

**HYPOTHYROIDISM: A HIDDEN ENDOCRINE DISORDER**

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**ABSTRACT**

Hypothyroidism is a hormonal disorder encountered mostly in middle aged dogs. In the present study, hypothyroidism was diagnosed in 26 out of 38 dogs were screened. Common clinical signs recorded were pruritus, chronic skin lesions, hyperpigmentation, generalized hairloss, failure of hair regrowth, bilateral symmetrical alopecia, rat tail appearance and obesity. Cases were diagnosed based on the clinical signs and thyroid profile (decreased T3, TT4 and FT4 level) and increased cholesterol values. Common secondary skin infections recorded in the present study were malassezia pachydermatitis, dermatophytosis, demodicosis, scabies and pyoderma. All the animals were successfully managed with levothyroxine along with specific therapy for secondary dermatological diseases.

**KEYWORDS:** Hypothyroidism, levothyroxine, thyroid profile, canine.

**INTRODUCTION**

Hypothyroidism is common endocrine disorder caused by deficiency of thyroid hormone due to various reasons and is characterized clinically with lethargy, weight gain, alopecia and secondary skin infections (Finora and Greco, 2007). It is common endocrine disorders in dogs than in cats. In blood more than 99 % of T4 and T3 are bound to plasma proteins. T3 enter cells more rapidly, has more rapid onset of action, and is three to five times more potent than T4. Thyroid hormone serves as volume dial for metabolism and every cell in the body can be affected by reduced levels of thyroid hormone leads to wide variety of signs in multiple body systems (Dar, 2013).

Thyroid hormone is essential for initiation of anagen hair follicles, regulation of cornification process and sebaceous gland secretion (Jackson and Marsella, 2012). Diagnosis of hypothyroidism is based on the thyroid profile (T3, T4, FT4) but clinically diagnosed based on weight gain/ obesity and skin and coat abnormalities. A typical sign of hypothyroidism is poor hair regrowth, mostly noticeable after the dog has been clipped. The disease occurs most often in middle aged dog breeds mostly 4 to 8 years old and breeds commonly affected were Golden retriever, Doberman, Dachsund, Labrador retriever, Grey hounds and Cocker spaniel.

Present study documents varied clinical manifestations which includes skin and coat abnormalities and further thyroid profile, secondary skin infections and therapeutic management in hypothyroid dogs.

**MATERIALS AND METHODS**

A total of 38 dogs were tentatively diagnosed as hypothyroidism, based on varied clinical signs in various breeds, sex, and age (3 to 12 years) at Small Animal Medicine Unit, Veterinary Clinical Complex, RIVER. Animals were subjected to detailed clinical examination and varied clinical signs recorded in hypothyroidism were obesity, chronic skin infections, rat tail and severe alopecia. Skin scrapings were collected from the affected site and subjected to direct microscopic examination to rule out mite infestation and dermatophytes. Moist sterile swabs were used to collect samples from scaly/eczematous skin lesions, impression smear were prepared which was subjected to Methylene blue staining and observe under oil immersion for detection of yeast. Impression smear were subjected to gram staining for detection of bacteria. Blood was collected in clot activator vials for Serum biochemistry profile.

**RESULTS**

Based on clinical signs and serum biochemistry (Thyroid profile) (Table 1), 26 dogs were diagnosed as

hypothyroidism out of 38 dogs that were suspected and screened. The various breeds of dogs affected were Mongrel (42%), Labrador (19%), Beagle (11%), Pug

(11%), Dachsund (7%), Spitz (4%), and German Sheperd (4%). The common clinical manifestations recorded in the present study were summarized in Table 2.

