Temporomandibular joint involvement in children with juvenile idiopathic arthritis: a preliminary report

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Objective. Children with juvenile idiopathic arthritis (JIA) are at risk for temporomandibular joint (TMJ) arthritis. This can lead to pain, limited mouth opening, facial asymmetry, and malocclusion. Our objective was to characterize patients with JIA and TMJ involvement in a single center.

Study Design. This was a retrospective study of children with JIA evaluated at Children's Healthcare of Atlanta. Inclusion criteria were confirmed JIA and jaw complaints. Medical records were reviewed to document demographics, JIA information, age at first TMJ complaint, and involvement of other joints. Descriptive statistics were computed.

Results. Majority of patients were white (mean age 13 years; range 5-18 years) with polyarticular rheumatoid factor (RF) negative or oligoarticular persistent JIA. Some were antinuclear antibody (ANA) positive, RF positive, or human leukocyte antigen (HLA)-B27 positive. Patients had involvement of other joints (e.g., fingers, knees, wrists). Of those with TMJ symptoms, 6 (10%) had TMJ arthritis.

Conclusions. In our cohort, 60 (10%) of patients were diagnosed with TMJ arthritis. In this population, patients who are female, white, RF negative, HLA-B27 negative, ANA negative, and polyarticular RF-negative subtype and have involvement of other joints have a higher likelihood of having TMJ symptoms. If a patient meets these criteria, careful evaluation of TMJs should take place. (Oral Surg Oral Med Oral Pathol Oral Radiol 2019;127:19−23)

Juvenile idiopathic arthritis (JIA) is the most common rheumatic disease of childhood. The disease affects approximately 300,000 children in the United States.[1] JIA is defined by the International League of Associations for Rheumatology (ILAR) as arthritis of unknown etiology that begins in children at age 16 years or less. The diagnosis is based on a combination of medical history, clinical presentation, and radiologic and laboratory abnormalities. Accordingly, JIA is categorized into 7 subtypes (systemic, oligoarthritis, RF-positive, RF-negative, psoriatic, enthesitis-related, undifferentiated). The diagnosis is based on the presence of 2 of the following features for at least 6 weeks: pain or limitation of motion, warmth overlying joint, and joint swelling.[2] Children with JIA often develop inflammation of the temporomandibular joint (TMJ), with a reported prevalence between 17% and 87%.[3-6] Untreated TMJ involvement in children with JIA can lead to restricted mandibular growth, causing jaw asymmetry, malocclusion, and limited maximal incisal opening.[4,7-10]

Diagnosis of TMJ involvement in children with JIA remains a challenge. It would be beneficial to be able to identify children who are at high risk for TMJ involvement. Providers would be able to refer and intervene sooner and likely help prevent progression. TMJ involvement can be present in all subtypes of JIA.[11] Sometimes it is the only involved joint[7,12] The purpose of this study was to characterize a population of patients with TMJ involvement in a single-center cohort study of patients with JIA.

Statement of Clinical Relevance

Temporomandibular joint involvement in children with juvenile idiopathic arthritis can lead to restricted mandibular growth, jaw asymmetry, malocclusion, and limited mouth opening. It would be beneficial to identify children who are at high risk for temporomandibular joint involvement to prevent progression.

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MATERIALS AND METHODS

This study was approved by the Emory University Institutional Review Board (IRB00017214) and conformed to the US Health Insurance Portability and Privacy Act requirements. Informed consent was obtained from parents and children, as appropriate.

This was a retrospective study of children with JIA evaluated by the Pediatric Rheumatology division at the Children's Healthcare of Atlanta (CHOA, Atlanta, GA) from November 2011 to December 2015. Patients were diagnosed with JIA by a pediatric rheumatologist according to the International League of Associations for Rheumatology (ILAR) criteria.[11] A description of JIA and its subtypes is beyond the scope of this article and can be found elsewhere.[2] Children were enrolled at varied time points after their JIA diagnosis and followed up prospectively from time of enrollment. They returned for their usual follow-up clinic visit every 3 to 6 months.

Inclusion criteria consisted of the following: (1) a confirmed diagnosis of JIA by a pediatric rheumatologist, (2) evaluation by rheumatology service, and (3) TMJ involvement (pain or limited function as identified by the patient or an abnormal result on clinical examination). All patients were enrolled in a study assessing uveitis in JIA. Exclusion criteria consisted of the following: (1) incomplete medical records of the initial cohort; (2) presence of congenital or acquired facial anomalies (e.g., hemifacial macrosomia, cleft lip and palate, Treacher Collins syndrome, TMJ ankylosis, etc.); or (3) a history of facial fractures. As part of participation in the uveitis study, patients responded to a questionnaire regarding symptoms (including jaw symptoms) during each rheumatology visit. When indicated, patients were referred for a detailed evaluation by the Oral and Maxillofacial Surgery department. TMJ magnetic resonance imaging (MRI) was ordered, depending on patient history and clinical examination findings by an oral and maxillofacial surgeon (OMS).

