

Microscopic Study of Left Middle Cerebral Artery in Different Age Groups

M B Prasanna¹, Cessy Job¹, P A Nandagopalan²

¹Associate Professor, Department of Anatomy, Government Medical College, Kottayam, Kerala, India, ²Head, Department of Anatomy, P. K. Das Institute of Medical Sciences, Palakkad, Kerala, India

Abstract

Background: It has been described earlier by many authors that there is an age linked increase in thickness of layers of cerebral vessels.

Objective: A microscopic study of left middle cerebral artery in different age groups to observe the sequence of changes in the vessel wall, with advancing age.

Materials and Methods: Left middle cerebral artery from 30 specimens of different age groups were taken, sections made and stained. The changes in the layers were observed and measured.

Results: The left middle cerebral artery showed progressive thickening of layers with age. Intima showed intimal cushions IEL become prominent and showed splitting.

Conclusion: The left middle cerebral artery showed progressive thickening of layers with age. Intima showed intimal cushions IEL become prominent and showed splitting. The presence of intimal cushion and widening of the artery due to large media defect can lead to atherosclerosis.

Application: Thickening of the layers of the left middle cerebral artery can lead to progressive deterioration in nutrition. This knowledge is imperative for the neurosurgeons in pre-operative planning.

Key words: Atherosclerosis, Tunica intima, Tunica media

INTRODUCTION

A thorough knowledge of arterial circulation in the brain is essential due to the present days increasing frequency and danger of intracranial vascular lesions which form the third most common cause of death. The histological changes associated with the middle cerebral artery in different ages and sexes show the presence of intimal cushions (IC). The widening of arteries due to large media is a cause of cerebral insufficiency.

MATERIALS AND METHODS

The left middle cerebral artery from 30 brain specimens belonging to different age groups and both sexes were taken. Bits of 1 cm were taken, fixed in 10% formalin, separately processed, cleared and blocked in paraffin wax. Sections of 6 μ thickness were cut and stained using the following stains.

1. Hematoxylin and eosin
2. Verhoeff's elastic stain counter stained with Van Gieson's stain
3. Masson's trichrome stain.

The changes in the thickness of tunica intima, media, and adventitia were observed under low and high powers of the light microscope. The relative thickness of intima, media, and adventitia was tabulated. It was observed that intima was thin and composed of a single layer of endothelial cells with internal elastic lamina (IEL) and a well-developed media in the fetus.

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Corresponding Author: Cessy Job, Department of Anatomy, Government Medical College, Kottayam, Kerala, India.
 E-mail: drcessy@gmail.com

Tunica media became thicker in the first and second decades.

The IEL also became more prominent. The intimal thickening was uniform in the fourth decade. In the fifth decade, The intimal thickening became localized at places. In the seventh decade, the ICs were seen projecting into the lumen. The IEL showed splitting and atheromatous plaques.

DISCUSSION

Cerebral arteries like the muscular arteries, such as the muscular arteries, were composed of tunica intima, media, and adventitia with a thin media and a prominent IEL and ill-defined external elastic lamina.

The tunica intima was observed to proliferate with age from the second decade till the seventh in accordance with Das Alternals *et al.*,¹ who also described an age linked increase in the thickness of the layer leading to progressive deterioration in nutrition. Baker² described the IEL was the first to show aging changes as early as the third decade and the lamina becomes fragmented, reduplicated, and later loses its uniformity. This was also seen here. The IEL showed changes such as splitting.

Physiological ICs in the young individuals has been described by Hassler.³ It was observed here that these thickening became more prominent in the seventh decade.

Windows in IEL of cerebral arteries were also noticed by Hassler⁴ which were reduced in number and size with increasing age leading to atherosclerosis. This has also been noticed here.

Media increases in thickness with age as in accordance with Baker,⁵ who described this thickening is due to increase in collagenous tissue and muscular elements.

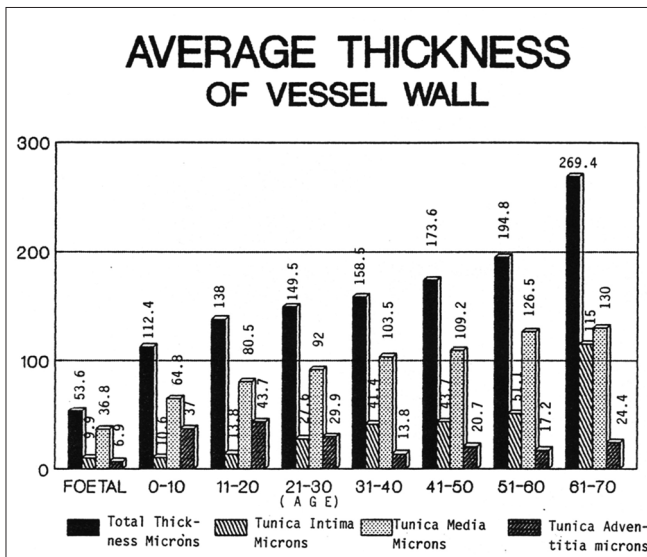


Figure 1: Bar diagram showing the thickness of vessel wall layers in different age groups

