Neurohistopathological Effects of Gentamycin on Pons of Adult Albino Rat

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Abstract

Getamicin, an aminoglycosidic antibiotic, is ototoxic,nephrotoxic and causes neuromuscular blockade as well.

A total of twenty albino rats (10 males and 10 females) were used in the present study, and they were equally divided into control and experimental groups. Experimental group rats received gentamicin intramuscularly for 21 days. Control group rats received normal saline. Then rats of both the groups were anaesthetized with nembutol, 35 mg/kg body wt. and perfused with 10% formalin. 10µ thick sections of pons were stained with H&E and Thionine.

Observation under light microscope revealed degenerative changes.

Key words: Albino rats, Pons, Gentamicin, Toxic effects

Introduction

Gentamicin is among the group of aminoglycosides that are used to treat aerobic gram negative bacterial infections. Amikacin, kanamycin, neomycin, streptomycin , paromomycin and tobramycin are other antibiotics in this group. The toxicity of these agents is dose related. Aminoglycosidic antibiotics block neuromuscular junction1. Gentamicin was introduced in 1958 by Weinstein. It is nephrotoxic, neurotoxic and ototoxic and it's side effects include ringing in ears, hearing loss, tinnitus, dizziness and anuria. Study was conducted on pharmacokinetics and dosage requirement of gentamycin in 1640 patients receiving treatment of gram-negative infections (daily dose ranged from 0.5 to 25.8 mg/kg2 The effects of gentamycin were studied on 1327 patients, of which 31 patients (2.3%) had significant ototoxicity3 The average frequency of cochlear toxicity for gentamycin was reported to be 8.3% and exact incidence of vestibule-ototoxicity as about 3%4. Disequilibrium and ataxia were noted as main symptoms of vestibulotoxicity5. The chronic toxicity was related to aminoglycoside-phosphoionositol binding6. Evidence of neurotoxicity due to gentamicin and other aminoglycosides is available7.

A biochemical basis for the inherited susceptibility to aminoglycoside ototoxicity, has also been reported8. Greater sensitivity of the auditory cortex to aminoglycosidic antibiotics as compared to the periphery (cochlea) was reported9 Gentamycin toxicity was reported to depend on other factors like: dose and kidney function, other potentiating medications, genetic susceptibility and age10.

Though the effects on pons have been reported along with ototoxic effects but the neurohistological effects of gentamycin on auditory cortex have less well been documented.

So, the present study is aimed to have further insight into the effects of gentamicin on the histology of the pons, which may explain central cause of ototoxicity.

Material and methods

20 adult albino rats, with equal number of males and females and weighing approximately 130 gms, were used in the present study. They were divided into control and experimental groups. Each group was comprised of 10 rats with equal male and female ratio. Experimental group rats were injected with gentamycin, 135mg/kg of body weight, intramuscularly for 21days (Gentamycin WHO food Additives series 4, www.inchem.org/documents). Control group rats were treated with normal saline in same volume by intramuscular route for 21 days. After this duration, rats were anaesthetized by injecting nembutol, 35 mg/kg body wt and perfused with buffered 10% formalin. Pons tissue samples were obtained from the brain. Tissue samples were processed for paraffin embedding. Then 10µ thick sections were obtained with rotatory microtome. Sections were stained with H&E and Luxol Fast Bue stains for observation under light microscope.

Observations

In Haematoxyliin & Eosin sttaiinied sections, the control group (Figs1), well stained nuclei, while the experimental group rats (Fiig 2).showed reduction in the staining material iintensity

Iin Luxol Fast Bue sttaiinied sections, in the control group (Fig 3), well stained neuronal as well as glial elements and nerve fibre bundles were seen, while in the experimental group (Fig 4), scanty nerve fibres with reduced number of vacuolated profiles were observed.

