PATHOLOGY OF ENDOCRINE SYSTEM, EYES AND EAR

- Pathology of Endocrine System
  - Pathology of Hypothalamus
  - Pathology of Pituitary
  - Pathology of Thyroid
  - Pathology of Parathyroid
  - Pathology of Adrenal glands
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- Pathology of Ear
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PATHOLOGY OF HYPOTHALAMUS
The lesions in hypothalamus may cause diabetes insipidus characterized by polydipsia and polyuria with low specific gravity of urine. It occurs due to deficiency of antidiuretic hormone vasopressin.

Etiology/ Occurrence
- Lesions in hypothalamus and/or pituitary
- Adenoma and adenocarcinoma of pituitary
- Necrosis of hypothalamic nuclei due to larval migration

PATHOLOGY OF PITUITARY GLAND
HYPERPITUITARISM
Hyperpituitarism is increased secretion of hormone(s) from pituitary gland such as excessive secretion of somatotropic hormone may cause gigantism characterized by increased length of long bones, heavy and thick bones leading to large hands, feet, skull bones (acromegaly). Hyperpituitarism also increases adrenal cortical stimulating hormone leading to hyperplasia of adrenal cortex. Pituitary adenoma or adenocarcinoma is responsible for hyperpituitarism.

HYPOPITUITARISM
Hypopituitarism is decrease in pituitary hormone secretions due to atrophy, aplasia or hypoplasia of pituitary. Systemic diseases such as meningitis of bacterial or viral origin may also cause lesions in pituitary e.g. infectious canine hepatitis, hog cholera. It is characterized by dwarfism, genital hypoplasia and prolonged gestation period.

PATHOLOGY OF THYROID
HYPERTHYROIDISM
Hyperthyroidism is increased activity of thyroid gland leading to increased production of thyroxin characterized by tachycardia, increased basal metabolic rate, bulging of eyeballs and early maturity. It occurs due to presence of tumor in thyroid. Other signs included polydipsia, polyuria, and loss of weight, weakness, fatigue and hyperthermia.

HYPOTHYROIDISM
Hypothyroidism is reduced activity of thyroid gland characterized by decreased basal metabolic rate, obesity, retardation of growth and sexual development leading to cretinism. In adult, it is characterized by myxomatous mucoid degeneration in subcutaneous region giving floppy and oedematous appearance. Hypothyroidism is caused by aplasia or hypoplasia of thyroid gland.

Goiter
Goiter is enlargement of thyroid gland, which may be accompanied by hypo- or hyperthyroidism. The enlargement of thyroid is due to hyperplasia, inflammation, or proliferation of connective tissue. The hyperplasia of gland is characterized by increased height and number to epithelial cells in acini of gland. It may be caused by deficiency of iodine, thiouracil toxicity and by use of goiterogenic substances such as soybean and cabbage. The goiter has been classified into 6 forms described as under:

Hyperplastic goiter
Due to iodine deficiency, there is hyperplasia of thyroid gland with reduction in thyroxin production. It occurs due to increased level of thyrotropic hormone from pituitary gland.

Familial goiter
There is hyperplasia of thyroid gland with reduced thyroxin secretion caused by defective or absence of enzymes responsible for thyroxin synthesis. It is not related with iodine deficiency but have congenital basis of occurrence

Colloid goiter
Colloid goiter is enlargement and distention of acini filled with colloid and flat epithelium caused by deficiency of iodine.

Adenomatous goiter
This is characterized by nodular enlargement of thyroid gland, with one or many hard nodules of variable in size and are characteristic adenoma of gland.
Fig. 21.1. Photograph showing conjunctivitis in pigeon due to poxvirus infection.

Fig. 21.2. Photograph showing conjunctivitis in pigeon due to poxvirus infection.

Fig. 21.3. Photograph showing mucopurulent discharge from eyes due to mallein test in horse.

Fig. 21.4. Photograph showing mucopurulent exudate in eye.

Fig. 21.5. Photograph showing iridocyclitis.

Fig. 21.6. Photograph showing cataract.

Fig. 21.7. Photograph showing corneal opacity.

Fig. 21.8. Photograph showing otitis externa in pig.
Toxic goiter
Toxic goiter is characterized by exophthalmus due to hyperthyroidism, enlargement of thyroid due to hyperplasia, and occurs as a hypersecretion of thyrotropic hormone from pituitary.

Equine goiter
Equine goiter is caused by excessive iodine levels in feed and occurs in new born foals with weakness from a goiterous mare. These foals are having enlarged thyroid gland.

LYMPHOCYTIC THYROIDITIS
Lymphocytic thyroiditis is characterized by infiltration of lymphocytes in gland causing destruction and is caused by autoimmune mechanism. The infiltration of lymphocytes is so severe that gives lymphofollicular appearance.

PATHOLOGY OF PARATHYROID GLAND
HYPOPARATHYROIDISM
Hypoparathyroidism is decreased activity of parathyroid gland characterized by decreased concentration of blood calcium and tonic spasms of muscles. It occurs due to infection, neoplasms, low calcium diets and hypersecretion of thyrocalcitonin.

