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Evaluation of Prevalence of the Types of Thyroid Disorders Using Ultrasound and Pathology of One Humped Camel in Iran (*Camelus dromedarius*)

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***Abstract*—**The thyroid gland is the largest classic endocrine organ that effects many organs of the body and plays a significant role in the process of Metabolism in animals. The aim of this study was to investigate the prevalence of thyroid disorders diagnosed by ultrasound and microscopic Lesions of the thyroid during the slaughter of apparently healthy One Humped Camels (*Camelus dromedarius*) in Iran. Randomly, 520 male camels (With an age range of 4 to 8 years), were studied in 2012 to 2013. The Camels' thyroid glands were evaluated by sonographic examination. In both longitudinal and transverse view and then tissue sections were provide and stained with H & E and finally examined by light microscopy. The results obtained indicated the following: hyperplastic goiter (21%), degenerative changes (12%), follicular cysts (8%), follicular atrophy (4%), nodular hyperplasia (3%), adenoma (1%), carcinoma (1%) and simple goiter colloid (1%). Ultrasound evaluation of thyroid gland in adenoma and carcinoma showed enlargement and irregular of the gland, decreased echogenicity, and the heterogeneous thyroid parenchyma. Also, in follicular cysts were observed in the enlarged gland with no echo structures of different sizes and decreased echogenicity as a local or general. In nodular hyperplasia, increase echogenicity and heterogeneous parenchymal were seen. These findings suggest the use of sonography and pathology as a screening test in the diagnosis of complications of thyroid disorders.

***Keywords*—**One humped camel, pathology, sonography, thyroid gland.

I. Introduction

THE thyroid gland is the largest classic endocrine organ which exude triodothyronine, thyroglobulin and thyroxin hormones, that effects many organs of the body and plays a significant role in the process of metabolism in animals [1], [2]. Thyroxin plays a significant role in metabolic activities of the animal body. The most outstanding characteristic of the vertebrate thyroid gland is its skill to concentrate large total of iodine for the synthesis of thyroxin and its disorders [2]. Thyroid hormones are involved in thermoregulation of the body. In cooperation by other hormones, it raises the body temperature via oxidant of fat, CHO and protein and release heat [2]. Ultrasonography can be used as a screening test in the early evaluation of the patient; the results of other diagnostic procedures can be used to confirm its findings which could lead to more correct diagnosis [3]. The use of sonography and pathology of the thyroid can improve the diagnosis of patients with thyroid adenoma or carcinoma, parathyroid hyperplasia and primary producer or neoplastic disorder. Ultrasonography and pathology of the thyroid gland in animals such as sheep [4], [5], goats [6], cows [6] and cat [7], as well as in humans [8] have been studied. Few studies have been done about histological and anatomical characteristics of camel thyroid glands in Iran [9], and no studies have been done about the use ultrasound and pathology for diagnosing thyroid disorders in One Humped Camel in Iran. The present study was conducted to investigate the use of ultrasonography and pathology in the diagnosis of thyroid disorders of One Humped Camel (*Camelus dromedarius*) with the aim to evaluate the types of thyroid complications.

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II. Materials and Method

A. Sample Collection

This study was performed in the local abattoir of Najaf-Abbad, Esfahan province, central part of Iran from 2012 to 2013. In this abattoir, ruminants including sheep, goats, cattle and camels are slaughtered daily. The camels originated from east, south and south-east parts of Iran areas with warm, dry and windy weather. For this study, 520 thyroid glands of slaughtered one humped camel (*Camelus dromedarius*) (4 to 8 years old) were randomly inspected and specimens were taken for macroscopic and histopathological study.

B. Ultrasonography Investigation

The thyroid gland, in the view of the longitudinal and cross-section using an ultrasound device (EX8000 Medison Ultrasound system) and linear transducer with frequency 7-9 MHz were studied Document Modification

C. Pathological Investigation

At the beginning of the thyroid tissue for longitudinal and transverse cross-section for different thyroid glands were examined macroscopically. The collected samples of the thyroid glands were fixed in 10% neutral buffered formalin (for period of 48 h) for histopathological examination. The samples were then dehydrated in graded ethanol and embedded in paraffin wax. Sections of 5 μm in thickness were stained with hematoxylin and eosin (H&E) and then examined by an ordinary light microscopy.

D. Ultrasonography Investigation

The data were entered, organized and grouped in the Microsoft Excel 2010. Data analysis was computed by using

SPSS/PC-16.0 statistical software (SPSS Inc. Chicago, IL).

