lesions in either the aorta or its arterial branches, it is concluded that degenerative lesions of the vascular wall may be responsible for triggering off the process of thrombosis. However, the fact that these cases were seen in

relatively younger animals makes these finding an interesting observation which requires further critical studies.

Summary

Marked thrombosis extending from the aortic sinuses, through the thoracic to the abdominal aorta is described in three cows aged between one and two years. In one case, the thrombotic lesions involved all the major arterial branches from the aorta. Saccular dilatations of the abdominal aorta at the point of origin of the cranial messenteric artery was observed in all the three cases. These changes led to obduration of all the affected vessels. Thrombosis of the aortic quadrifurcation with involvement of the iliac arteries resulted into intermittent claudication and recumbency. Rupture of one of the branches of the cranial messenteric artery resulted in fatal internal haemorrhages. Infarcts, as a result of thrombosis or thromboembolism were seen in the kidney, spleen and the small intestinal loop. The cause of the condition is unknown, but it is suggested that degenerative lesions of the vascular wall might play an important role.

Zusammenfassung

Massive Thrombenbildung, die sich von den aortischen sinus durch die Aorta thoracica bis zur Aorta abdominalis erstreckt wird in 3 Kuehen im Alter von 1-2 Jahren beschrieben. Die thrombotischen Laesionen erstreckten sich in einem Fall auf alle Hauptzweige der Aorta. Dilatation der Aorta abdominalis in Hoehe der Abzweigung der Arteria mesenterica cranialis wurde in allen 3 Faellen beobachtet. Diese Veraenderungen fuehren zur Obduration aller betroffenen Gefaesse. Thrombosierung der aortalen Quadrifurcation unter Einbeziehung der Arteriae iliacae fuehren zu intermittierendem Hinken und Festliegen. Ruptur eines Zweiges der Arteria mesenterica cranialis fuehrte zu einer fatalen inneren Blutung. Infarkte als Folge van Thrombose oder Thromboembolism wurden in Niere, Milz und Duenndarm beobachtet. Die Ursache dieser Stoerung ist nicht bekannt; degenerative Veraenderungen der Blutgefaesse sollen eine wichtige Rolle spielen.

Resume

Une thrombose marquée entre le sinus aortique, passant par l'aorte thoraciaque jurqu'à l'aorte abdominale est décrite dans trois vaches âgees de 1 à 2 ans. Dans un cas, les lesions thromboniques ont impliqué toutes les branches artérielles majeures en provenance de l'aorta. Des saccula dilatations de l'aorte abdominale au point d'origine de l'artére messentérique craniale ont été observées dans tous les trois cas. Ces changements ont entrainé l'obduration de tous les vaissaux affectés. La thrombose de la quadrifurcation aortique avec l'implication des artéres iliaques eu comme consequence une claudication a et une recumbance intermittentes. La rupture d'une des artéres craniennes messentériques a occasionne des hemorragies internes fatales. Des infaretus, causés par la thrombose ou le thromboembolism ont été constatés dans le rein, la rate et dans le boucle du petit intestin. La cause de la condition est inconnue mais on suppose que les lesions dégénératives due mur vasculaire pouvaient jouer un rôle important.

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