Progressive/Idiopathic Condylar Resorption

Three Case Reports

Biography
Sylvain Chamberland

DMD (Doctor en Médecine Dentaire), University Laval, 1983
Private practice, general dentistry 1983-1988
Certificate in Orthodontics, University of Montreal, 1990
M.Sc. in Dental Science, University Laval, 2008
Private practice in orthodontics since 1990

Publications
✦ Closer look at SARPE, JOMS 2008
✦ Short-term and long-term stability of SARPE revisited, AJODO 2011
✦ Long-term dental and skeletal changes following SARPE, letter to editor, SOBOR 2013
✦ Functional genioplasty in growing patients, AO 2016
✦ Response to: Functional genioplasty in growing patients by Chamberland et al, AO 2016, BS, p.1088
✦ Progressive/Idiopathic Condylar Resorption: Case Reports, AJODO 2019, In Press

Lecturer in several graduate program and scientific meeting in USA, Canada, Europe

Milestone

1983
1984
1990 1996 2001 2003
2018

Dr Louis Mercuri

Dr David Hatcher

Progressive idiopathic condylar resorption: Three case reports
Progressive/Idiopathic Condylar Resorption

- Localized degenerative disease of the TMJ
- Lysis and repair of the articular fibrocartilage and underlying bone
- Aggressive nature
- Mostly seen in young female adolescent

Prevalence 9F: 1H


Constitutional Risks Factors

- Strong female predilection
- Hormonal imbalance (↓ estrogen, ↓ 17β-estradiol)
- Nutritional status (↓ Vit D, ↓ Omega-3)

- Bruxism and repetitive oral habits
  - Free radical generation through shear stress and increased metabolic demands

Iatrogenic Causes

Iatrogenic causes:

- Orthognathic surgery,
- Intermaxillary fixation
- Rigid fixation used in mandibular ostectomy
- Improperly designed and utilized occlusal appliances

- All condylar change or displacement through compression

PCR/ICR

- Loss of condylar mass
- Decrease of ramus height and length
- Clockwise rotation of the mandible
- Anterior open bite
- Destruction localized to the section superior to a line bisecting condylar poles

Active phase

- Associated with decreased interincisal opening + TMJ pain
- Followed by condylar flattening and decorticating

Flattening may form a congruent articulation with opposing surface
- Permit redistribution of functional loads
- Restoration in condylar motion and reduction of pain

Associated Growth Changes

- PCR/ICR occurring before completion of growth
  - 1. Shorter condylar process
  - 2. Shortened ramus height
  - 3. Increased antegonial notch
  - 4. Compensatory appositional bone at gonial angle
  - 5. Decreased lateral mandibular growth on the affected side

Clinical Significance of PCR/ICR

Clockwise facial growth pattern and development of an anterior open bite.
Reduction in airway dimensions is a risk factor for sleep apnea.
Increased lower anterior facial height may cause lip incompetence in repose
Reduced bone thickness facial to the roots of incisors

Imaging Modalities

Panoramic (OPG) imaging:
✦ Readily available, easily performed, low cost
✦ Gross examination,
  ✓ Size, loss of condylar bone mass,
  ∆ Articular eminence
  Flattening of the anterosuperior surface
  Distal inclination of the condylar neck
✦ Sensitivity 97%, specificity 45% (Fx-positive)

Imaging Modalities

Cephalogram
✦ Serial cephs taken during active phase will show progression of the disease and mesial migration of Articulare point
✦ Hyperdivergency
  ✓ Shortened posterior face height
  ✓ Increased anterior face height
✦ OJ & OB

Imaging Modalities

CBCT images
Symptomatic patient with TMJ OA =
✦ Resorption of the anterior surface of the lateral pole, the posterior surface of the medial pole, and flattening of the articular surface & subcortical cyst formation (Ely’s cyst)
✦ Significant positive correlation between the location and extent of condylar resorption and pain intensity and duration

Imaging Modalities

Magnetic Resonance Imaging:
✦ Cartilaginous integrity of the condylar surface, disc derangement inflammation
T1-weighted MRI: disc position, presence of alteration in bone + soft tissue anatomy
T2-weighted MRI: inflammation response in the TMJ + bone marrow edema
Gold Standard for evaluation of inflammatory arthritis
MRI sensitivity =78%; predictive value =54%