III. Results

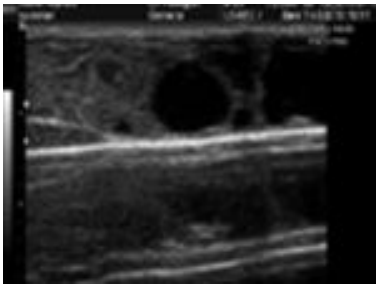

Fig. 1 There are anechoic structure (multiple cyst) with different size

Fig. 2 Diffuse decreased echogenicity and heterogeneous parenchyma of thyroid gland

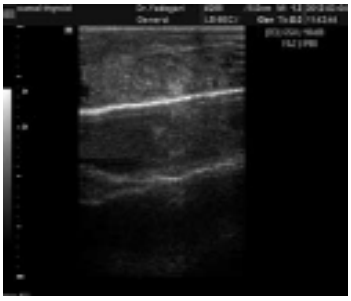

Fig 3 Nodules of the thyroid with hyper-echoic and heterogeneous echogenicity

Fig. 4 Local increased echogenicity

Ultrasound of the normal thyroid parenchyma showed uniform reflection and echogenic. In symptoms such as carcinoma and adenoma, enlargement of the gland often with reduced echogenicity and a heterogeneous range of irregular thyroid parenchyma were observed. Also thyroid enlargement in follicular cystic areas, without echo structures with different sizes and decreased, reduced the echogenicity for regional or general, hyperplasia nodular, increased echogenicity and being a heterogeneous parenchyma (Figs. 1-4).

In this study the major lesion of the thyroid gland was, the diffuse hyperplastic goiter with an abundance of 19%. Grossly, thyroid glands were enlarged uniform throughout the thyroid lobes. Follicles were irregular in size and shape and contained varying amounts of eosinophilic and vacuolated colloid. Some follicles were lack of colloid and collapsed. The follicles were covered by single or multiple layers of hyperplastic epithelial cells and formed papillary projections into the lumens (Fig. 5).

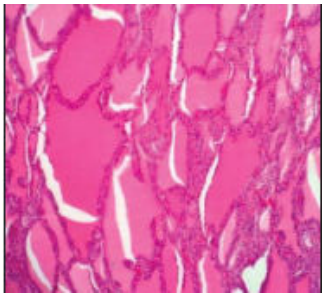

Fig. 5 The follicles are irregular size and shape, and covered by single or multiple layers of hyperplastic epithelial cells. Papillary projections of hyperplastic epithelium are visible in the follicular space (H&E, ×100)

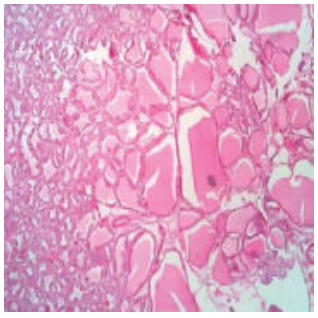

Fig. 6 Nodular hyperplasia. Hyperplastic nodule (right side of figure) is composed of large and irregularly shaped follicles that lined by one or more layers of cuboidal cell (H&E, × 40)

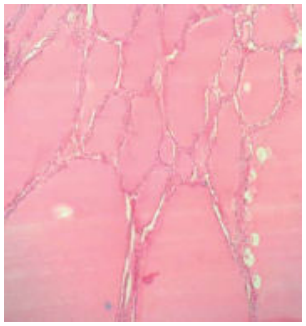

Fig. 7 Goiter colloid. Follicles are dilated and filled with colloid (H&E, × 100)

The frequency of nodular goiter was (3%). Affected thyroid showed multiple foci of hyperplastic follicular cells that were demarcated from the adjacent follicles. In microscopic study, hyperplastic nodules were composed of large, irregularly shaped follicles that lined by one or more layers of cuboidal cells. Papillary projections of follicular epithelium occurred into the lumen of some follicles (Fig. 6). Other diagnosed lesion was colloid goiter (1%). At the colloid goiter, follicles were dilated with deeply eosinophilic colloid. The macro follicles were lined with flattened epithelial cells (Fig. 7). Degenerative changes and atrophy was observed in (12%) and (4%) of thyroid samples respectively. The gland was smaller than normal. Follicles were shrinkage and contained little colloid. The epithelial cells of some follicles showed degenerative changes including eosinophilic cytoplasm and pyknotic nuclei. Follicular epithelium was desquamated into the space of follicles. Disruption of thyroid follicles was lead to releasing of colloid into the interstitium and caused mild infiltration of lymphocytes. Also, fibrosis increased in the interstitial tissues (Fig. 9).

