The current study was carried out to investigate both morphological and histochemical features of pineal gland in goat. Eight samples of pineal glands were used. The morphological study was involved the position, relation, weight, length and width of the glands. The tissue sections were prepared for paraffin embedding technique and stained with Hematoxyline & Eosin, Masson trichrom, Alizarin and PAS stains. The morphological result of pineal showed slightly irregular round-spherical shaped, grayish white in color. It located in the same mid-depression between the thalami body and two colliculi. The weight of gland was 0.478±0.02 mg and measured 2.10±0.06mm in length and 2.52±0.15mm in width. Histologically, the pineal gland has enveloped by a smooth thin layer of loose connective tissue capsule showed less trabiculae that carried the blood vessels into gland and the trabiculae have composed of fine collagen fibers. The glandular parenchyma showed marked lobular pattern of division with marked lighter central region which showed less cellular population. The glandular lobule consisted of three types of cells; Type I pinealocytes or dark pinealocytes, the second type was the less populated type II pinealocytes or light pinealocytes and the third type was the glial cell. The Alizarin stain was revealed multiple of variable size calcium patches within collagen fibers. The cytoplasmic contents of both pinealocytes types I & II showed no glycogen granules.

**Keywards:** Pineal Gland, Pinealocytes, Goat, Glial Cells, Histochemical.
Introduction

A pine cone shaped gland belonging to the endocrine system is the pineal gland. It is situated on the midline of the cerebrum, connected to the third ventricle's posterior end of the roof. (1&2). It is found to be situated below the cerebral hemispheres laterally. It tends to appear in front of the cerebellum as a slight grayish hump. The gland varies in size among species; it is around 1 cm in length for camels and humans. (3,4 and 5). Whereas it is much smaller in dogs, it is not longer than 1 mm. (6), The pineal gland produces several important hormones including melatonin. Melatonin influences sexual development and sleep-wake cycles. The pineal gland is a small endocrine gland in the brain of most vertebrates shaped like a pinecone, the pineal gland located in the midbrain and it's caudal part is almost in contact with the third ventricle (7). This gland in mammals is a neuroendocrine organ that exhibits a circadian rhythmicity in its secretion of hormone melatonin (8, 9, 10, 12, 13 and 14). The gland is composed of pinealocytes, astrocytes and glial cells (15). Pineal gland acts as neuroendocrine glands which secrete melatonin and other enzymes that help to regulate the animal's circadian rhythm.

Materials and methods

Eight samples of pineal glands of healthy adult goat (1.5-2 years) were used for this study. The animals' heads were immediately removed of the carcass after slaughter and brains were dissected for achieving the following pineal glands position and relation. Then the glands were removed out to record the morphological parameters; length, width by vernia caliber, weight by digital electronic balance and color. For histochemical study the samples of pineal glands were immediately washed up with normal slain and fixed with neutral buffer formalin 10% (16). The specimens were processed as the paraffin embedding technique. The tissues were sectioned at 5µm by rotatory microtome and the tissue sections were stained with Hematoxyline & Eosin, Masson trichrom to demonstrate the type of connective tissue, Alizarin stain for detection the calcium deposition and PAS stain for detection the presence of intra cytoplasmic glycogen content. The morphological images were examined by stereo microscope and histological images were captured by digital camera 5 Mega pixel, Future Win Joe China.

Result and Discussion

Morphologically, goats pineal had slightly irregular round-spherical shaped, grayish white in color and were located in the mid-depression between the thalami body and two colliculi. The thalamic body "Massa" represented the anterior border of the pineal gland while the superior coliculus and inferior coliculus were represented the caudal border of the pineal gland. Dorsally the pineal gland was covered by the splenuim of the corpus callosum (fig.1 & 2). This result was differing from other animals like buffalo which have pea-shape according to (18) weather in horses &camels it was fusiform in shape (19 and 20) in the human pineal gland have a pine-shaped according to (21).According to Rasha et al., (2016) and Vollrath (1981) the tonsillar-like aspect differs from the general bat-shape found in rodents. Branco (1997) showed that doges pineal gland shaping from conic to tongue-like (concerning the human tongue). With regarded to the location our study showed that the pineal gland in the deep mid-depression between the thalami body and two colliculi and this generally agree with all studies on mammals (18, 19 and 24).). In local breed goat the mean weight of gland was 0.478±0.02 mg and measured 2.10±0.06 mm in length and 2.52±0.15mm in width, the pineal gland weight of goat was smaller than what noticed by other researchers whom study on Buffalo, camel and horse and more heavily than another animals like fox, dog and
The size of pineal gland in local breed goat was closely related and was between (2.52-2.73mm) this result was the first study for illustration of morphology of pineal gland, there’s no studies on large scale except very little papers restricted morphometric data of a few species of animals most studies where found on human (27) and large ruminant (28). Also recent studies was very few concerning morphology of pineal gland (29), so the comparison between morphology in general have a very difficult distinct and this is due to the large differences between sizes of animal.

