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DISTRIBUTION OF MAST CELLS IN OUTER COATS OF HUMAN CORONARY ARTERIES

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ABSTRACT

Introduction : With the increasing toll of human lives due to coronary thrombosis, a stir is caused in the minds of medical men with number of queries like – has the distribution and population of mast cells in relation to the coronary arteries to do anything with thrombosis? It has been suggested that presence of mast cells in relation to coronaries may protect against the occurrence of atherosclerosis, while their absence predisposes to it. **Material and Method :** The material for the present study consisted of coronary arteries along with surrounding connective tissue from the human heart. These were obtained from the post-mortem cases which came to the Department of Forensic Medicine, Government Medical College, Jabalpur. Twenty human hearts were collected for the present study. The distribution of mast cells in the perivascular tissue and tunica adventitia of the coronary arteries was examined in histological slides under the high power of microscope. **Conclusion :** The mast cells with coarse granules are mostly situated in tunica adventia and perivascular connective tissue.

INTRODUCTION :

The role of heparin as anticoagulant is well established and one of its sources in the human body is considered to be the mast cell. The mast cells are known to be distributed within and around the wall of blood vessels. It is presumed that the subintimal distribution of these cells is responsible directly for preventing thrombosis or atherosclerosis either because of anticoagulant activity of heparin or because of its capacity to transport fats from the blood stream.

The first recorded observation of mast cells was probably made by Hausen in 1863. However, the credit for their discovery is usually given to Ehrlich (1877-1879) for it was he who drew attention to their specific metachromatic staining and gave them the name "mast Zellen". Ehrlich recorded the occurrence of mast cells in various species of animal kingdom. According to Holmgren and Willander (1937), cytoplasmic granules of mast cells consist of a substance having properties like those of heparin. This has been verified by Jorpes et al (1937) and Hirst (1938). Quantitative data on the distribution of mast cells have been reported for number of human and animal tissues by many workers. Possibly the most comprehensive is that of Hellstrom and Holmgren (1950) who studied the mast cells in human skin and heart from a large series of autopsy cases. The number of mast cells and their relationship with age in the human beings and variety of animals has been established. However, the work on the distribution of mast cells in and around the blood vessels has been rather restricted.

With the increasing toll of human lives due to coronary thrombosis, a stir is caused in the minds of medical men with number of queries like – has the distribution and population of mast cells in relation to the coronary arteries to do anything with thrombosis? what changes are brought about in the distribution and morphology of mast cells in coronaries with advancing age? It has been suggested that presence of mast cells in relation to coronaries may protect against the occurrence of atherosclerosis, while their absence predisposes to it.

Curiously aroused, and therefore the present study was undertaken to establish a possible relationship, if any between distribution of mast cells and coronary arteries of the apparently healthy individuals.

MATERIAL AND METHOD :

The material for the present study consisted of coronary arteries along with surrounding connective tissue from the human heart. These were obtained from the post-mortem cases which came to the Department of Forensic Medicine, Government Medical College, Jabalpur. Twenty human hearts were collected for the present study. The hearts were examined for any scarring, infarction or coronary occlusion; cases with any of the above changes were rejected.

Soon after removal of hearts, the right and the left coronary arteries along with their interventricular branches were dissected. Along with surrounding connective tissue, one centimeter long segment from each of these arteries was cut from their commencement, and soon fixed in 10 % chilled neutral formalin for 24 hours. Then these segments were subjected to routine dehydration and were cleared in cedar wood oil. Thereafter, they were embedded in paraffin wax by vaccum embedding method. Seven micron thick serial sections were cut, mounted and labeled. These sections were stained by Haematoxyline & Eosin, Toluidine blue in acetate buffer and Gomori's aldehyde fuschin methods. The distribution of mast cells (exhibiting metachromasia) in the perivascular tissue and tunica adventitia of the coronary arteries was examined under the high power of microscope. The number of mast cells was counted in 5 different fields of 5 alternate sections. An average number is thus calculated and recorded.

A large number of hearts collected could not be utilized for the study as mast cells could not be demonstrated in them on account of autolytic changes. Only those specimen which were relatively fresh collected 6 hours or less after death, could be used.