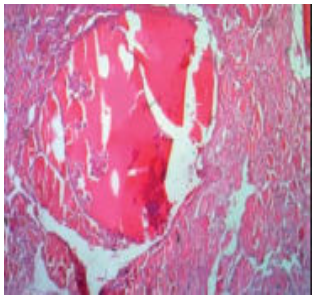

Fig. 8 Follicular cysts (H&E, × 40)

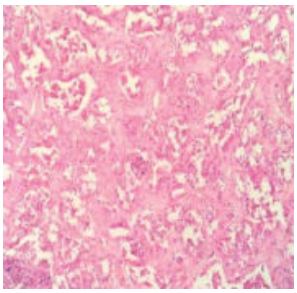

Fig. 9 Follicular degeneration. Follicles are shrinkage and contained little colloid. Fibrosis increases in the interstitial tissues of follicles (H&E, × 40)

Follicular cysts were observed in (5%) of thyroid glands (Fig. 8). Follicular adenoma was observed in one case (1%). Grossly, thyroid was consisted of white-tan, small, solid nodules that were well demarcated from the surrounding thyroid parenchyma. The affected thyroid lobe was enlarged. Follicular adenoma was as solitary lesion in a normal gland and composed of micro follicular growth pattern (Fig. 10). Papillary thyroid carcinoma was diagnosed in one sample (1%). Tumor cells had papillary pattern growth into cystic spaces of affected follicles. Papillary projection had fibro vascular stalks and lined with single or multiple layers of cuboidal cells. The nuclei were vesicular and pleomorphism and had prominent nucleoli.

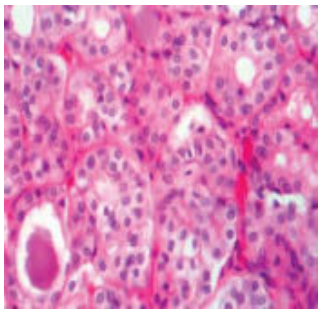

Fig. 10 Follicular adenoma. It is compose of microfollicular growth pattern (H&E, × 400)

IV. Discussion

The thyroid, the largest endocrine organ, influences the function of almost every organ in the body. The thyroid produces thyroxine (T4) and triiodothyronine (T3), which regulates the rate of metabolism and affect growth and rate of function of many other body systems [10]. In the present study, thyroid pathological lesions observed included diffuse hyperplastic goiter, degenerative changes and follicular atrophy, diffuse lesions, follicular cysts, nodular hyperplasia, colloid simple goiter, adenocarcinoma, and adenoma follicular cells. Few studies have been done about thyroid glands of the camels. Though, [11] reported, tissue samples of thyroid glands of 16 healthy camels (*Camelus dromedarius*) were investigated under two age groups i.e. group A (3-5 years) and group B (6-10 years) with equal number of animals, for their gross and microscopic anatomy. In the present study nodular thyroid hyperplasia were observed. Nodular thyroid hyperplasia characterized by the formation of nonneoplastic nodules in the thyroid and has been reported in humans, horses, cats, dogs, and the rhesus monkey [12]. Follicular cyst was another prominent structure observed on the thyroid gland. Although the exact mechanism of this singularity is unknown, but the deficiency of vitamin A can be one of the possible causes that should be of interest to be used investigated [13]. A Thyroid follicular adenoma findings in this study based on our understanding is the first report in camels in the world. A follicular adenoma is a benign encapsulated tumor of the thyroid gland. It is a firm or rubbery, homogeneous, round or oval tumor that is surrounded by a thin fibrous capsule. Adenoma of thyroid cystic adenoma (papillary, cystic) for the first time in cattle has been reported [14]. Mohajeri et al. [15], in their histopathological study on thyroid gland of goat in east Azerbaijan province of Iran examined a total of 386 thyroid specimens, where 71 cases had diffuse hyperplasia of thyroid follicular cells, 10 cases parenchymal cysts, 8 cases follicular atrophy, 5 cases colloid goiter, 4 cases thyroid fibrosis, 3 cases nodular hyperplasia and 1 case had C-cell adenoma and 1 case had C-cell carcinoma. In [16] in Tabriz of Iran thyroid glands of sheep