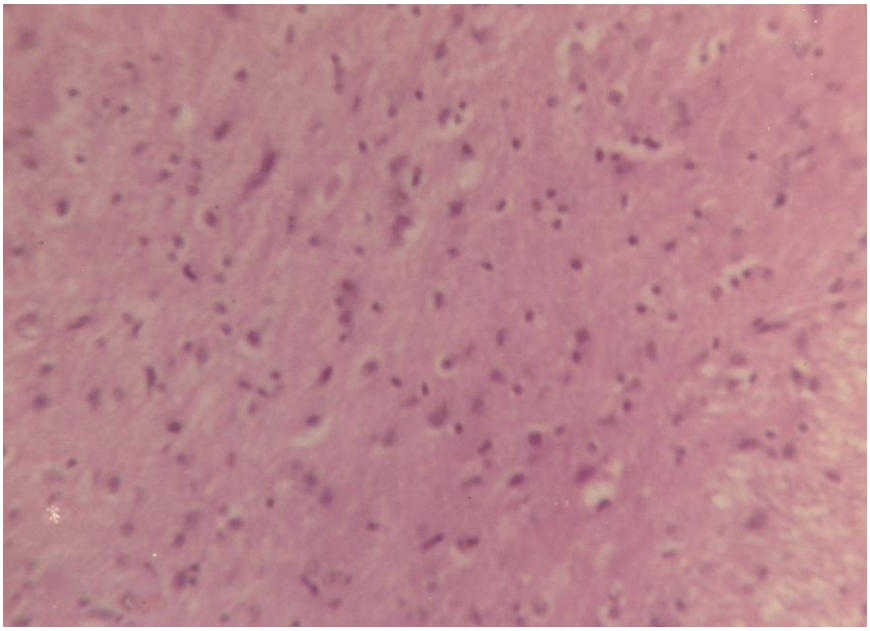

Fig. 1

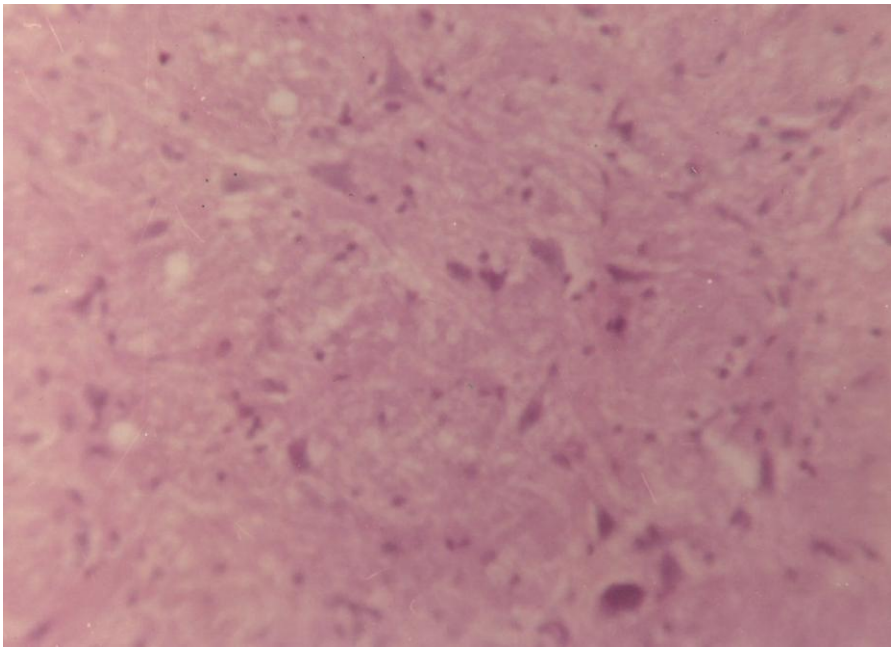

Fig. 2

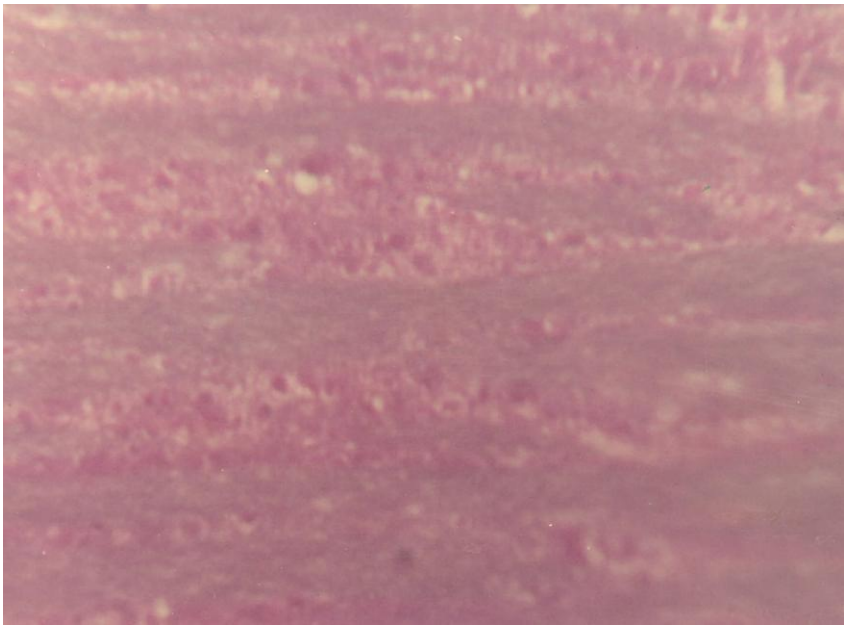

Fig. 3

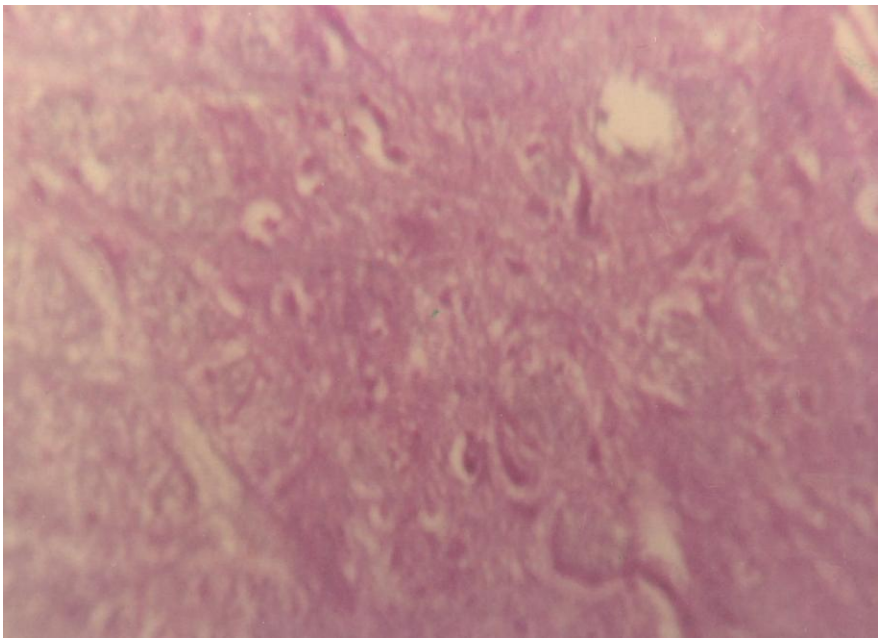

Fig 4

Conclusion

Exposure of rat to gentamicin for three weeks produces some demonstrable microscopic changes in the pons.

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