**Table 1: Serum biochemistry alterations of hypothyroid dogs.**

| S.No | Parameter                    | Diseased group (N=26) Mean $\pm$ SE | Reference range |
|------|------------------------------|-------------------------------------|-----------------|
| 1    | T3 (Triiodothyroxine)(ng/dl) | 54 $\pm$ 3.0                        | 98 – 139        |
| 2    | T4 (Thyroxine) ( $\mu$ g/dl) | 1.3 $\pm$ 0.13                      | 3.20 - 3.60     |
| 3    | FT4 (Free Thyroxine) (ng/dl) | 0.58 $\pm$ 0.05                     | 0.9 - 3.2       |
| 4    | Cholesterol (mmol/L)         | 12.2 $\pm$ 1.04                     | 6.4             |

**Table 2: Clinical signs of hypothyroid dogs.**

| S.No | Clinical signs                            | No of animals affected (N=26) | Percentage(%) |
|------|---|-------------------------------|---------------|
| 1    | Bilateral symmetrical alopecia            | 5                             | 19            |
| 2    | Obese                                     | 5                             | 19            |
| 3    | Generalized hair loss                     | 19                            | 73            |
| 4    | Typical rat tail                          | 3                             | 11            |
| 5    | Puppy like coat                           | 1                             | 4             |
| 6    | Skin lesions, hyperpigmentation, pruritus | 22                            | 84            |
| 7    | Corneal lipidosis                         | 3                             | 11            |
| 8    | Barrel shaped abdomen                     | 2                             | 7             |
| 9    | Skin fold at the base of tail             | 2                             | 7             |
| 10   | Myxedema                                  | 1                             | 4             |
| 11   | Bradycardia                               | 4                             | 15            |
| 12   | General weakness, exercise intolerance    | 6                             | 23            |
| 13   | Head tilt                                 | 1                             | 4             |
| 14   | Irregular estrus cycle                    | 1                             | 4             |
| 15   | Aggressiveness                            | 3                             | 11            |



Fig.1 Myxedema of face in a hypothyroid dog



Fig.2 Alopecia and thickening of skin on dorsal aspect of body in a hypothyroid dogs



Fig.3 Head tilt in a hypothyroid dog

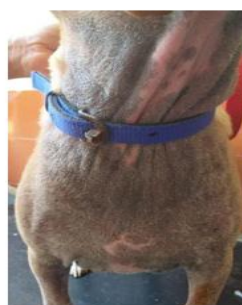


Fig.4 Hyperkeratosis of ventral region of neck in a hypothyroid dog



Fig.5 Rat tail appearance in a hypothyroid dog



Fig.6 Hypothyroid dog with lipoma



Fig.7 Failure to re-growth of hair after trimming in a hypothyroid dog



Fig.8 Excessive skin folds at the base of tail in a hypothyroid dog



Fig.9 Obesity in a hypothyroid dog



Fig.10 Bilateral symmetrical alopecia in a hypothyroid dog

Dogs which are positive for hypothyroidism were treated with levothyroxine sodium (Vet thyro®) @ 0.02 mg/kg b.wt PO, q12h BID in empty stomach. However the

secondary skin disorders were treated with specific drugs (Table 3).

**Table 3: Treatment for secondary skin infestation in hypothyroid dogs.**

| S. No. | Skin disorder                              | Treatment  |
|--------|--|--|
| 1      | Malassezia pachydermatitis/dermatophytosis | Tab. Itraconazole (Itra-D®) @ 5mg/kg b.w SID for 6 days<br>Shampoo Ketoconazole bathing twice weekly               |
| 2      | Bacterial Pyoderma                         | Tab. Enrofloxacin (Ataxin®) @ 5mg/kg b.w for 2 weeks<br>Shampoo Chlorohexidine bathing twice weekly                |
| 3      | Demodicosis/Scabies                        | Tab. Fluralaner (Bravecto®) @ 25mg/kg b.w single dose PO<br>Shampoo benzyl peroxide (Petben®) bathing twice weekly |

## DISCUSSION

Thyroid system plays a major role in regulating several functions of body that influences on the immune system, and decline in thyroid functions may predisposed to recurrent secondary skin infections in dogs (Chen and Loch, 1997) which recorded in the present study (Table 3). Hypothyroidism cause impaired neutrophil and lymphocyte function thereby, causing abnormal systemic immune responses and alterations in local immunity resulting in pyoderma and seborrhoea (Chastain and Panciera, 1995). Primary hypothyroidism in dogs is due to lymphocytic thyroiditis, idiopathic thyroid atrophy or neoplastic destruction resulting in loss of functional thyroid tissue and impaired thyroxin production (Panciera, 1997a).

