MANAGING PATIENTS WITH JUVENILE IDIOPATHIC ARTHRITIS AND SIMILAR TMJ PATHOLOGY

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NOTHING TO DECLARE

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LECTURE OUTLINE

ONE OF THE MOST CHALLENGING DENTOFACIAL DEFORMITY AND MALOCCLUSION IN ORTHODONTICS

- TMJ INFLAMMATION AND DENTOFACIAL GROWTH DEVELOPMENT
- TERMINOLOGY – DEFINITIONS – DIAGNOSIS
- MANAGEMENT AND TREATMENT
  - Recognize JIA
  - Possess knowledge of the influence of the pathologic process to the dentofacial growth and development
  - Demonstrate knowledge of treatment options related to JIA

ABBREVIATIONS

- **JIA** JUVENILE IDIOPATHIC ARTHRITIS
- **ICR** IDIOPATHIC CONDYLAR RESORPTION
- **OA** OSTEOARTHRITIS
- **OAs** OSTEOARTHRROIS
- **TMJ** TEMPOROMANDIBULAR JOINT
- **PR** PEDIATRIC RHEUMATOLOGIST
- **PRE** PEDIATRIC RHEUMATOLOGY EXAMINATION
- **GP** GENERAL PHYSICIAN
- **MRIc** MAGNETIC RESONANCE IMAGING + CONTRAST
- **CE** CLINICAL EXAMINATION

TMJ INFLAMMATION and DENTOFACIAL GROWTH / DEVELOPMENT

- Low posterior face height
- Retro- or micrognathic
- Asymmetry
- Deformed mandibular morphology
- Skeletal open bite
- Proclined upper-lower incisors
TMJ ANOMALY:
- Deformity of the condyle
- Deformity of the tuberculum
- Intra-articular abnormal relations
- Disc degeneration
- Disc displacement

55 PATIENTS – ISOLATED TMJ ARTHRITIS IN JIA

- 53 OLIGOARTHRITIS
- 2 PSORIATIC ARTHRITIS

- 33% ANA +
- 0% RF +
- 12% HLA-B27 +

6 DEVELOPED ARTHRITIS IN OTHER JOINTS BETWEEN 0.5-17 MO’S (MEDIAN 6) SIGNIFICANTLY LONGER DISEASE DURATION (47 VS 29 MO’S, P=0.001)

4 HAD UVEITIS PRIOR TO TMJ ARTHRITIS – 3 ANA +

DIAGNOSTICS MIGHT FAIL TO DISTINGUISH BETWEEN ISOLATED TMJ ARTHRITIS/JIA AND ICR FAILURE IN OPTIMAL TX OF JIA

TMJ AND DENTOFACIAL ISSUES IN JIA

- REFRACTORY TO ANTIRHEUMATIC MEDICAL TX
- CONDYLAR GROWTH DISTURBANCE
- DENTOFACIAL GROWTH DISTURBANCE
  - MALOCCLUSION
  - DYSMORPHIC JAWS
- OROFACIAL PAIN AND DISORDERS
  - DECREASED MOBILITY
  - IRRIGULAR JOINT MOVEMENT
- FUNCTIONAL INABILITIES
  - MASTICATORY
  - RESPIRATORY
  - MUSCULAR
- AESTHETICS

TMJ – THE UNIQUE JOINT

- “Phylogenetically, the explanation for this peculiar responsiveness to mechanical force might be found in the fact that the temporomandibular joint in mammals appeared as the result of a secondary (in a way, adaptive) joining of the squamosal and the dentary bones, along with the subsequent formation of a condylar cartilage”

**TMJ Evolution – Phylogenetic Development**

- Squamous Bone = Temporal Bone
- Dental Bone = Mandible
- Quadrate Bone = Incus
- Articular Bone = Malleus

**Mandibular Pre-Natal Development**

- Mandible – Intramembranous Ossification
  - Mesenchymal condensation lateral to Meckel’s cartilage
  - Ossification starts at foramen mentale envelopes Alveolaris nerve

- Condyle
  - Condylar cartilage develops independently as a secondary cartilage fusing with the mandible 12–15 week
  - Intramembraneous ossification until week 15 – endochondral ossification

