Association Between Thyroid Autoimmunity and Joint Hypermobility in Children and Adolescents

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ABSTRACT

Background: Joint Hypermobility Syndrome (JHS) is a common and often underdiagnosed noninflammatory hereditary connective tissue disorder. JHS is defined as musculoskeletal symptoms in the presence of generalized joint hypermobility not attributable to a systemic rheumatologic disease. Prevalence rates vary greatly according to age, gender, and ethnicity with higher rates in younger individuals, females an Asians. Over the past decade, JHS has been shown to be associated with fibromyalgia, chronic fatigue syndrome, functional gastrointestinal disorder, dysautonomia, anxiety, and panic disorders. Beighton score is a commonly used reliable measure of joint hypermobility, whose possible scores range from 0 to 9. Autoimmune thyroiditis describes a group of thyroid disorders including Graves' disease and chronic lymphocytic thyroiditis (Hashimoto thyroiditis). Together, they constitute most prevalent autoimmune disorders affecting about 10% of population and are a recognized cause of fibromyalgia and chronic widespread pain syndromes. Joint hypermobility shares many comorbid symptoms with hypothyroidism including sleep disturbance, fibromyalgia, osteoarthritis, and carpal tunnel syndrome. There are studies reporting association of thyroid autoimmunity with fibromyalgia and chronic fatigue syndrome. Evidence exists that joint hypermobility is present in a significant percentage of fibromyalgia and chronic fatigue syndrome patients. There are no studies to determine whether there is an association between joint hypermobility and thyroid autoimmunity

Purpose of the Study: To explore the association between joint hypermobility and autoimmune thyroid disorder.

Hypothesis: Children and adolescents with autoimmune thyroid disorders have a higher prevalence of joint hypermobility.

Design/Methods: Case control study comparing Beighton scores in children aged 5-18 years with autoimmune thyroid disorders with healthy controls followed in Flushing Hospital Medical Center (FHMC) between May and November 2018. Joint hypermobility was assessed by one investigator during subjects' routine visits. All cases and controls were examined to determine their Beighton score, ranging from 0 to 9. To derive Beighton score, the examiner assigned one point for each side of the body on which the subject can (1) passively dorsiflex the 5th finger beyond 90 degrees, (2) passively appose the thumb to the flexor aspect of the forearm, (3) hyperextend the knees beyond 190 degrees, and (4) hyperextend the elbows beyond 190 degrees. One point was also assigned if the subject can perform forward flexion of the trunk with the knees straight so that the palms rest flat on the floor. Exclusion criteria were the presence of rheumatological, neurological or psychiatric conditions. Data collected included gender, ethnicity, age , height, weight, BMI, family history, thyroid function tests, thyroid autoantibodies, celiac panel and ANA. Data were analyzed using SPSS software, ANOVA, percentages and chi square, $p<0.05$ was considered significant.

Results: Total of 109 patients consented to participate. Of those, 37 (34%) had Hashimoto's thyroiditis (mean age 14.1, 54% female) and 23 (21%) were followed up for hypothyroidism without autoimmunity (mean age 10.4 48% female). Control group consisted of 49 (45%) healthy children (mean age 10.4 51%) followed up in FHMC Ambulatory Care Clinic. Compared to the control group, Hashimoto patients were older ($p<0.01$). Gender distribution groups were not significantly different ($p=0.11$). Controls were more likely to be Hispanic ($p<0.01$). Family history of autoimmune disease was significantly higher in Hashimoto group ($p<0.01$). Distribution of Beighton scores were not significantly different between 3 groups, 3% of Hashimoto's patients had a Beighton score of ≥4 which is consistent with joint hypermobility. Likewise, 3% of controls has a Beighton score of ≥4. None of the 23 patients in hypothyroidism without autoimmunity group had a Beighton score ≥4. No statistical significance detected between 3 groups in terms of proportion of Beighton score above ≥4.

Conclusion: In our small sample, JH was not increased in autoimmune thyroid disorders or in thyroid dysfunction compared to healthy subjects.

INTRODUCTION

- Joint Hypermobility Syndrome (JHS) is a common and often underdiagnosed noninflammatory hereditary connective tissue disorder
- Beighton score is commonly used and reliable measure of joint hypermobility
- Autoimmune thyroiditis disorder (ATD) describes a group of thyroid disorders including Graves' disease and Hashimoto's thyroiditis and affects about 10% of the population
- ATD is a recognized cause of fibromyalgia and chronic widespread pain syndromes
- Diagnosis of ATD is based on the presence of thyroid autoantibodies, 80% have antibodies to TSH receptor in Graves' disease, 90 to 95% have anti-TPO Ab, 20 to 50% have anti-TG Ab in Hashimoto's thyroiditis
- Joint hypermobility shares similar demographic profile (females, Asians) and many symptoms with hypothyroidism, sleep disturbance, fibromyalgia, osteoarthritis, migraine headaches, carpal tunnel syndrome
- There are no studies associating joint hypermobility and thyroid autoimmunity

OBJECTIVE

•To explore the association between joint hypermobility and autoimmune thyroid disorder.