HYPERPARATHYROIDISM
Hyperparathyroidism is the increased activity of parathyroid gland characterized by weakness, polydipsia, polyurea, hypercalcemia nephrocalcinosis, demineralization of bones, metastatic calcification in soft tissues and fibrous osteodystrophy. It may occur in adenoma or adenocarcinoma of parathyroid and hyperplasia of gland. Hyperparathyroidism is also associated with renal disease and chronic hypocalcemia to produce more parathormone hormone.

PATHOLOGY OF ADENAL GLANDS
HYPOADRENOCORTICISM
Hypoadrenocorticism is decreased activity of adrenal cortex characterized by atrophy, necrosis and decreased hormones leading to low blood pressure, decreased blood volume, hypoglycemia, gastrointestinal malfunction and hyperpigmentation in skin. It may occur in tuberculosis, histoplasmosis, amyloidosis, neoplasms and drug toxicity.

HYPERADRENOCORTICISM
Hyperadrenocorticism is increased activity of adrenal cortex characterized by hyperplasia and neoplasia of the gland leading to alopecia, muscle weakness, pendulous abdomen, obesity, polyuria, polydipsia, lymphopenia, eosinophilia, neutrophilia and excessive secretion of 17-ketogenic steroids.

PATHOLOGY OF PANCREAS
Pancreatic islets or islets of Langerhans’ are responsible for production of insulin, deficiency of which may cause hyperglycemia or diabetes mellitus. It is characterized by polyuria, glycosuria, hyperglycemia, polydipsia, loss of secretory granules in β-cells of pancreatic islets. It is caused by inflammation of pancreas causing exocrine pancreatitis. This condition may lead to arteriosclerosis in blood vessels of animals.

PATHOLOGY OF PINEAL GLAND
The pineal gland is responsible for secretion of melatonin hormone which inhibits gonadotropic hormone synthesis and release by pituitary and thus plays an important role in seasonal estrus/reproductive capacity of animals. Degeneration and necrosis of gland may cause its decreased function but are not well reported. Adenoma of gland may be associated with increased sexual libido and activity.

PATHOLOGY OF EYE
Blepharitis is the inflammation of eyelids while conjunctivitis is used to describe the inflammatory condition of conjunctiva and keratitis for cornea. Inward turning of eyelid is known as entropion which may result in keratitis or conjunctivitis. Conjunctivitis is also caused by double row of eye lashes (discichiasis).

DEVELOPMENTAL ANOMALIES
Aphakia is the absence of lens.
Microphakia is the small size of lens. Hypoplasia of optic nerve is underdeveloped optic nerve with absence of optic nerve layer and ganglion cell layer of retina. Agenesis of optic nerve is absence of optic nerve. Coloboma is the congenital defect in the continuity of one of the tunics of the eye i.e. iris. Congenital anophthalmos is the absence of the eye which may occur due to vitamin A deficiency in dam. Congenital microphthalmos is the decreased size of eyes and may occur due to maternal vitamin A deficiency. Congenital opacity of cornea occurs in cattle and dogs due to effect of inherited recessive gene trait. Hemeralopia is day blindness which may occur in dogs due to single autosomal recessive gene.

KERATOCONJUNCTIVITIS
Keratoconjunctivitis is the inflammation of cornea and conjunctiva characterized by congestion of eyes, blindness, opacity and corneal oedema (Fig 21.1 to 21.7).

Etiology
- Penetrating foreign objects e.g. Awns of wheat
- Moraxella bovis
- Mycoplasma spp.
- BHV-1, poxvirus
- Rickettsia conjunctivae
- Chlamydia spp.
- Thelazia spp.
- Allergy

Macroscopic features
- Congestion of conjunctiva leading to redness “pink eye”.
- Oedema, pain
- Increased lacrimation (Decreased lacrimation also causes conjunctivitis)
- Corneal opacity

CATARACT
Cataract is opacity of lens and is classified as under:

Subcapsular cataract is the opacity of lens due to abnormal proliferation of lens epithelium in anterior end as a result of injury. Posterior polar cataract is opacity of lens due to abnormal growth of lens epithelium at posterior face of lens. Cortical cataract is opacity of lens due to disorganization of the lens fibers. Nuclear cataract is the increased density of fibers of lens at the centre and occurs in old animals. Morgagnian cataract is the liquefaction of cortical substance and has not been observed in animals. Congenital cataract is seen in neonatal animals and occurs due to failure of closure of primary lens vesicle at the periphery of lens vesicle and is associated with chediak-Higashi syndrome.

RETINITIS
Retinitis is the inflammation of retina caused by trauma, iritis, iridocyclitis and choroiditis. When it is associated with inflammation of choroids, it is known as chorioretinitis. It may lead to detachment of retina. Iritis is inflammation of iris. Iridocyclitis is the inflammation of iris and uvea. Choroiditis is inflammation of choroid plexus. The chorioretinitis is characterized by glaucoma occurs in canine distemper, feline panleukopenia, toxoplasmosis, tuberculosis, coccidioidomycosis, deficiency of vitamin A and bracken fern poisoning.

