Nail Changes Associated With Thyroid Disease

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PRACTICE **POINTS**

- Koilonychia is associated with hyperthyroidism.
- Clubbing is a manifestation of thyroid acropachy in Graves disease and also affects other patients with hyperthyroidism.
- Onycholysis improves in patients with hypothyroidism treated with thyroid hormone replacement therapy.

Nail changes with thyroid disease have not been well studied. Nail findings are helpful in early diagnosis of thyroid disorders and therefore are important for dermatologist education. We reviewed the literature on nail changes in thyroid patients and found that onycholysis and slow-growing, thin nails are associated with hypothyroidism and that onycholysis, koilonychia, and brittle nails changes are associated with hyperthyroidism.

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The major classifications of thyroid disease include hyperthyroidism, which is seen in Graves disease, and hypothyroidism due to iodine deficiency and Hashimoto thyroiditis, which have potentially devastating health consequences. The prevalence of hyperthyroidism ranges from 0.2% to 1.3% in iodine-sufficient parts of the world, and the prevalence of hypothyroidism in the general population is 5.3% in Europe and 3.7% in the United States.[1] Thyroid hormones physiologically potentiate α- and β-adrenergic receptors by increasing their sensitivity to catecholamines. Excess thyroid hormones manifest as tachycardia, increased cardiac output, increased body temperature, hyperhidrosis, and warm moist skin. Reduced sensitivity of adrenergic receptors to catecholamines from insufficient thyroid hormones results in a lower metabolic rate and decreases response to the sympathetic nervous system.[2] Nail changes in thyroid patients have not been well studied.[3] Our objectives were to characterize nail findings in patients with thyroid disease. Early diagnosis of thyroid disease and prompt referral for treatment may be instrumental in preventing serious morbidities and permanent sequelae.

Methods

PubMed, Scopus, Web of Science, and Google Scholar were searched for the terms *nail + thyroid*, *nail + hyperthyroid*, *nail + hypothyroid*, *nail + Graves*, and *nail + Hashimoto* on June 10, 2020, and then updated on November 18, 2020. All English-language articles were included. Non–English-language articles and those that did not describe clinical trials of nail changes in patients with thyroid disease were excluded. One study that utilized survey-based data for nail changes without corroboration with physical examination findings was excluded. Hypothyroidism/hyperthyroidism was defined by all authors as measurement of serum thyroid hormones triiodothyronine, thyroxine, and thyroid-stimulating hormone outside of the normal range. Eight studies were included in the final analysis. Patient demographics, thyroid disease type, physical examination findings, nail clinical findings, age at diagnosis, age at onset of nail changes, treatments/medications, and comorbidities were recorded and analyzed.

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Ms. Rosenberg reports no conflict of interest. Dr. Lipner is a consultant for Hoth Therapeutics, Ortho Dermatologics, and Verrica Pharmaceuticals.

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Results

Nail changes in patients with thyroid disease were reported in 8 studies (7 cross-sectional, 1 retrospective cohort) and are summarized in the Table.[4-11] The mean age was 41.2 years (range, 5–80 years), with a higher representation of females (range, 70%–94% female). The most common nail changes in thyroid patients were koilonychia, clubbing, and nail brittleness. Other changes included onycholysis, thin nails, dryness, and changes in nail growth rate. Frequent physical findings were xerosis, pruritus, and alopecia.

Both koilonychia and clubbing were reported in patients with hyperthyroidism. In a study of 32 patients with koilonychia, 22 (68.8%) were diagnosed with hyperthyroidism.[10] Nail clubbing affected 7.3% of Graves disease patients (n=150)[6] and 5.0% of hyperthyroid patients (n=120).[7] Dermopathy presented more than 1 year after diagnosis of Graves disease in 99 (66%) of 150 patients as a late manifestation of thyrotoxicosis.[6] Additional physical features in patients with Graves disease (n=150) were pretibial myxedema (100%), ophthalmopathy (99.0%), and proptosis (88.0%). Non–Graves hyperthyroid patients showed physical features of soft hair (83.3%) and soft skin (66.0%).[7]

Nail brittleness was a frequently reported nail change in thyroid patients (4/8 studies, 50%), most often seen in 22% of autoimmune patients, 19.6% of nonautoimmune patients, 13.9% of hypothyroid patients, and 9.2% of hyperthyroid patients.[5,8] For comparison, brittle nails presented in 10.8% of participants in a control group.[5] Brittle nails in thyroid patients often are accompanied by other nail findings such as thinning, onycholysis, and pitting.