**Mandibular Postnatal Growth**

**Important Growth Sites**
1. Endochondral ossification of the condyle
   - CC growth site + Articular surface – local growth factors and function

2. Sites of apposition – resorption
   - Mandibular growth and development are the sum of genetic and environmental cues

**TMJ Cartilage Fibrocartilage vs Hyaline**

- **Primary Cartilage**
  - Belongs to primary skeletal cartilage
  - Type II collagen
  - Stable – resistant to inactivity
  - Interstitial cell proliferation occurs in chondrocytes
  - Reacts primarily to systemic growth stimuli such as hormones

- **Secondary Cartilage**
  - Appear later in embryonic development
  - Type I collagen – ability to generate type II collagen
  - Degenerates with inactivity and compression
  - Apoitional proliferation
  - Additional modulation by local growth factors

**TMJ Cartilage Fibrocartilage vs Hyaline**

- Less susceptible to aging
- Late maturation
HIGH ABILITY FOR REPAIR AND FUNCTIONAL ADAPTATION
HIGH DEGREE OF BIOLOGICAL ACTIVITY
POTENTIAL FOR METABOLIC DISTURBANCES

Remodeling due to compression

ENVIRONMENT
MECHANICAL FORCES

GROWTH - DEVELOPMENT

EPIDEMICS
FACTORS UP- OR DOWNREGULATING GENE EXPRESSION
(i.e., GROWTH FACTORS, CYTOKINES, HORMONES)

GENETICS
INDIVIDUAL AND GROUP OF GENES

CELLS ARE INFLUENCED BY GENES AND ENVIRONMENTAL CUES

TRIAD OF RANKL/RANK/OPG

RANKL: RECEPTOR ACTIVATOR FOR NUCLEAR FACTOR κ B LIGAND

RANK: RECEPTOR ACTIVATOR OF NUCLEAR FACTOR κ B

OPG: OSTEOPROTEGERIN of OSTEOCLASTOGENESIS INHIBITORY FACTOR

RANKL/OPG RATIO INFLUENCES THE ACTIVITY OF BONE RESORPTION/FORMATION
Osteoclastogenic cytokines in TMJ arthritis

TNF in TMJ synovial fluid

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TMD classification, DC-TMD

I. Temporomandibular joint disorders
II. Masticatory muscles disorders
III. Head ache
IV. Associated structures

TMD CLASSIFICATION

I. TEMPOROMANDIBULAR JOINT DISORDERS

1. JOINT PAIN

2. JOINT DISORDERS

3. JOINT DISEASES

4. FRACTURES

5. CONGENITAL/DEVELOPMENTAL DISORDERS

Schiffman E. et al J Oral Facial Pain Headache 2014

I. TEMPOROMANDIBULAR JOINT DISORDERS

2. JOINT DISORDERS

A. Disc disorders
   1. Disc displacement with reduction
   2. Disc displacement with reduction with intermittent locking
   3. Disc displacement without reduction with limited opening
   4. Disc displacement without reduction without limited opening

B. Hypomobility disorders other than disc disorders
   1. Adhesions/adherences
   2. Ankylosis
      a. Fibrous
      b. Osseous

C. Hypermobility disorders
   1. Dislocations
      a. Subluxation
      b. Luxation

Schiffman E. et al J Oral Facial Pain Headache 2014

I. TEMPOROMANDIBULAR JOINT DISORDERS

3. JOINT DISEASES

A. Degenerative joint disease
   1. Osteoarthrosis
   2. Osteoarthritis

B. Systemic arthritides

C. Condylar ischiatic condylar resorption

D. Osteochondritis dissecans

E. Osteonecrosis

F. Necrosis

G. Synovial chondromatosis

Schiffman E. et al J Oral Facial Pain Headache 2014

TMJ OSTEOARTHRITIS IN JIA

- Autoimmune condition in children
- Inflammation of the synovial tissue
- Joint deformities
- Growth disturbances
- High risk for TMJ involvement
- High inflammatory
- Functional inability
- Pain

TMJ ICR

- Pathologic degenerative condition
- Unknown origin
- Bone condylar deformation
- Low inflammatory
- Functional inability
- Pain
- Disease without definition

