

Coronary Arterial Collagen Fibres - A Histological Study in Mammals



Medical Science

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ABSTRACT

For comparison of the density of collagen fibres in coronary arterial wall of mammals tissue of their circumflex and interventricular branches from the adult hearts of human, buffalo, pig, goat, dog and rabbit were obtained at constant levels to be preserved in 10% formalin. After processing paraffin sections of 10 micron thickness were stained with Van Gieson's Picrofuchsin. Density of collagen fibres was + in tunica intima, ++ in tunica media and +++ in tunica adventitia in circumflex arteries while in interventricular arteries density of collagen fibres was nil in tunica intima, + in tunica media and +++ in tunica adventitia per magnified field in all the mammals. It was concluded that distal to commencement of coronary arteries density of collagen fibres gradually decreases in tunica adventitia tunica media and tunica intima in circumflex and interventricular arteries.

INTRODUCTION

Gross et al (1934)¹ described histology of coronary arteries and their branches in human heart. Moore and Ruska (1957)² observed fine structure of capillaries and small arteries. Parker (1958)³ performed electron microscopic study of coronary arteries. Margaret and Harkness (1958)⁴ noticed collagen and elastic content of arterial wall in dog. Boucek et al (1963)⁵ reported relation between microanatomy and functional properties of coronary arteries in dog. Spiro and Weiner (1963)⁶ narrated fine structure of coronary arteries. Keshaw Kumar (2001)⁷ showed the microstructure of human arteries. Keshaw Kumar (2003, 2003)^{8,9} calculated coronary arterial pulse pressure and put forth mechanism of coronary arterial lipid accumulation. Keshaw Kumar (2005)¹⁰ studied elastic fibres in coronary arteries of mammals. Keshaw Kumar (2009)¹¹ described collagen in coronary arteries of mammals.

Present study was conducted to compare density of collagen fibres in tunica intima, tunica media and tunica adventitia of circumflex and interventricular branches of coronary arteries in different mammals, which is not reported in the literature as yet.

MATERIAL AND METHODS

Hearts of human, buffalo, pig, goat, dog and rabbit (50 of each) were procured immediately after their death. Human hearts were procured from dissection room cadavers, hearts of buffalo, pig and goat were procured from slaughter house of Allahabad situated at Atala. Hearts of dog were procured from experimental laboratory of Physiology department and rabbit hearts were procured from experimental laboratory of Pharmacology department. These mammals were healthy and were of adult age group. Circumflex and interventricular branches of right and left coronary arteries were dissected in all the hearts and 0.5 cm long arterial segments were obtained from the following arteries to be preserved in 10% formalin.

1. Right circumflex artery 1 cm distal to its commencement.
2. Left circumflex artery 1 cm distal to its commencement.
3. Anterior interventricular artery 2 cm distal to its commencement.
4. Posterior interventricular artery 0.5 cm distal to its commencement.

The above mentioned sites of the arteries are the sites commonly effected during atherosclerosis as reported by Gross et al. (1934)¹. Paraffin sections of 10 micron thickness were cut with the help of rotary microtome to be stained with Van Gieson's Picrofuchsin. Density of collagen fibres per

magnified field was observed in tunica intima, tunica media and tunica adventitia of circumflex and interventricular branches of coronary arteries in different mammals.

Each layer of coronary arteries in each mammal was graded +, ++, +++, ++++ for density of collagen fibres with + representing minimum density and ++++ representing maximum density of collagen fibres. Results were obtained as visual assessment by a single observer.

OBSERVATIONS

1. Circumflex Arteries (Fig. 1, 2 and 3; Table I)

In right and left circumflex branches of coronary arteries density of collagen fibres was observed + in tunica intima, ++ in tunica media and ++++ in tunica adventitia per magnified field in all the mammals studied.

2. Interventricular Arteries (Fig. 3 and 4; Table II)

In anterior interventricular branch of left coronary artery and posterior interventricular branch of right coronary artery density of collagen fibres was observed nil in tunica intima, + in tunica media and +++ in tunica adventitia per magnified field in all the mammals studied.