Among hypothyroid patients, nail changes included fragility (70%; n=50), slow growth (48%; n=50), thinning (40%; n=50), onycholysis (38%; n=50),[7] and brittleness (13.9%; n=173).[5] Less common nail changes in hypothyroid patients were leukonychia (9.4%; n=32), striped nails (6%; n=50), and pitting (1.2%; n=173).[5,7,11] Among hyperthyroid patients, the most common nail changes were koilonychia (100%; n=22), softening (83%; n=120), onycholysis (29%; n=14), and brittleness (9.2%; n=173).[5,7,9,10] Less common nail changes in hyperthyroid patients were clubbing (5%; n=120), thinning (4.6%; n=173), and leukonychia (3%; n=120).[5,7]

Additional cutaneous findings of thyroid disorder included xerosis, alopecia, pruritus, and weight change. Xerosis was most common in hypothyroid disease (57.2%; n=460).[4] In 2 studies,[8,9] alopecia affected approximately 70% of autoimmune, nonautoimmune, and hyperthyroid patients. Hair loss was reported in 42.6% (n=460)[4] and 33.0% (n=36)[9] of hypothyroid patients. Additionally, pruritus affected up to 28% (n=32)[11] of hypothyroid and 16.0% (n=120)[7] of hyperthyroid patients and was more common in autoimmune (41%) vs nonautoimmune (32%) thyroid patients.[8] Weight gain was seen in 72% of hypothyroid patients (n=32),[11] and soft hair and skin were reported in 83.3% and 66% of hyperthyroid patients (n=120), respectively.[7] Flushing was a less common physical finding in thyroid patients (usually affecting <10%); however, it also was reported in 17.1% of autoimmune and 57.1% of hyperthyroid patients from 2 separate studies.[8,9]

Comment

There are limited data describing nail changes with thyroid disease. Singal and Arora[3] reported in their clinical review of nail changes in systemic disease that koilonychia, onycholysis, and melanonychia are associated with thyroid disorders. We similarly found that koilonychia and onycholysis are associated with thyroid disorders without an association with melanonychia.

In his clinical review of thyroid hormone action on the skin, Safer[12] described hypothyroid patients having coarse, dull, thin, and brittle nails, whereas in thyrotoxicosis, patients had shiny, soft, and concave nails with onycholysis; however, the author commented that there were limited data on the clinical findings in thyroid disorders. These nail findings are consistent with our results, but onycholysis was more common in hypothyroid patients than in hyperthyroid patients in our review. Fox[13] reported on 30 cases of onycholysis, stating that it affected patients with hypothyroidism and improved with thyroid treatment. In a clinical review of 8 commonly seen nail abnormalities, Fowler et al[14] reported that hyperthyroidism was associated with nail findings in 5% of cases and may result in onycholysis of the fourth and fifth nails or all nails. They also reported that onychorrhexis may be seen in patients with hypothyroidism, a finding that differed from our results.[14]

The mechanism of nail changes in thyroid disease has not been well studied. A protein/amino acid–deficiency state may contribute to the development of koilonychia. Hyperthyroid patients, who have high metabolic activity, may have hypoalbuminemia, leading to koilonychia.[15] Hypothyroidism causes hypothermia from decreased metabolic rate and secondary compensatory vasoconstriction. Vasoconstriction decreases blood flow of nutrients and oxygen to cutaneous structures and may cause slow-growing, brittle nails. In hyperthyroidism, vasodilation alternatively may contribute to the fast-growing nails. Anti–thyroid-stimulating hormone receptor antibodies in Graves disease may increase the synthesis of hyaluronic acid and glycosaminoglycans from fibroblasts, keratinocytes, adipocytes, or endothelial cells in the dermis and may contribute to development of clubbing.[16]

Our review is subject to several limitations. We recorded nail findings as they were described in the original studies; however, we could not confirm the accuracy of these descriptions. In addition, some specific nail changes were not described in sufficient detail. In all but 1 study, dermatologists performed the physical examination. In the study by Al-Dabbagh and Al-Abachi,[10] the physical examinations were performed by general medicine physicians, but they selected only for patients with