GLAUCOMA
Glaucoma is the intraocular hypertension due to occlusion of the filtration angle and is caused by trauma, iridocyclitis, intraocular haemorrhage and neoplasm. It may be unilateral or bilateral. It is characterized by enlargement of eye ball, opaque cornea and increase aqueous humor.

PATHOLOGY OF EAR
OTTITIS EXTERNA
Otitis externa is inflammation of external ear caused by Actinomycyes bovis, parasites and fungus and characterized by granulomatous inflammation (Fig. 21.8).
Etiology

- Actinomyces bovis
- Psoroptes communis - mite
- Otobius megnini - tick
- Fungi - (otomycosis)
- Grass of wheat awns

Macroscopic features
- Swelling and congestion leading to obstruction of ear canal.
- Excessive production of thick, tenacious and brownish wax.
- Granulomatous lesions filling the external auditory meatus

Microscopic features
- Granulomatous lesions of actinomycosis in subcutaneous region around the cartilage.

OTITIS MEDIA

Otitis media is inflammation of middle ear including tympanic cavity and eustachian tube.

Etiology
- Infections from otitis externa or nasopharynx
- Mites
- Awns of wheat
- Pasteurella spp.

Macroscopic features
- Occlusion of eustachian tube
- Purulent inflammation

Microscopic features
- Suppurative inflammation

OTITIS INTERNA

Otitis interna is the inflammation of inner ear including membranous and osseous labyrinth. This is also known as labyrinthitis.

Etiology
- Infection from otitis media
- Mycoplasma spp.
- Mumps
- Measles

Macroscopic features
- Disturbance in equilibrium
- Deafness

Microscopic features
- Suppurative inflammation

MODEL QUESTIONS

Q.1. Fill in the blanks with suitable word(s).
1. Pathological lesions in hypothalamus may cause..............characterized by.............. and ..............with low specific gravity of............... 
2. Hyperpitutarism is excessive secretion of..............hormone which may cause..............characterized by.............., ..............leading to large.............., ..............and............... 
3. Goiter is...............of thyroid gland accompanied by...............or............... 
4. Hypoparathyroidism is characterized by...............and...............and caused by..............., .............., ..............and...............secretion of thyrocalcitonin. 
5. Hypoadrenalism may occur in..........................and............... 

Q.2. Write true or false against each statement. Correct the false statement.
1. Hypoadrenocorticism may cause lymphopenia.
2. Disctichiasis is protrusion of eyelid.
3. Moraxella canis causes pink eye.
4. Diabetes mellitus is related with insulin deficiency.
5. ..........Hemeralopia is night blindness
6. ..........Aphakia is absence of eyelid.
7. ..........BHV-1 virus is responsible for keratoconjunctivitis.
8. ..........Iridocyclitis is inflammation of iris and lens.
9. ..........Bracken fern poisoning may cause chorioretinitis
10. ..........Cretinism is related with hypothyroidism.

Q. 3. **Define the followings.**

1. Aphakia
2. Disctichiasis
3. Labyrinthitis
4. Glaucoma
5. Conjonctivitis
6. Microphakia
7. Retinitis
8. Lymphocytic Thyroditis
9. Iritis
10. Keratitis
11. Hyperthyroidism
12. Iridocyclitis
13. Coloboma
14. Gigantism
15. Hemeralopia

Q. 4. **Write short notes on.**

1. Goiter
2. Cataract
3. Pink eye
4. Otitis externa
5. Hyperparathyroidism

Q. 5. **Select most appropriate word(s) from the four options given against each statement.**

1. Metastatic calcification occurs in.................
   (a) Hyperthyroidism    (b) Hyperparathyroidism    (c) Hypothyroidism    (d) Hypoparathyroidism
2. Goiter is related with.................
   (a) Hyperthyroidism    (b) Hyperparathyroidism    (c) Both a & b    (d) None
3. Otitis media is the inflammation of middle ear including.................
   (a) Tympanic cavity    (b) Eustachian tube    (c) Both a & b    (d) None
4. Disturbance in equilibrium occurs in animals with disease of.................
   (a) External ear    (b) Eyes    (c) Middle year    (d) Inner ear
5. Glaucoma is caused by.................
   (a) Neoplasm    (b) Trauma    (c) Haemorrhage    (d) All of above
6. *Thelazia* spp worms may cause.................
   (a) Keratocojunctivitis    (b) Microphakia    (c) Aphakia    (d) Coloboma
7. Cleft in iris is known as.................
   (a) Iritis    (b) Microphakia    (c) Aphakia    (d) Coloboma
8. Equine goiter is caused by.................
   (a) Iodine deficiency    (b) Iodine excess    (c) Cabbage    (d) Radiation
9. Exophthalmos is a feature of................. goiter
   (a) Colloid    (b) Adenomatous    (c) Toxic    (d) Familial
10. Acromegaly is caused by.................
    (a) Hyperpituitarism    (b) Hypopituitarism    (c) Hypothyroidism    (d) Hyperthyroidism