METHODS

- **Design**: Case control study
- **Setting**: Flushing Hospital Medical Center
- **IRB**: Approved by Flushing Hospital Medical Center
- **Time Frame**: May 2018 to November 2018
- **Inclusion criteria**: Children and adolescents aged 5 to 18 years with autoimmune thyroid dysfunction or congenital hypothyroidism
- **Exclusion criteria**: Presence of rheumatologic, genetic, neurologic or psychiatric conditions
- **Tool**: Beighton Score
- **Statistical analyses**: SPSS software, percentages, ANOVA, student t-test and chi square, $p<0.05$ was considered significant

RESULTS

- **Subjects:** 109
  - Hashimoto's thyroiditis (Group 1): 37 (34%)
  - Congenital hypothyroidism (Group 2): 23 (21%)
  - Controls (G3): 49 (45%)
- **Demographics:** age ($F=10.2$, $p<0.01$), BMI ($F=2.3$, $p=0.11$), gender ($F=2.3$, $p=0.89$, ethnicity and family history ($x^2=33.2$, $p<0.01$), figure 1
- **Beighton score:** range from 0-9, joint hypermobility is a score>4, figure 2
- **Joint mobility:** Beighton score for all subjects, figure 3

Figure 1: Demographics

	Control	Group 1	Group 2	Statistic	p-value
	n=49	n=37	n=23		
Mean age (SD)	10.4 (3.9)	14.1 (4.0)	10.4 (4.0)	F = 10.2	< 0.01
Mean BMI (SD)	20.2 (5.0)	22.8 (7.2)	21.3 (4.0)	F = 2.3	0.11
Gender (Female)	25 (51%)	20 (54%)	11 (48%)	X^2 = 0.23	0.89
Ethnicity				X^2 = 25.4	< 0.01
White	1 (2%)	5 (14%)	4 (17%)		
Black	1 (2%)	4 (11%)	1 (4%)		
Asian	1 (2%)	2 (5%)	4 (17%)		
Hispanic	41 (84%)	17 (46%)	8 (35%)		
Indian	5 (10%)	9 (24%)	6 (26%)		
Family History	6 (12%)	27 (73%)	8 (35%)	X^2 = 33.2	< 0.01

Figure 2: Beighton score

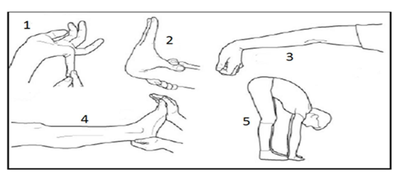
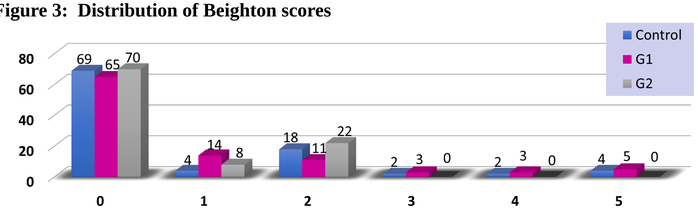


Figure 3: Distribution of Beighton scores



Beighton Scores	Control n (%)	Group 1 n (%)	Group 2 n (%)	X^2 = 5.9	p = 0.82
0	34 (69)	24 (65)	16 (70)		
1	2 (4)	5 (14)	2 (8)		
2	9 (18)	4 (11)	5 (22)		
3	1 (2)	1 (3)	0		
4	1 (2)	1 (3)	0		
5	2 (4)	2 (5)	0		
Hypermobility	3 (6)	3 (8)	0	X^2 = 1.9	p = 0.40

CONCLUSION

Joint hypermobility was not increased in autoimmune thyroid disorders or in thyroid dysfunction compared to healthy subjects in our small sample.

ACKNOWLEDGEMENTS

Kelly Cervellione, MPhil and Pablo Strauch, M.D.

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Eastern Society for Pediatric Research, Phila, PA March 24, 2019, Pediatric Society of Queens, April 9, 2019, FHMC Resident Poster Presentation June 3, 2019