Summary of Studies Reporting Nail Changes in Patients With Thyroid Disorders

Reference (year)	Study type	Method	No. of patients	Disease diagnosis	Mean age (SD)/range, y	Sex	Nationality	Nail change (patients affected, %)	Other physical findings (patients affected, %)	Duration (SD), y
Keen et al (2013)[4]	Cross-sectional	Physical examination	460	Hypothyroid	38.42 (11.02)/5–72	90% F	Indian	Brittleness (2.0), slow growth (0.7)	Xerosis (57.2), hair loss (42.6), edema (38.5), pruritus (17.2)	NA
Takir et al (2017)[5]	Cross-sectional	Physical examination	100	Control	40.0 (13.0)/NA	90% F	Turkish	Brittleness (10.8), thinning (17.0)	Xerosis (10.6), alopecia (9.3), hyperhidrosis (7.0), pruritus (2.4), flushing (2.3)	NA
			173	Autoimmune thyroid/ hyperthyroid	42.0 (14.0)/NA	94% F		Brittleness (9.2), thinning (4.6), onycholysis (1.2)	Alopecia (12.7), hyperhidrosis (8.7), xerosis (6.9), pruritus (5.8), flushing (4.6)	NA
				Autoimmune thyroid/hypothyroid				Brittleness (13.9), thinning (11.6), onycholysis (3.5), pitting (1.2)	Xerosis (26.0), alopecia (16.8), pruritus (14.5), flushing (6.4), hyperhidrosis (4.6)	
			127	Nonautoimmune thyroid/ hyperthyroid	44.0 (10.0)/NA	88% F		Brittleness (1.6), thinning (1.6), pitting (1.6)	Xerosis (7.1), pruritus (3.9), hyperhidrosis (3.9), alopecia (3.1), flushing (3.1)	
				Nonautoimmune thyroid/hypothyroid				Brittleness (6.3), thinning (1.6), pitting (1.6), onycholysis (0.8)	Xerosis (18.1), alopecia (10.2), pruritus (6.3), flushing (1.6), hyperhidrosis (1.6)	
Fatourechi et al (1994)[6]	Retrospective cohort	Medical record review	150	Graves disease	51.2 (NA)/18–80	78% F	NA	Thyroid acropachy/ clubbing (7.3)	Pretibial myxedema (100), ophthalmopathy (99.0), proptosis (88.0), pitting edema (58.0)	1.5 (0.50)[a]
Razi et al (2013)[7]	Cross-sectional	Physical examination and questionnaire	120	Hyperthyroid	25.86 (14.69)/ NA	74% F	Iranian	Nail softening (83.0), onycholysis (16.6), clubbing (5.0), leukonychia (3.0)	Soft hair (83.3), soft skin (66.0), pruritus (16.0), hyperpigmented (12.5), myxedema (6.5)	NA
			50	Hypothyroid	38.24 (14.45)/NA	70% F		Fragileness (70.0), slow growth (48.0), thinning (40.0), onycholysis (38.0), striped nails (6.0)	Dry, course skin (70.0), myxedema (18.0), purpura ecchymosis (8.0), telangiectasia (6.0)	

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Reference (year)	Study type	Method	No. of patients	Disease diagnosis	Mean age (SD)/range, y	Sex	Nationality	Nail change (patients affected, %)	Other physical findings (patients affected, %)	Duration (SD), y
Acer et al (2019)[8]	Cross-sectional	Physical examination	41	Autoimmune thyroid	52.23 (12.52)/NA	85% F	Turkish	Brittleness (22.0), longitudinal streak (14.6), fine (12.2), dry (7.3), soft (7.3)	Alopecia (70.7), xerosis (43.9), pruritus (41.5), facial erythema (22.0), flushing (17.1), periorbital edema (4.9)	7.84 (2.14)
			56	Nonautoimmune thyroid				Brittleness (19.6), fine (10.7), dry (10.7), longitudinal streak (8.9), onycholysis (3.6), soft (3.6)	Alopecia (71.4), xerosis (41.1), pruritus (32.1), facial erythema (16.1), flushing (5.4), periorbital edema (3.6)	
Puri (2012)[9]	Cross-sectional	Physical examination	36	Hypothyroid	NA	NA	Indian	Nonspecific changes (39.0)	Xerosis (100), carotenemia (53.0), hair loss (33.0), palmoplantar keratoderma (33.0), urticaria (6.0)	NA
			14	Hyperthyroid	NA	NA		Onycholysis (29.0)	Exophthalmos (85.7), alopecia (71.0), hyperhidrosis (64.3), flushing (57.1), skin pigmentation (50.0), myxedema (42.8)	
Al-Dabbagh and Al-Abachi (2005)[10]	Cross-sectional	Physical examination	32	22 hyperthyroid; 10 additional[b]	40.1 (10.7)/NA	77% F	Iraqi	Koilonychia (100)	NA	NA
Dogra et al (2006)[11]	Cross-sectional	Physical examination	32	Hypothyroid	39 (NA)/6–60	87% F	Indian	Leukonychia (9.4), brittleness (3.1)	Weight gain (72.0), xerosis (59.4), telogen effluvium (40.6), pigmentary disorders (37.5), pruritus (28.0)	NA

Abbreviations: F, female; NA, not available.