(FIG-1)
Transverse section of left circumflex artery of pig showing ++ density of collagen fibres in tunica media and + density of collagen fibres in tunica intima (Van Gieson's Picrofuchsin X100)



(FIG-2)
Transverse section of right circumflex artery of dog showing ++++ density of collagen fibers in tunica adventitia and ++ density of collagen fibres in tunica media. (Van Gieson's Picrofuchsin X100)

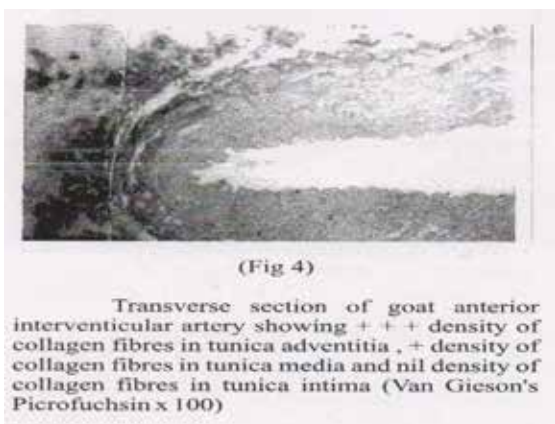
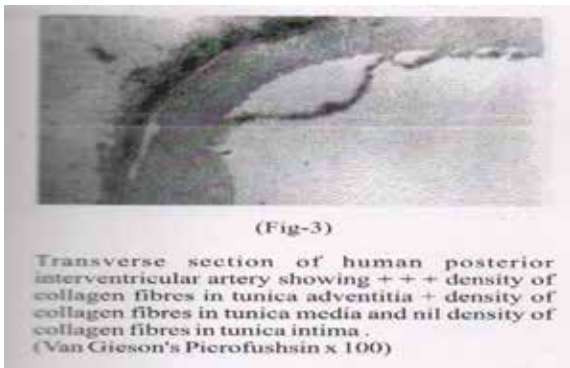


Table - I
Density of collagen fibres in circumflex branches of coronary arteries of mammals

Mam- mals	Right circumflex artery			Left circumflex artery		
	Tunica Intima	Tunica Media	Tunica Adven- titia	Tunica Intima	Tunica Media	Tunica Adven- titia
Human	+	++	++++	+	++	++++
Buffalo	+	++	++++	+	++	++++
Pig	+	++	++++	+	++	++++
Goat	+	++	++++	+	++	++++
Dog	+	++	++++	+	++	++++
Rabbit	+	++	++++	+	++	++++

Table - II
Density of collagen fibres in interventricular branches of coronary arteries of mammals

Mam- mals	Posterior Interventricu- lar Artery			Anterior Interventricu- lar Artery		
	Tunica Intima	Tunica Media	Tunica Adven- titia	Tunica Intima	Tunica Media	Tunica Adven- titia
Human	nil	+	+++	nil	+	+++
Buffalo	nil	+	+++	nil	+	+++
Pig	nil	+	+++	nil	+	+++
Goat	nil	+	+++	nil	+	+++
Dog	nil	+	+++	nil	+	+++
Rabbit	nil	+	+++	nil	+	+++

DISCUSSION

Density of collagen fibres per magnified field gradually decreases in tunica adventitia, tunica media and tunica intima of right and left coronary arteries distal to their commencement from ascending aorta (Fig. 1, 2, 3, 4).

However the density of collagen fibres was markedly noticed in tunica adventitia of coronary arteries by various workers (Parker 1958)³, (Spiro & Weiner 1963)⁶, (Boucek 1963).⁵ Present study also corroborates the finding of previous workers where tunica adventitia adjacent to tunica media of the artery showed elastic fibres and other portion of tunica adventitia consisted of excessive amount of collagenic substance, (Fig 2, 3, 4).

In the present study collagen fibres were seen dispersed between the smooth muscle fibres of tunica media of coronary arteries as described by other workers and also in the smooth muscles elsewhere, (Moore and Ruska 1957)² (Pease 1955).¹²

Collagen fibres are fibrous supporting tissue of arteries. In transverse sections of arteries collagen fibres appear as dot like structures because these run longitudinally in the entire length of arteries to support smooth muscle fibres and elastic fibres in the arterial wall. Findings in the present study resemble with the findings of Keshaw Kumar (2009)¹¹

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