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Electron microscopic study of the myelinated nerve fibres and the perineurial cell basement membrane in the diabetic human peripheral nerves.

[El-Barrany WG](#), [Hamdy RM](#), [Al-Hayani AA](#), [Jalalah SM](#).

Department of Anatomy, Faculty of Medicine, Alexandria University, Alexandria, Egypt.

Abstract

OBJECTIVE:

To study the quantitative and ultrastructural changes in myelinated nerve fibers and the basement membranes of the perineurial cells in diabetic nerves.

METHODS:

The study was performed at the Department of Anatomy, Faculty of Medicine, King Abdul-Aziz University, Jeddah, Saudi Arabia from 2003 to 2005. Human sural nerves were obtained from 15 lower limbs and 5 diabetic nerve biopsies. The total mean and density of myelinated nerve fibers per fascicle were calculated, with density of microtubules and mitochondria in the axoplasm. The number of the perineurial cell basement membrane layers was counted, and thickness of the basement membrane was measured.

RESULTS:

Among the 15 diabetic and 5 normal human sural nerves, the average diameters, number and surface area of myelinated nerve fibers and axonal microtubules density were found to be less in diabetic nerves.

Mitochondrial density was higher in diabetic axons. Thickness of the perineurial cell basement membrane had a greater mean, but the number of perineurial cell layers was less than that of the diabetic group. The inner cellular layer of the perineurium of the diabetic nerves contained large vacuoles containing electron-dense degenerated myelin. A few specimens showed degenerated myelinated nerve fibers, while others showed recovering ones. Retracted axoplasms were encountered with albumin extravasation.

CONCLUSION:

Diabetes caused an increase in perineurial permeability. The diabetic sural nerve showed marked decrease in the myelinated nerve fibres, increase degenerated mitochondria, and decreased microtubules.