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Short Communication

HISTOLOGICAL STUDIES ON THE PINEAL GLAND OF THE HORSE

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SUMMARY

The pineal gland studied in 6 young horses revealed a dense capsule giving rise to trabeculae which divided the pineal parenchyma into small lobules separated by glial zones. The pinealocytes constituting the majority of parenchyma were densely packed towards the periphery and showed different patterns of arrangement in rest of the parenchyma. The glial cells localized mainly to the glial zones were categorized into 4 types on the basis of nuclear morphology. Melanin containing cells and mast cells were irregularly distributed in between the pinealocytes and glial regions. A moderate PAS reaction was observed in the cytoplasmic processes of the pinealocytes and the glia cells.

Key words: Pineal gland, pinealocytes, glial cells, horse

The pineal gland or epiphysis cerebri located in the sub-pineal fovea present between thalamus and two rostral colliculi of corpora quadrigemina has no definitive functional significance. However, it contains an enzyme hydroxy-indole-o-methyl transferase which helps in formation of melatonin (Wurtman *et al*., 1963). The pineal hormone also acts as an antigonadotrophic factor by inhibiting release of pituitary gonadotrophins (Roth *et al*., 1962). The structure of pineal gland has been studied in buffalo (Rao and Saigal, 1971, Prasad and Singh, 1977), goats (Sharma *et al*., 1980, Kumar *et al*., 1995) and sheep (Saggar *et al*., 2001). The paucity of literature in horses led to pursue this study to explore histoarchitecture of pineal gland in young horses.

The pineal glands were collected from 6 young horses immediately after their death by exposing the brain. The tissues fixed in 10% neutral buffered formalin were processed for paraffin technique to make sections of 5-6 µ and stained with routine Harris hematoxylin and eosin stain, Gomori's method for reticular fibres, Weigert's method for elastic fibres, Bielschowsky's method for nerve fibres, Toluidine stain for mast cell, Kossa's method for calcium, McManus' method for glycogen (Luna, 1968) and Crossman's trichrome stain for collagen fibres (Crossman, 1937).

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The oval shaped pineal gland of the horse was surrounded by a dense capsule having a simple cuboidal epithelial lining and a loose irregular arrangement of collagen and reticular fibres and fine blood vessels (Fig 1). The epithelial lining varied from simple squamous to stratified cuboidal in goat (Kumar *et al*., 1995). The trabeculae of connective tissue penetrated and divided the parenchyma into small lobules comprising of pinealocytes, glia cells, glial fibres, blood vessels and nerve fibres (Fig 2). The dense cellular component in sub-capsular portion was delineated from the rest of the parenchyma giving an impression of cortex as reported in goat (Sharma *et al*., 1980). A distinct outer cortex and a bulky medulla had been reported in the pineal of ox (Jayatilaka, 1970, Jain and Koranne, 1976). Whereas, the pinealocytes arranged in a narrow zone at the periphery and a syncytium like pattern towards the centre of the pineal gland had been reported in buffalo calves (Lalitha and Seshadri, 1986). The ventral portion of the pineal attaching to habenular and posterior commissures was sparsely populated by the cells especially the glia cells in the horse (Fig 3).

The pinealocytes constituting main bulk of the parenchyma were arranged uniformly in irregular cords, rosettes or follicles and were of two types. Type-I pinealocytes had round to oval nuclei with fine uniform distribution of chromatin towards

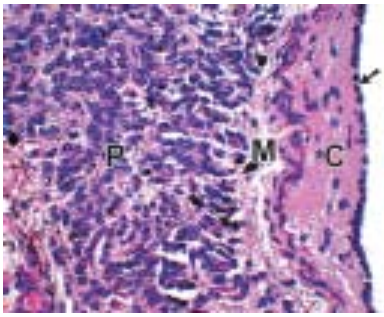

Fig 1. Photomicrograph of the pineal gland showing capsule (C) and denser arrangement of parenchymal cells towards periphery. Note cuboidal epithelial lining (arrow), pinealocytes (P) and melanin containing cells (M). (H. & E. x 400)

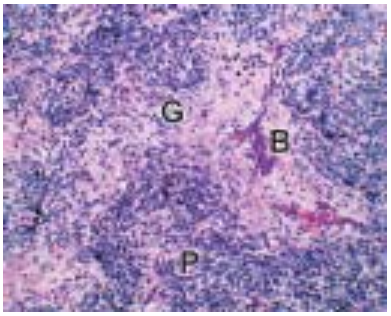

Fig 2. Photomicrograph showing pineal parenchyma dividing into small lobules by trabeculae. Note presence of pinealocytes (P), glia cells (G) and blood vessels (B). (H. & E. x 100)