were examined histopathologically. Of the total 100 thyroid examined, 33 showed various lesions on which 27% showed hyperplastic goiter, 4% showed colloid goiter and 2% showed lymphocytic (immuno-dediated) thyroiditis. Their findings were similar to our study by showing the highest frequency of the hyperplastic goiter. Out of 800 pairs of thyroid glands in [6], 15% had lesions in which histopathological changes were categorized as follicular atrophy (2.5%), focal hyperplastic goiter (0.88%), colloid goiter (3.39%), parenchymal cyst (1.38%), follicular cell hyperplasia (0.27%), thyroid fibrosis (0.635%), diffuse hyperplastic goiter and the parenchymal cyst (0.63%). Other study [17] investigated 100 pairs of thyroid glands collected from ewes and their fetuses at the local municipal abattoir in Ahvaz city of Khuzestan province, multiple lesions were seen in 59% and 21% of the thyroid glands of ewes and fetuses, respectively. Histologically, ninety-nine lesions in the ewes and twenty two lesions in the fetuses' thyroid glands were noticed. Histopathological changes for ewes were categorized as follicular hyperplasia (37%), bronchial cyst (31%), ultimobranchial cysts (14%), hyperemia and hemorrhagia (10%), follicular necrosis (4%), thyroiditis (1%), lymphocytic thyroiditis (1%), and trabecular adenoma (1%).The pathologic conditions observed in thyroid glands of these animals (cow, sheep and goat) by [5] included of simple colloid goiter: goat 12 (13.3%) cow 21 (11.66%) sheep 14 (15.5%), hyperplastic goiter: goat 43 (47.7%) sheep 30 (33.3%). parenchymal cysts: goat 3 (3.33%), cow 22 (12.2%), sheep 8 (8.9%), ultimobranchial nodules: goat 7 (7.7%) sheep 16 (17.8%) follicular atrophy: goat 10 (11.1%) cow 11 (6.66%) sheep 5 (5.5%), inflammatory and degenerative lesions: goat 4 (4.4%) cow 12 (6.6%) sheep 2 (2.2%). The number of animals without lesion included: goat 11 (12.2%) cow 114 (63%) and sheep 15 (16.6%). There are several reports with pathological changes in the thyroid gland of various animals, including ruminants and dog [18], [19]. The major pathological case of thyroid diseases is goiter [20], [21]. Previous studies have shown that colloid goiter was most and thyroid lymphocytic inflammation was the lowest case of pathological lesions in buffalo of east Azerbaijan [22]. However, the hyperplastic goiter was the most and lymphocytic thyroiditis was the lowest thyroid pathology in carcasses of slaughtered sheep in East Azerbaijan [23]. The presence of lesion such as the types of goiter (colloidal and hyperplastic) in camels case study of deficiency iodine and deficiency vitamin A, calls for plans to prevent its occurrence. Perhaps the mode of feeding the camel is the main cause of this deficiency. There seems to be some factors simultaneously that induce pathological changes in the thyroid glands of mothers and their fetuses. It is well known that among environmental factors two are more importantly to affect the thyroid glands: ambient temperature and feed intake [24], [25]. The overall prevalence of thyroid problems can cause camel feeding and maintenance conditions of the animals.