TMJ OSTEOARTHROSIS

- Cartilage degeneration
- Accompanying periarticular bone response
- Primarily non-inflammatory
- Secondary low inflammatory
- Mechanical stress vulnerability
- Low resistance withstanding and repair
- Functional inability
- Pain

OA

OAs

JIA

ICR

Schiffman E. et al J Oral Facial Pain Headache 2014

Schiffman E. et al J Oral Facial Pain Headache 2014
JUVENILE IDIOPATHIC ARTHRITIS, JIA

- MOST COMMON AUTOIMMUNE DISEASE IN CHILDHOOD
  Berenboim L et al, J Rheumatol 2003;30(10):2275-2282

- 150 CHILDREN/100,000 GLOBAL

- 7 CATEGORIES WITH DIFFERENT PROGNOSIS AND CLINIC ACCORDING TO ILAR CLASSIFICATION (Pety et al, J Rheumatol 2004;31(2):390-2)

- ARTHRITIS BEFORE THE AGE OF 16 OF UNKNOWN ETIOLOGY PERSISTING > 6 WEEKS; OTHER KNOWN CONDITIONS EXCLUDED (Pety et al, J Rheumatol 2004;31(2):390-2)

- DIAGNOSTIC CRITERIA ARE CLINICAL

1. SYSTEMIC 4-17% fever, rash, lymph node, hepatospleenomegaly, serositis, TMJ: 45%
   Pedersen et al, J Rheumatol 2001; 28(9): 2109-21

2. OLIGARTICULAR 27-56%, TMJ: 45%
   1. PERSISTENT 1-4 joints throughout disease course
   2. EXTENDED 1-4 joints cumulative > 5 joints

3. POLY RF- 11-28%, 3 or more joints, rheumafactor negative, TMJ: 66%

4. POLY RF+ 2-7%, 5 or more joints rheumafactor positive

5. PSORIATIC 2-11% arthritis, psoriasis or arthritis + 1) dactylitis 2) nail abnormalities 3) family history of psoriasis

6. ENTHESITIS RELATED 3-11% HLA-B27, sacro-iliac joint

7. UNDIFFERENTIATED ARTHRITIS 11-21%

ICR: AN EARLY FORM OF JUVENILE OA OCCURS UNI- AND BILATERAL

ICR: A SYNDROMIC FORM OF OA SPECIFIC GENETIC BACKGROUND IN COMBINATION WITH REPEATED TRAUMA AND POSSIBLE HORMONAL INTERACTIONS OCCURS BILATERAL

A CERTAIN OVERLAP EXISTS WHERE THE DIAGNOSIS BECOMES UNCERTAIN

ICR IS NOT A WELL-DEFINED DISEASE

MOST PATIENTS HAS OROFACIAL SIGNS AND SYMPTOMS


JIA IS A GENERAL DIAGNOSIS WITH HIGH RISK OF TMJ INVOLVEMENT

COLLABORATION BETWEEN PEDIATRIC RHEUMATOLOGISTS, ORTHODONTISTS, OMF SURGEONS, OROFACIAL PAIN SPECIALISTS

JUVENILE IDIOPATHIC ARTHRITIS CATEGORIES (Pety et al, J Rheumatol 2004;31(2):390-2)
**Juvenile Idiopathic Arthritis**

**DIAGNOSIS**

- **Diagnosis is clinical**
- **SEROLOGY**
  - Supports the diagnosis and subtype
  - Assesses activity
  - Prognostic
  - ANA 40% correlates to uveitis, females, young age at diagnosis
  - RF 5-7% late onset, poor prognosis
  - HLA-B27 sacroiliac joint arthritis
- **TMJ arthritis presents a particular issue in JIA**

**Terminology for Orofacial Conditions in JIA**

1. **TMJ Arthritis:**
   - Active inflammation in the TMJ
2. **TMJ Involvement:**
   - Abnormalities caused by TMJ arthritis
3. **TMJ Symptoms:**
   - Patient or parents reported conditions related to TMJ arthritis or involvement
4. **TMJ Dysfunction:**
   - Physician-reported functional examination abnormalities related to TMJ arthritis or involvement

**Method of Assessment**

1. **TMJ Arthritis:**
   - MRI contrast enhanced
2. **TMJ Involvement:**
   - MRI, CBCT, clinical examination
3. **TMJ Symptoms:**
   - Patient reported
4. **TMJ Dysfunction:**
   - Clinical examination