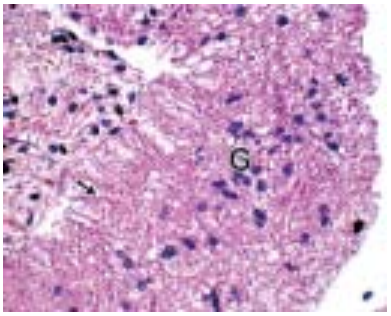

Fig 3. Photomicrograph showing the ventral portion of the pineal gland attaching to habenular and posterior commissure. Note sparsely populated glia cells (G) and glial zone having mesh work of glia fibres (arrow). (H. & E. x 400)

outer nuclear membrane giving a vacuolar appearance to rest of nucleoplasm (Fig 4). Their nuclei contained one or more centric/eccentric nucleoli. A few pinealocytes having dense arrangement of chromatin towards the centre of nuclei and masking the nucleoli were considered type-II pinealocytes which may be representing some physiological stage (Fig 4). The latter has been called dark pinealocytes in the goat because of presence of a uniform distribution of chromatin material (Kumar *et al*., 1995). Both the types of pinealocytes possessed fine eosinophilic cytoplasmic processes.

The clusters or lobules of pinealocytes were separated from each other by glia zones where 4 types of glia cells were identified as reported in the goat (Kumar *et al*., 1995). Type-I glial cells had round to oval nuclei similar to those of pinealocytes and showed irregular distribution of fine chromatin towards the periphery of nuclear membrane (Fig 5). Their cytoplasmic processes were more eosinophilic than those of

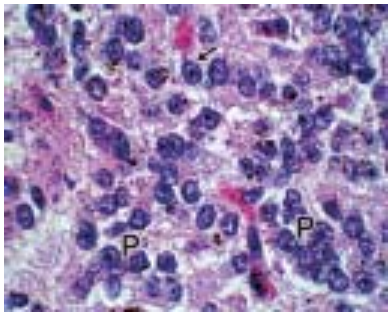

Fig 4. Photomicrograph showing type-I (P) and type-II (arrow) pinealocytes. (H. & E. x 1000)

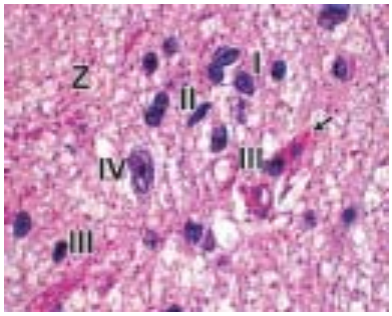

Fig 5. Photomicrograph showing type-I (I), type-II (II), type-III (III) and type-IV (IV) glia cells. Note tufts of glia fibres (Z) and fine blood capillary (arrow). (H. & E. x 1000)

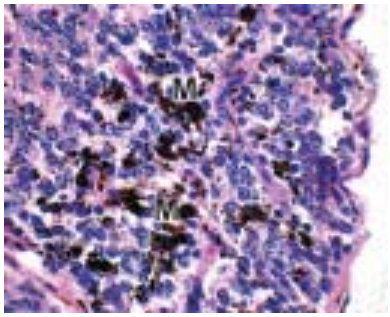

Fig 6. Photomicrograph showing large number of melanin containing cells (M) towards the periphery of the gland. (H. & E. x 400)

others. Type-II glial cells contained oval or elongated nuclei with fine homogeneous distribution of chromatin material. The nuclei of type-III glial cells were irregular shaped, smallest in dimensions and strongly basophilic due to dense arrangement of chromatin. Only a few cells having very large size but less basophilic nuclei were considered as type-IV glial cells (Fig 5). The type-I glial cells predominated over other glia cells. These glia cells were irregularly distributed without any relationship except type-III glial cells which were mainly associated with fine blood capillaries.

The glia cells have been characterized into astroglia, microglia and oligodendroglia cells in the goat (Sharma *et al*., 1980). However, the glia cells had been divided into three types in buffalo calves on the basis of number of processes (Lalitha and Seshadri, 1986). The fibrous processes of these glia cells intermingled with each other and constituted a comparatively denser arrangement of glia zone (Figs 3, 5). A moderate PAS reaction was observed in the processes of the pinealocytes and the glia cells. Melanin containing cells were irregularly distributed amongst pinealocytes and glia cells with their increased numbers towards the periphery of the gland (Fig 6) as reported in goat (Saigal *et al*., 1976). However, these cells had been reported absent in another study in young goats (Kumar *et al*., 1995). In addition mast cells with metachromatic granules, a few nerve bundles and blood vessels were also present. Calcium and corpora arenacea were not observed in the present study.

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