REFERENCES

[1] N. Gritzmann, D. Koishwitz, and T. Rettenbacher, "Sonography of the thyroid and parathyroid glands", Radiol. Clin. North. Am, vol. 38, 2000: 1131-1145.
[2] I. U. I. Bazhenov, and B. K Sydykov, "Role of thyroid gland hormones in thermoregulatory reactions during adaptation to high altitude", Vet. Physio. Jou,vol. 67, 1981: 294-298.
[3] E. R. Wisner, and T. G. Nyland, "Ultrasonography of the thyroid and parathyroid Glands", Small. Anim. Pract, vol. 28, 1998: 973-991.
[4] M. Mirzadeh, M. Nouri, G. H. Khwaja, and B. Mohammadian, "Environmental Effects of age and sex on levels of T4, T3, T3 uptake and FTI sheep in Ahvaz", Tehran. Univ. Vet. J, vol. 60, 2006: 388-383.
[5] M. Sayari, K. Mardomi, and M. Hoshyar, "Comparative study of macroscopic and microscopic on thyroid gland of apparently healthy ruminants (Cow, sheep and goat)" J. Anim. Health. Dis, vol. 3, 2010: 77-76, (In Persian).
[6] A. P. R. Saber, M.T. Jalali, D. Mohjeri , A. A. Akhoole , and H. Z. N. Teymourluei, "The effect of ambient temperature on thyroid hormones concentration and histopathological changes of thyroid gland in cattle in Tabriz", Asian. J. Anim. Vet. Adv, vol. 4, 2009: 28-33.
[7] V. Barberet, Y. Baeumlin, O. Taeymans, L. Duchateau, and K. Peremans, "Pre- and post-treatment ultrasonography of the thyroid gland in hyperthyroid cats" Vet. Radiol. Ultrasound, vol. 51, 2010: 324-330.
[8] P. Vejbjerg, N. Knudsen, H. Perrild, P. Laurberg, and I.B. Pedersen, "The association between hypoechogenicity or irregular echo pattern at thyroid ultrasonography and thyroid function in the general population", Eur. J. Endocrinol, vol. 155, 2006: 547-552.
[9] S. J. Ahmadpanahi, and M. H. Yousefi, "Anatomical and histological study on thyroid gland in one humped camel (Camelusdromedarious)", J. Vet. Res, vol. 67, 2012: 273-278.
[10] D. W. Brammer,P.L. Juneau, C.E. Chrisp, and D.M. Altrogge, "Spontaneous hyperthyroidism in an aged male and female Macacamulatta", J. Med. Primatol, vol. 27, 1998: 273-277.
[11] R. Kausar, and R.U. Shahid, "Gross and microscopic anatomy of thyroid gland of one humped camel (Camelus dromedaries)", Pakistan .Vet. J, vol. 25, 2006:205-206.
[12] C.C. Capen, K.V.F. Jubb, P.C. Kennedy "The endocrine glands, nodular thyroid hyperplasia". In, K.V.F. Jubb, P.C. Kennedy, 'Pathology of Domestic Animals". 4th ed., Vol. 3, 1993, 317-318, Academic Press, London.
[13] T.C. Jones, R.D. Hunt, N.W. King "Veterinary Pathology". 6th ed., p.1236, 1997, Williams & Wilkins, Baltimore, MD.
[14] M.D. McGavin, J.F. Zachary: Pathologic Basis of Veterinary Disease. Penny Radulph, 4th ed., 698-700 &720-728, 2007, Elsevier Mosby, London.
[15] D. Mohajeri, G.H.Mousavi, and M. Nazeri, "Histopathological study on thyroid gland of goat in East Azerbaijan province of Iran", Res. J. Biol. Sci, vol. 7, 2012:17-22.
[16] S. Alipourzamani, M.H. Movassagh, and M. Nouri, "Goiter in the sheep slaughtered in Tabriz slaughterhouse in Iran", Ann. Biol. Res, vol. 2, 2011: 242-246.
[17] M. Nouri, K.H. Mirzadeh, and B. Mohammadian, "The effect of ambient temperature on thyroid hormones concentration and histological changes of thyroid gland in sheep", Pakistan. J. Biol. Sci, vol. 9, 2006:: 2308-2312.
[18] Hefco E, Krulich L, Illner P, Larsen PR "Effect of acute exposure to cold on the activity of the hypothalamic-pituitary-thyroid system". Endocrinology. 97, 1975, 1185-1195.
[19] M.P. Sandler, J.A. Patton, "Recent advances in thyroid imaging". OtolaryngolClin North Am, 23, 1990, 251-70.
[20] E. Hefco, L. Krulich, P. Illner, and P.R. Larsen PR, "Effect of acute exposure to cold on the activity of the hypothalamic-pituitary-thyroid system", Endocrinology.J, vol. 97, 1997: 1185-1195.
[21] R.L. Sutherland, and C.H. Irvine, "Effect of season and pregnancy on total plasma thyroxine concentration in sheep", Am. J. Vet. Res, vol. 35, 1998: 311-312.
[22] G.A. Gooding, "Sonography of the thyroid and parathyroid", Radiol.Clin. North. Am, vol. 5, 1993: 967-989.
[23] C.R. Barb, R.R Kraeling, J.B. Barrett, " Serum glucose and free fatty acids modulate growth hormone and luteinizing hormone secretion in the pig". ProcSocExpBiol Med, vol. 198, 1991, 636.
[24] S.E. Evans, and D.L. Ingram, "The effect of ambient temperature upon the secretion of thyroxin in the young pig", J. Physiol, vol. 264, 1999: 511-521.
[25] L. Todini, "Thyroid hormones in small ruminants: effects of endogenous, environmental and nutritional factors", Animal, vol.81, 2007: 997-1008.