Histologically, the pineal gland in goat was enveloped by thin layer of loose connective tissue capsule of pia matter which revealed fewer trabeculae. The insertion of trabeculae into glandular parenchyma was showed fewer of glandular surface indentations with marked nerve stalk. The Inserted of trabeculae were carried the blood vessels into gland and have composed of fine collagen fibers (fig. 3 & 4). This result was differing from another animals like buffalo the gland which is covered with dense capsule that infiltrates the entire parenchyma with their trabeculae according to (25), but in donkey the gland is surrounded by well vascularized connective tissue capsule and the greater part of blood vessels are seen in the trabeculae of the of the connective tissue (24). In foals the gland connective tissue is denser compared to that adult horses (19), but in camel the pineal gland is surrounded by thick fibrous connective tissue capsule according (20).

The parenchyma of the goat's pineal gland was showed marked lobular pattern of division with marked lighter central region which showed less cellular population (fig. 5). The glandular lobule of goat pineal gland was more obvious and there were marked demarcation among the lobule that related for less of cellular population of pinealocytes (fig.6). This result was similar that recorded by (20) in female camel cells of pineal glands are ovoid to round shape and appeared light to dark brown in color. The current result was showed three types of cells in the pineal gland; Type I-pinealocytes (Dark pinealocytes) which were irregularly shaped with peripheral processes, type II-pinealocytes (Light pinealocytes) which were had large round nuclei the third type of cell was the neuroglia cells or interstitial cells (glial cells) which were possessed round, oval or cone-shaped nucleus with round or oval strongly basophilic nuclei, or elongated nuclei closely associated with the blood capillaries and a few cells with large nuclei (fig.7). This result was similar that recorded by (20) in female camel, also some of these cell showed a higher amount of pigment content in their cytoplasm according to viscacha, (30), and showed 2 types of cells one which have around or oval nucleus contained prominent nucleolus (type I cells or pinealocytes of population I), presented an irregular shaped nucleus (type II cells or pinealocytes of population II). Light dark pinealocytes distinguished with in type I cell. Some of glial cells and pigmented cells are also observed. The pineal parenchyma of the pregnant females presented major amount of dark pinealocytes according to viscacha (31). The pinealocytes had large round nuclei with a remarkable loose chromatin and a weak basophilic cytoplasm, while typical astrocytes intermingled them according to (32). So in goat agree with the idea about the unique behaviors that seen in camels have especially that concerning to some physical properties (20). Also the goat pineal gland cytoarchitecture were similar that seen in bird (turkey pineal gland) which consist of 3 types of cells (33). In the albino rat cells differs from small cells with little cytoplasm and small darkly stained nuclei to large cells with abundant cytoplasm & large pale nuclei with prominent nucleioli according to (34). The results showed multiple of variable size calcium patches within glandular parenchyma and the magnified section revealed oval concentrated calcium particles between pinealocytes and
within collagen fibers (fig. 8 & 9). The result of PAS stain showed that the cytoplasmic contents of both pinealocytes types I & II showed no glycogen granules (fig.10). Goat's pineal gland had the pineal stalk which has composed of dense nerve tract enclosed by pia matter (fig.11).

Figure 1; Sagittal section of brain goat shows: cerebellum (C). Cerebrum (Ce). Medulla oblongata (Mo). Thalamic body 'Massa' (Th). Superior colliculus (Sc). Inferior colliculus.

Figure 2; Macrograph of goat pineal gland after dissecting and removing from brain

Figure 3: Histological section of the goat pineal gland shows: less of capsule indentations (Black arrows) & pineal gland stalk (St). H&E

Figure 4: Histological section of the goat pineal gland shows: thin pia matter capsule (Black arrows). H&E stain. 400x

Figure 5; histological section of the goat pineal gland shows: lighter central region (Lr), dark pinealocytes (Black arrows), light pinealocytes (Red arrows) and glial cells (Blue arrow). H&E stain. 400x

Figure 6: Histological section of goat pineal gland capsule shows: lobule (Black arrow) & thin trabeculae (Red arrows). H&E stain. 100x
Figure 7; Magnified histological section of goat pineal gland shows: Dark pinealocytes (Black arrows), light pinealocytes (Red arrows) & glial cells (yellow arrow) H& E stain. 400x

Figure 8; histological section of goat pineal gland shows: multiple small of variable size calcium patches (Arrows). Alizarin stain. 40x.

Figure 9; histological section of goat pineal gland lobule shows: multiple small of variable size calcium patches (Black arrow), pinealocytes (red arrow) trabecula (T). Alizarin stain. 400x.

Figure 10; histological section of goat pineal gland lobule shows: No intracytoplasmic glycogen granules within pinealocytes type I&II (Arrows), trabeculae (T). PAS stain. 400x.

Figure 11; histological section of goat pineal gland stalk shows: pia matter (Pm), blood vessels (Bv), nerve tract (Nt). H&E stain. 400x.
Conclusions

The pineal gland of goat was similar to that other special with small ruminant with limited morphometric differences.

References

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