Medical records were reviewed to document demographics (sex, race, age, parents' self-described race and ethnicity), JIA information (onset, age at first TMJ complaint, date of diagnosis, JIA subtype, joints [in addition to TMJ] with tenderness, swelling or limitation), laboratory results (rheumatoid factor [RF], antinuclear antibody [ANA], human leukocyte antigen [HLA]-B27, anticyclic citrullinated peptide, erythrocyte sedimentation rate), and imaging reports (MRI). Follow-up data were collected at 3- to 6-month intervals from the time of the last study visit to the current study visit.

Patient information was recorded on a spreadsheet. Statistical analyses were conducted by using SAS version 9.4 for Windows (SAS Institute, Cary, NC). Data were summarized by using means and standard deviations, medians and interquartile ranges (25th-75th percentiles), or counts and percentages, when appropriate.

RESULTS

This cohort consisted of 330 patients with JIA. Of these, 60 patients (52 females, 8 males) had TMJ symptoms and met the inclusion criteria (Table I).

Table I. Summary of patients (N = 60)

Characteristic	*N (%)(mean [range])*
Sex	
- Female	52 (86.7%)
- Male	8 (13.3%)
Race	
- White	43 (71.7%)
- Black	4 (6.7%)
- Hispanic	7 (11.7%)
- Other	6 (10%)
Age at first Jaw complaint, median (IQR) (N = 20)*	13 (10-16)
RF Lab (N = 52)	
- Positive	5 (9.6%)
- Negative	47 (90.4%)
HLA B27 Status (N = 49)	
- Positive	9 (18.4%)
- Negative	40 (81.6%)
ANA Status	
- Positive	26 (43.3%)
- Negative	34 (56.7%)
Other Joints†	
- None	22 (36.7%)
- Fingers	18 (30%)
- Knees	18 (30%)
- Wrists	14 (23.3%)
- Hips	9 (15%)
- Back	7 (11.7%)
- Ankles	6 (10%)
- Entheses	5 (8.3%)
- Toes	4 (6.7%)
- Neck	2 (3.3%)
- Shoulders	2 (3.3%)
- Elbows	2 (3.3%)
Subtype	
- Polyarticular RF negative	19 (31.7%)
- Oligoarticular, persistent	15 (25%)
- Enthesitis related	9 (15%)
- Oligoarticular, extended	7 (11.7%)
- Polyarticular RF positive	4 (6.7%)
- Systemic	3 (5%)
- Psoriatic	2 (3.3%)
- Undifferentiated	1 (1.7%)
Current Medications†	
- NSAIDs	41 (68.3%)
- Methotrexate	37 (61.7%)
- None	7 (11.7%)
- Prednisone	7 (11.7%)
- Adalimumab	7 (11.7%)
- Etanercept	5 (8.3%)
- Infliximab	3 (5.0%)
- Mycophenolate	1 (1.7%)

*First jaw complaint on study.
†Not mutually exclusive. Percentages may add to more than 100%.
ANA, antinuclear antibody; *HLA,* human leukocyte antigen; *IQR,* interquartile range; *NSAIDs,* nonsteroidal anti-inflammatory drugs; *RF,* rheumatoid factor; *SD,* standard deviation.

Of the 60 patients who met the inclusion criteria, mean age was 13 years (range 5-18 years). Most were white (n = 43 [71.7%]) and the rest were Hispanic (n = 7 [11.7%]), black (n = 4 [6.7%]), or other (n = 6 [10%]). JIA categories were polyarticular RF negative (n = 19), oligoarticular persistent (n = 15), enthesitis related (n = 9), oligoarticular extended (n = 7), polyarticular RF positive (n = 4), systemic (n = 3), psoriatic (n = 2), and undifferentiated (n = 1) (Figure 1). Overall, 38 patients (63%) had involvement of joints other than TMJ, for example, fingers (n = 18, 30%), knees (n = 18, 30%), and wrists (n = 14, 23.3%) (Figure 2). Most of the patients were ANA negative (34 [90.4%]), RF negative (47 [18.4%]), or HLA-B27 negative (40 [81.6%]). Patients were taking the following systemic medications at the time of initial TMJ symptoms: nonsteroidal anti-inflammatory drugs (NSAIDs; n = 41 [68.3%]), methotrexate (n = 37 [61.7%]), prednisone (n = 7 [11.7%]), adalimumab (n =7 [11.7%]), etanercept (n = 5 [8.3%]), infliximab (n = 3 [5%]), or mycophenolate (n = 1 [1.7%]). Seven patients (11.7%) were not taking any medications (Table II).