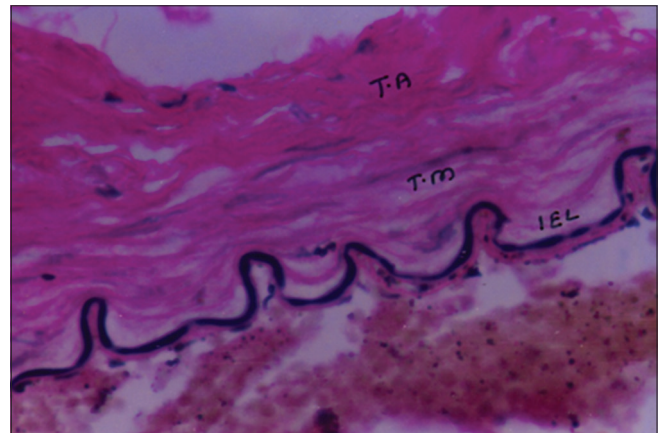


Figure 3: Transverse section of left middle cerebral artery of a 25-year-old male Verhoeff's staining $\times 200$

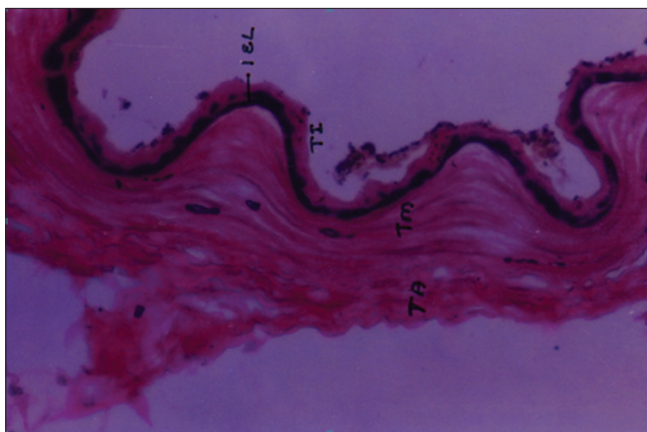


Figure 2: Transverse section of left middle cerebral artery of a 15-year-old male Verhoeff's staining $\times 200$

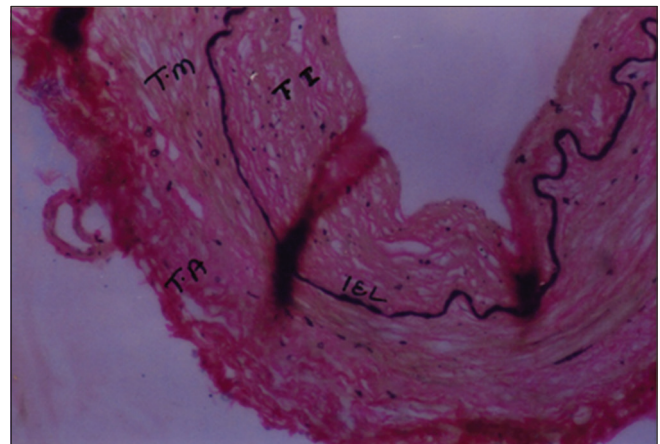


Figure 4: Transverse section of left middle cerebral artery of a 65-year-old male showing intimal cushions Verhoeff's staining $\times 100$

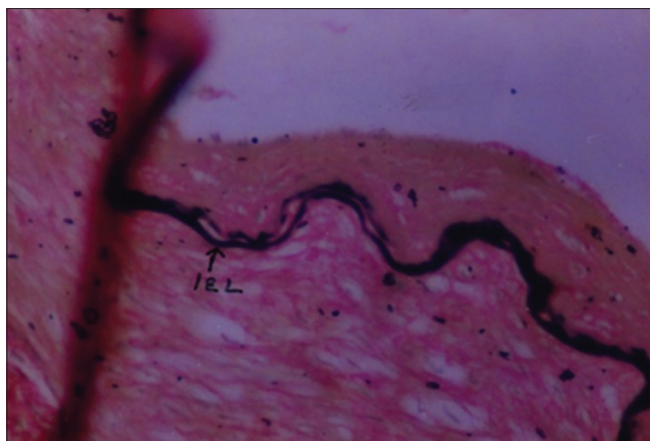


Figure 5: Transverse section of the left middle cerebral artery of a 65-year-old male showing splitting of the internal elastic lamina. Verhoeff's staining x200

The adventitia does not show much change here which is in contrast to the study of Das Alternals² *et al.*

RESULTS

The histological study of left middle cerebral artery conducted in 30 human brain showed progressive thickening with age in the tunica intima and media. IEL became prominent with age and showed splitting.

Intima became localized at places in form of intimal cushions. (Figures 1-5).

CONCLUSION

A histological study of left middle cerebral arteries was conducted in 30 human brains. The post mortem specimens and the full term stillborn fetuses have been used to understand the natural changes occurring with age.

The intima and media showed progressive thickening with age. The presence of ICs and widening of the arteries due to large media defects with advancing age can lead to pathological changes such as atherosclerosis causing cerebral insufficiency. This knowledge is imperative for the neurosurgeons in pre-operative planning.

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