Thyroid profile includes T3, T4 (bound form), fT4 (free form) and TSH. T4 is the precursor form which is converted by body tissues into T3, is active form of

thyroid hormone. The two forms of T4 were free and bound form. The free of T4 is floating and loose in the blood stream, where as bound form of T4 is bind to blood proteins. The free form of T4 will enter cells and may convert to T3 and conversion concentration of free T4 corresponds to thyroid hormone activity where it counts at the tissue level. Free T4 levels are less subject to fluctuate into a falsely low range in response to non-thyroidal diseases or drugs than a total T4 level. Negative feedback on the pituitary by T3 and T4 results in reduction in the production of TSH (Panciera, 1997b). T3 is the potent thyroid hormone at the cellular level, but in dogs a large proportion (40%–50%) is not made in the thyroid gland and is not the predominant circulating thyroid hormone.

Deficiency of thyroid hormone affects all systems causing a decrease in Basal Metabolic Rate (BMR). The present study was in agreement with Satish kumar *et*

*al.*(2007) stated that hypothyroidism commonly affected in dogs between 4 to 15 years of age. Common clinical signs noticed in the present study were bilateral symmetrical alopecia (Fig.10), generalized hair loss, typical rat tail (Fig.5), puppy like coat, hyperpigmentation (Fig.4), pruritus, corneal lipidosis, obesity (Fig.9), barrel shaped abdomen, skin fold at the base of tail (Fig.8), bradycardia, generalized weakness and exercise intolerance. Myxedema (cutaneous mucinosis) is an occasional dermatological sign characterized by non-pitting thickening of skin particularly of eyelids, cheeks and forehead due to deposition of hyaluronic acid in the dermis (Kelly and Hill, 1984) which is recorded in the present study (Fig.1). Primary hypothyroidism in dogs has been associated with variety of neuromuscular signs including generalized peripheral neuropathy, peripheral vestibular syndrome, facial paralysis, laryngeal paralysis, megaesophagus and myasthenia gravis (Fors, 2008) which is recorded in the present study. These changes are reversible neurological sequelae of hypothyroidism (Higgins *et al.*, 2006). Thyroid malfunction affects spinal and cranial nerves results in behavioural changes and polyneuropathies such as unprovoked aggression, head tilt (Fig.3), seizures, ataxia, circling, laryngeal and facial nerve paralysis (Nesbit *et al.*, 1980; Baker, 1997). Beaver, 2003 studied the relationship between aggression and hypothyroidism and prolonged anoestrus in dogs.

Diagnosis of hypothyroidism is challenging for veterinarians as non-thyroid illness (Euthyroid sick syndrome) and steroidal drug therapy or use of sulpha drugs can influence the thyroid results. Age of dog needs to be considered as concentrations will decrease with age. When clinical signs are atypical, it is best to measure either serum T4 or fT4 in combination with canine TSH and cholesterol levels. Hypercholesterolaemia noticed in present study which was similar to cases reported by Panciera, 1994.

It is understood that specific signs such as bilateral alopecia, rat tail and hyperpigmentation is usually associated with thyroid malfunction and treated with thyroxin supplementation (Satish kumar *et al.*, 2007; Varshney *et al.*, 2007). Thyroxin is a safe medication and given in adequate doses (0.02-0.04 mg/kg BW in dogs). If the dose is too high for long time therapy may leads to excessive water consumption, weight loss and restlessness (Nesbit *et al.*, 1980).

## CONCLUSION

This study shows that hypothyroid dogs were found to be associated with secondary skin infestations like malasseziosis, demodicosis and bacterial pyoderma. Among biochemical tests TT4 and FT4 are reliable for diagnosis of hypothyroidism. Sensitivity and accuracy of serum TT3 measurement for diagnosis of hypothyroidism are low. Hence it is concluded from the present study on 38 dogs suspected for hypothyroidism based on the clinical signs, 26 dogs were positive for

hypothyroidism based on lowered T3, T4 and FT4. All dogs, responded well to thyroxin treatment without any side effects.

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