All patients were referred for a detailed evaluation by an OMS. Of them, 9 (15%) underwent MRI. Six (10%) had evidence of TMJ synovitis or degenerative condylar changes on MRI and were ultimately diagnosed with TMJ arthritis. They underwent TMJ surgery (i.e., lysis, lavage, or arthroscopy). Eventually, the dosage of systemic medications was escalated (see Table II).

DISCUSSION

In previous studies, estimates of TMJ involvement in JIA ranged from 17% to 87% as a result of differing methods of evaluation and examination. In our population, age at first jaw complaint was 13 years. This age, which is older than the typical age of JIA diagnosis, is important to note because long-term TMJ degeneration is associated with younger age at JIA onset.[13] In our population, the majority of patients (n = 38 [63%]) had involvement of other joints. This finding is similar to that in other studies where patients had involvement of

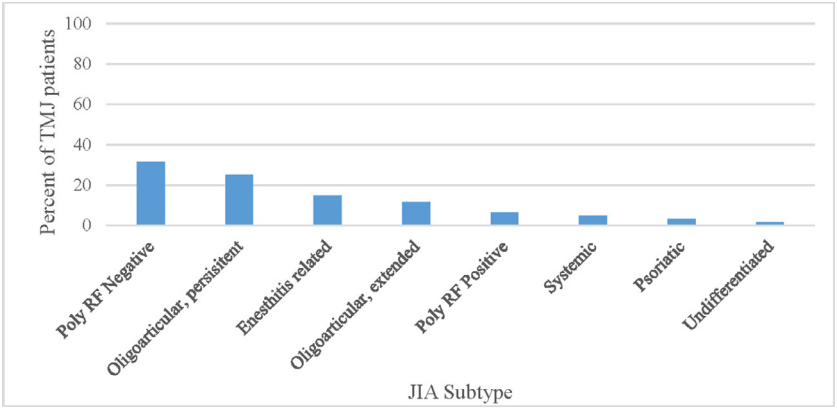

Fig. 1. Juvenile idiopathic arthritis (JIA) subtypes of patients.

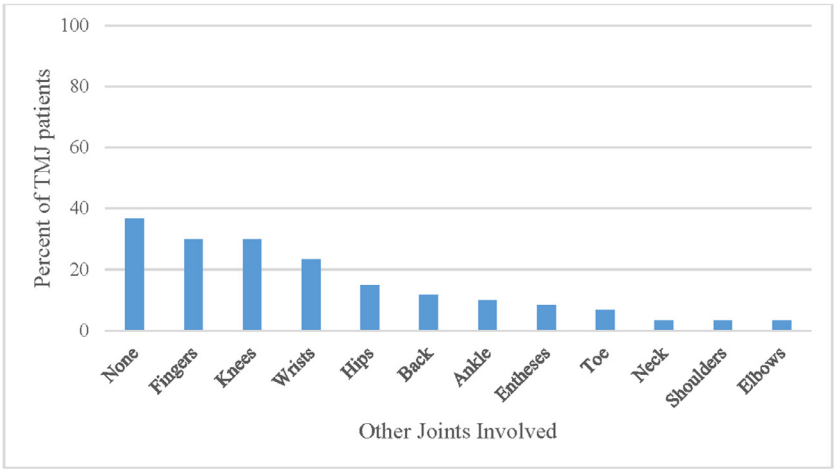

Fig. 2. Other joint involvement in children with temporomandibular joint (TMJ) involvement.