Imaging Modalities

Nuclear medicine bone scanning with Tc-99
✦ Assess if there are any active bony change
✦ Specificity not sufficient to assess state of stability/remission
Pathogenesis of TMJ diseases

TMJ osteoarthritis has a non-inflammatory origin;

✦ ≠ rheumatoid arthritis

Deterioration + abrasion of articular cartilage

Local thickening + remodeling of underlying bone

Changes accompanied by secondary inflammatory changes

Three Main Etiologies

1. Trauma or aberrant loading
2. Hormonal pathogenesis
3. Genetic basis for altered joint extracellular matrix

1, 2 and 3: Not mutually exclusive

Options For Management of TMJ Osteoarthritis

Goals

✦ Decreasing joint pain, swelling and muscle pain
✦ Increasing joint function
✦ Preventing further joint damage
✦ Preventing disability.

Options For Management of TMJ Osteoarthritis

Non-invasive management modalities

✦ Medications: NSAIDs, muscle relaxant
✦ Physiotherapy: active jaw movement, manual therapy
✦ Occlusal splint: Provide relief from muscle contraction/pain, decrease potential joint overload

Orthodontic treatment + TAOs

✦ Mx & Md dental intrusion of buccal segment

Minimally invasive modalities

✦ Arthroscopic surgery

✓ Little evidence to support the effectiveness of arthrocentesis in the management of TMJ osteoarthritis
✓ Should no longer be recommended
Options For Management of TMJ Osteoarthritis

Invasive surgical modalities: bone & joint procedures

✦ Arthroplasty
✦ Autogenous hemiarthroplasty
✦ Discectomy
✦ Bimaxillary osteotomy and disc repositioning


Disc Repositioning: Does it Really Works?

Disc repo + MxMd advancement (MMA)

✦ Better long-term outcomes

✦ Condylar bone apposition of at least 1.5 mm at the superior surface in 26.4%, the anterior surface in 23.4%, the posterior surface in 29.4%, the medial surface in 9.9%, or the lateral surface in 38.2%

Whereas bone apposition was not observed in patients treated with MMA.

Disc must be intact + the patient in the early stages of the disease.


End Stage TMJ Osteoarthritis

Salvage procedures—Total Joint Replacement

✦ Autogenous TJR
✦ Alloplastic TJR

MMA only, Patient without DD
MMA -Drep, Patient with DD


Case 1

Acknowledgement
✦ This case is courtesy of Dr Louis Cadotte (orthodontist)
✦ and Carl Bouchard (oral surgeon)
Case 3

Lac de la Ponsonnière

See article in AJODO who will be published soon

Discussion

Case 1 & 2
- End-stage condylar resorption
- TMJ non salvageable
- Alloplastic TJR

Case 1 & 3
- Onset during teenage years (13-15y)
  - Can be AICR or isolated TMJ juvenile idiopathic arthritis (JIA)

Case 2
- Onset during early adulthood (mid 20s)
  - Inflammatory TMJ arthritis, may be related to past condition during teenage years
  - Reactivation during pregnancy. Likely hormone related: estrogen + relaxin

Sustained Inflammation Of The TMJ

Induces degeneration of TMJ
- Lead to deterioration of the joint's mechanical properties
- Alteration of the disc ultrastructure
  + Might contribute to TMJ disc displacement

Hormonal relationship

Female hormone mediate biomechanical change within the TMJ,
- Causing hyperplasia of the synovial tissues that stimulate the production of cytokines that
  - Initiate breakdown of the ligamentous structure that normally support and stabilize the
    articular disc to the condyle
    - allowing the disc to be anteriorly displaced.

Cytokines penetrate through the outer surface of the condyle
- Cause thinning of the cortical bone leading to breakdown to subcortical bone
- The condyle slowly collapse without clinically apparent destruction of the fibrocartilage.