[a]Dermopathy 1.5 years after diagnosis in 99 Graves disease patients.

[b]Additional patients in study included: 2 chronic renal failure, 2 dilated cardiomyopathy, 2 bronchiectasis, 1 thyroid cancer, 1 asthma, 1 liver cirrhosis, and 1 ischemic heart disease.

koilonychia and did not assess for other skin findings. Fragile nails and brittle nails were described in hypothyroid and hyperthyroid patients, but these nail changes were not described in detail. There also were studies describing nail changes in thyroid patients; some studies had small numbers of patients, and many did not have a control group.

Conclusion

Nail changes may be early clinical presenting signs of thyroid disorders and may be the clue to prompt diagnosis of thyroid disease. Dermatologists should be mindful that fragile, slow-growing, thin nails and onycholysis are associated with hypothyroidism and that koilonychia, softening, onycholysis, and brittle nail changes may be seen in hyperthyroidism. Our review aimed to describe nail changes associated with thyroid disease to guide dermatologists on diagnosis and promote future research on dermatologic manifestations of thyroid disease. Future research is necessary to explore the association between koilonychia and hyperthyroidism as well as the association of nail changes with thyroid disease duration and severity.

REFERENCES

1. Taylor PN, Albrecht D, Scholz A, et al. Global epidemiology of hyperthyroidism and hypothyroidism. *Nat Rev Endocrinol*. 2018;14:301-316.
2. Lause M, Kamboj A, Faith EF. Dermatologic manifestations of endocrine disorders. *Transl Pediatr*. 2017;6:300-312.
3. Singal A, Arora R. Nail as a window of systemic diseases. *Indian Dermatol Online J*. 2015;6:67-74.
4. Keen MA, Hassan I, Bhat MH. A clinical study of the cutaneous manifestations of hypothyroidism in Kashmir Valley. *Indian J Dermatol*. 2013;58:326.
5. Takir M, Özlü E, Köstek O, et al. Skin findings in autoimmune and non-autoimmune thyroid disease with respect to thyroid functional status and healthy controls. *Turk J Med Sci*. 2017;47:764-770.
6. Fatourechi V, Pajouhi M, Fransway AF. Dermopathy of Graves disease (pretibial myxedema). review of 150 cases. *Medicine (Baltimore)*. 1994;73:1-7.
7. Razi A, Golforoushan F, Nejad AB, et al. Evaluation of dermal symptoms in hypothyroidism and hyperthyroidism. *Pak J Biol Sci*. 2013;16:541-544.
8. Acer E, Ağaoğlu E, Yorulmaz G, et al. Evaluation of cutaneous manifestations in patients under treatment with thyroid disease. *Turkderm-Turk Arch Dermatol Venereol.* 2019;54:46-50.
9. Puri N. A study on cutaneous manifestations of thyroid disease. *Indian J Dermatol*. 2012;57:247-248.
10. Al-Dabbagh TQ, Al-Abachi KG. Nutritional koilonychia in 32 Iraqi subjects. *Ann Saudi Med*. 2005;25:154-157.
11. Dogra A, Dua A, Singh P. Thyroid and skin. *Indian J Dermatol.* 2006;51:96-99.
12. Safer JD. Thyroid hormone action on skin. *Dermatoendocrinol*. 2011;3:211-215.
13. Fox EC. Diseases of the nails: report of cases of onycholysis. *Arch Derm Syphilol*. 1940;41:98-112.
14. Fowler JR, Stern E, English JC 3rd, et al. A hand surgeon's guide to common onychodystrophies. *Hand (N Y)*. 2014;9:24-28.
15. Truswell AS. Nutritional factors in disease. In: Edwards CRW, Bouchier IAD, Haslett C, et al, eds. *Davidson's Principles and Practice of Medicine*. 17th ed. Churchill Livingstone; 1995:554.
16. Heymann WR. Cutaneous manifestations of thyroid disease. *J Am Acad Dermatol*. 1992;26:885-902.