**TMJ Involvement in JIA**

- Orofacial pain
- Frequency
- Intensity
- Location
- Click/locking
- Decreased mobility
- Inability chewing

**TMJ Symptoms**

- 55% Pain + functional disability
- Dentofacial anomalies 35%
DIAGNOSIS
5 RECOMMENDATIONS FOR ASSESSING TMJ INVOLVEMENT IN JIA

1. The medical history should include:
   - Sex
   - Age at time of examination
   - JIA category
   - Disease duration
   - Previous/current medications
   - Previous/current orthodontic treatment
   - Disease activity

2. The patient should be asked about the presence of orofacial symptoms:
   - Location
   - Intensity
   - Frequency
   - Character
   - Situations in which the symptoms occur

3. The clinical examination of orofacial signs should include:
   - Palpation of the temporomandibular joint (lateral pole)
   - Masticatory muscles (masseter and temporal muscles)
   - Assessment of pain on palpation
   - TMJ pain on mandibular movement
   - Assessment of joint sounds

4. The clinical examination of orofacial function should include assessment of temporomandibular joint function:
   - Maximal mouth opening
   - Mouth opening deviation
   - Protrusion – laterotrusion
   - Condylar translation during opening

5. The clinical examination should include assessment of facial morphology and symmetry:
   - Mandibular sagittal position (convexity of the facial profile)
   - Lower face asymmetry in the frontal plane
JIA + TMJ INVOLVEMENT – NO TMJ SYMPTOMS/DYSFUNCTION

TMJ ARTHRITIS
TMJ DEFORMITY
DENTOFACIAL ANOMALY
SYSTEMIC TX FOLLOW-UP ON DENTOFACIAL DEVELOPMENT
FOLLOW-UP ON DENTOFACIAL DEVELOPMENT
CONSIDER ORTHOPEDIC TX
ASSESSMENT OF GROWTH STAGE AND MATURITY
INDIVIDUAL TREATMENT PLAN

ORTHOPEDIC/ORTHODONTIC TX
DISTRACTION OSTEOTOMY
ORTHODONTIC SURGERY

TMJ AND DENTOFACIAL ISSUES RELATED TO EARLY TMJ PATHOLOGY

- CONDYLAR GROWTH DISTURBANCE/DEFORMATION
- DENTOFACIAL GROWTH DISTURBANCE
  - MALOCCLUSION
  - DYSMORPHIC JAWS
- PAIN
- JOINT DISORDERS
  - DECREASED MOBILITY
  - IRREGULAR JOINT MOVEMENTS
- FUNCTIONAL INABILITIES
  - MASTICATORY
  - RESPIRATORY
  - MUSCULAR – SKELETAL IMBALANCE
- AESTHETICS

EUROTMJOINT
PRIMARILY RECOMMENDATIONS FOR JIA – DENTOFACIAL ANOMALIES

- Orthopedic/functional treatment is recommended in JIA patients with TMJ symptoms and dysfunctions
- Orthopedic/functional treatment is recommended in JIA patients with TMJ involvement in order to support normal growth
- TMJ involvement implies development of a dentofacial deformity.
- Orthopedic/functional treatment in JIA patients is a highly specialized treatment
- Orthopedic/functional treatment in JIA patients is a medical requirement

2. showers et al. J Pediatr 2018;153:115-123
Treatment should be preceded by assessment of:
- Growth stage and maturity
- Dental stage
- Growth type

During orthopedic/functional, it is recommended, in JIA patients with TMJ involvement, clinically to reevaluate status currently using at least the euroTMjoint recommendations and additionally with respect to possible TMD.

Orthopedic/functional treatment in JIA patients should be reviewed in case of treatment default, latest after 6 months.

The aims of the appliance in the active arthritis phase are to:
- Positioning the condyles and mandible in an orthopedic stable position
- Stabilize the joint
- Consolidate the midline
- Pain relief
- Joint collapse prevention – keeping the joint space
- Avoid dental compensations

The orthopedic appliance should be designed with respect to:
- Stabilization of occlusion on posterior teeth
- Consolidate the midline
- Construction bite should be taken in relaxed muscular position without teeth in contact (rest position)