Table II. Characteristics of subjects with TMJ involvement (or arthritis if justified)

Subject	Sex	Race	JIA subtype	Age at first jaw complaint	RF status (±)	ANA status (±)	HLA-B27 status (±)	OMS intervention
1	Female	White	Oligo-persistent	Unknown* (< 6 years)	Negative	Positive	Not done	R arthroscopy
2	Female	Multi-racial	Oligo-extended	Unknown* (< 14 years)	Negative	Negative	Negative	R arthroscopy, L lysis and lavage
3	Female	White	Poly-RF-negative	13 years	Negative	Positive	Not done	B arthrocentesis, eventually B TMJ replacement
4	Female	Multi-racial,	Oligo-persistent	11 years	Negative	Negative	Not done	Nonsurgical intervention
5	Female	Multi-racial	Poly-RF-negative	Unknown* (< 12 years)	Negative	Negative	Not done	Nonsurgical intervention
6	Female	White	Enthesitis related	Unknown* (< 13 years)	Negative	Positive	Negative	B arthroscopy
7	Female	White	Systemic arthritis	Never†	Not done	Negative	Not done	B arthroscopy
8	Female	White	Oligo-extended	Unknown* (< 9 years)	Negative	Positive	Negative	Nonsurgical intervention
9	Male	White	Poly-RF-negative	Never†	Negative	Negative	Not done	Nonsurgical intervention

ANA, antinuclear antibody; *B*, bilateral; *L*, left; *HLA*, human leukocyte antigen; *JIA*, juvenile idiopathic arthritis; *NSAIDs*, nonsteroidal anti-inflammatory drugs; *OMS*, oral and maxillofacial surgeon; *R*, right; *RF*, rheumatoid factor; *SD*, standard deviation.

*First episode of jaw pain was in the past (prior to recruitment to study). The age is the age at first visit.

†Patient never complained of jaw pain but had clinical or radiographic signs of TMJ involvement.

other joints[14] but different from that of a recent study where the initial manifestation of JIA was TMJ arthritis.[12]

Previous studies have found a higher prevalence of TMJ symptoms in patients with the systemic subtype of JIA and polyarticular involvement.[14] However, unlike those in other studies, our population had the highest prevalence of TMJ symptoms in the polyarticular RF-negative subtype, whereas the systemic subtype had only 3% involvement. In a previous study, investigators found that HLA-B27 positivity was associated with a lower incidence of TMJ involvement.[11] The results of our study are similar to the findings of that study; the majority of our patients were HLA-B27 negative.

In our cohort, 60 patients (18%) experienced jaw symptoms either prior to or during enrollment in the study. In children diagnosed with JIA, untreated TMJ symptoms can lead to malocclusion, asymmetry, and decreased mandibular opening.[9] Thus, early diagnosis and prevention are essential. The differentiation between TMJ arthritis and myofascial pain dysfunction (MPD)[15] in patients with confirmed JIA and jaw pain may be difficult, and the distinction may not be completely clear.[16] However, it is critical to determine if a patient has MPD, TMJ arthritis, or both because the management strategies are different.[17] Patients diagnosed with MPD should be treated with nonsurgical interventions (e.g., diet adjustments, behavior modifications, physical therapy, or an occlusal splint). Patients with TMJ synovitis may receive lysis and lavage of TMJ, arthroscopy with or without steroid injections or a change in systemic medications. Those diagnosed with TMJ synovitis and MPD should be treated for both concurrently.[16,17]

Patients with TMJ synovitis, as seen on MRI, should be considered for TMJ lysis and lavage. However, use of routine corticosteroid injections after lysis and lavage is controversial because of the risk for further TMJ erosion.[18] Nevertheless, in a symptomatic (pain, limited maximal incisal opening) patient with otherwise well-controlled disease where MPD has been eliminated, TMJ lysis and lavage, perhaps with steroid injections as a temporary measure to decrease symptoms, should be considered. Another option is TMJ arthroscopy, which allows for direct examination of the synovium.[19] This is part of an ongoing investigation, which will serve as a follow-up to the present study. The present study serves as a preliminary investigation on JIA.

There were limitations in this study because of its retrospective design. Some patients did not follow up with the OMS, and therefore TMJ involvement could not be confirmed. This may have been a result of difficult access or referral patterns. In addition, patients were referred to the OMS at variable intervals after the initial JIA diagnosis. At our institution, we now have a

dedicated OMS, who examines patients with JIA at regular intervals. In addition, enrolling patients at disease onset in prospective studies would better enable clinicians to determine the natural history of TMJ involvement in patients with JIA. In this study, TMJ symptoms were patient reported, and this may have biased the sample toward a higher incidence because of lack of specificity. Similarly, there is a risk of missing patients with asymptomatic TMJ involvement.

CONCLUSIONS

The results of this study indicate that in this study population, TMJ arthritis occurs more often in females who are white, polyarticular RF-negative JIA subtype, HLA-B27 negative, and ANA negative, and who have involvement of other joints. It is important to evaluate patients with JIA for TMJ involvement for early recognition of symptoms and prevention of potential complications.

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