OBSERVATION :

Coronary arteries of twenty human hearts were studied, out of which in only 6 specimens the mast cells could be revealed. These 6 specimens were collected within 6 hours after death. Since no mast cell could be seen in the coronary arteries of the other 14 specimens, they were not included in the observation. Five different fields in five alternate sections were studied under high power of microscope. The total number of mast cells thus counted in 25 fields was recorded. Following observations were seen – In perivascular tissue the mast cells are present singly as well as in groups of 2 to 8 cells. In tunica adventitia the number of mast cells is less as compared to that in the perivascular tissue. Mast cells are present in groups of 2 to 3 either in a bunch form or in a row.In perivascular tissue, mast cells are usually larger in size with different shapes. The granules are mostly discrete and fine, taking light stain, however, some cells show coarse, compact and darkly stained granules. At places mast cells are seen with metachromatic granules liberated in the surrounding tissue.

In the tunica adventitia the mast cells are elongated with coarse compact and darkly stained granules. However, at places the mast cells are oval or polygonal with fine or coarse granules.

DISCUSSION :

Quensel (1933) studied the distribution of mast cells in men and found them exclusively near the small blood vessels without muscle coats. However in the present study they occure close to the walls of blood vessels and even in the coats of blood vessels.

This appears to be more in keeping with view of Riley (1953), where the blood vessels are surrounded by a sheath of fibro-fatty tissue, the mast cells lie between the vessel and the surrounding fat and are often disposed in chains parallel to the vessel wall.

The type I and type II cells described by riley (1953) are stained orthochromatically and metachromatically respectively in the rat. In this animal the mast cells produce serotonin in addition to heparin and histamin. In human being the mast cells do not produce serotonin and the two types of the cells in the present study are demonstrated by metachromasia. What has been described by Riley, could be due to difference in the secretion of rat's mast cells as compared to man.

CONCLUSION :

The following conclusions have been drawn –

1) The mast cells with coarse granules are situated in tunica adventia and perivascular connective tissue.

2) The cells with different types of granules are probably the different physiological states of the cells.

3) results are better with toluidine blue as compared to Gomori's aldehyde fuschin, for staining mast cells.

Table I
Average number of mast cells per high power field –

S.No.	Specimen	Right coronary artery		Left coronary artery		Ant. I. V. Artery		Post. I. V. Artery	
		P.V.T.	TA	P.V.T.	TA	P.V.T.	TA	P.V.T.	TA
1	Heart 1	1.16	0.56	1.44	0.60	0.80	0.44	0.64	0.48
2	Heart 2	1.12	0.68	0.92	1.20	0.48	0.36	0.44	0.16
3	Heart 3	0.92	1.28	1.56	0.68	0.44	0.32	00	00
4	Heart 4	0.36	0.60	0.20	0.20	0.48	0.20	0.80	0.52
5	Heart 5	0.20	0.12	0.56	0.68	0.56	0.44	0.20	0.12
6	Heart 6	0.56	0.32	0.60	0.28	0.44	0.40	0.64	0.28

REFERENCE:

1. Bates E. O. (1935) : Quantitative study and interpretation of the occurrence of basophil (mast) cells in the subcutaneous tissue of Albino rat. Anat.Rec. 60:231-239.
2. Baumer E. (1896) : Cited by Riley (1953) : Relationship of the tissue mast cells to the blood vessels in the rat. J.Path.Bact. 65:461-69.
3. Bloom G. D. (1974) : Structural and biochemical characteristics of mast cells. The inflammatory process. (Zweifach, Grant, McCluskey.Eds) 2nd Ed.Academic press, New York.
4. Clark W. E., LeGros (1971) : Tissues of the body : 7th Edn., Oxford University press.
5. dalgaard E N and J. B. dalgaard (1948) : The relationship of the tissue mast cells to the blood vessels in the rat. J. Path.Bact., 65:461-69.
6. Ehrlich P.(1877, 1879) : Numerical distribution of mast cells in human skin and heart. Acta Anat., 10:81-101.
7. Riley J. F. (1953) : Relationship of the tissue mast cells to the blood vessels in the rat. J. path. Bact., 65: 461-469.