### If ICR is in Remission

- Excessive joint loading
- Parafunctional habits,
- Trauma,
- Orthodontics,
- Orthognathic surgery

Can reinitiate the resorption process

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### TMJ Synovitis' Symptoms

- Pain during jaw movement, crepitus and restricted mouth opening capacity
- Isolated TMJ synovitis
  - Can be a presentation of the oligoarticular subtype JIA

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### Isolated TMJ Arthritis

- May be the 1st and only manifestation of JIA
  - Probably not as rare as previously reported
- JIA-related TMJ arthritis & ICR
  - 2 distinct conditions?
  - Or ICR constitutes a differential diagnosis to isolated TMJ JIA

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### Epidemiological Studies

- Higher prevalence of TMJ disease and pain in women than men

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### Estrogens Receptors in TMJs

- Role of Estrogen
  - Regulate the synthesis of proteins involved in articular tissue turnover
  - Enhance responses to relaxin, a polypeptide implicated in matrix metalloproteinase (MMP) synthesis and activation
- MMPs
  - Implicated in the degradation of the cartilaginous matrices in degenerative

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### Relaxin & TMJ Diseases

- Relaxin contributes to the degradative remodeling of joint fibrocartilage
- Association between relaxin-induced MMPs and matrix loss

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Relaxin & TMJ Diseases

Relaxin
- Found systemically in cycling and pregnant women but not in men
- Causes the targeted induction of tissue degrading enzymes of the MMP family in the fibrocartilaginous tissues of the TMJ
- Potentially predisposing to TMJ disease
- TMJ disc and pubic symphysis show the greatest induction of MMPs and matrix loss in response to relaxin and β-estradiol

This help to explain the role of hormone in the disease of case #2

What should we do?

Look at the condyles on the orthopantomogram
- Signs of degenerative change of the condyles may be present
- While clinical symptoms may be absent

Be aware of condylar shape, volume

Suspicion and recognition of these imaging changes, plus awareness of any clinical sign and symptoms, may be an indication for more sophisticated imaging (CBCT, MRI, Nuclear Medicine Scan), blood testing and consultation.

What should we do?

Early diagnosis
- Complete blood count, Sed rate, C-reactive protein, ANA, Rh factor, Anti-CCP, Vit D, 17β-estradiol
- Orthopantomogram, MRI + CBCT

Medication
- NSAID (Naproxen, Celebrex, Feldene)
- Vit D 1000UI, Ca++ 500mg

Rheumatologist with understanding of this TMJ pathology should manage medication
- Methotrexate (DMARD), Etanercept (TNF-a inhibitor)

Conclusion

Cases like this can be found in any orthodontic practice
If we are at fault, it is likely because we looked at this pathology like a dental problem.

Maybe it is time that we look at TMJ arthrosis like medical orthopedic pathology

To avoid the outcome of deleterious skeletal change and unsalvageable TMJ, early diagnosis and early treatment “en amont” (upstream) of the skeletal changes.

Bones with Articulating Surface at Each End

Femur:
- Each extremity can have OA

Mandible
- Each extremity can have OA
- Physicians say dentist will take care of it
- Dentists say: I will fix the occlusion and it will fix the joints

The Holy Grail

The dental profession embraced the concept that the TMJ is a unique articulation.

This has led, in the past to focused diagnostic and therapeutic modalities on the occlusion, and more recently focused on the intra-articular disc position despite no evidence to that effect.
Conclusion

All 3 cases were treated into a class I functional occlusion.

The post orthodontic problem does not support the theory that class I occlusion, canine guidance, incisor guidance, balanced occlusal contact can avoid TMJ problem.

Given the cycle of TMJ arthritis that can go active to inactive, it may mean that using a TMJ splint and get relief maybe a matter of chance that the splint is initiated prior to the remission period.

Conclusion

In conclusion, it is essential that TMJ osteoarthritis be presented as the pathologic entity it is in the same terms as our colleagues discuss osteoarthritis in orthopaedic circles.

Not doing this only exacerbates the problem that everyone has with TMJ disorders in general—patients, clinicians, insurance carriers, etc., because they do not consider TMJ pathology orthopaedic pathology, but rather that TMJ disorders are just dental.

Further studies are necessary to determine the true frequency of isolated TMJ arthritis in JIA and explore other possible causes for isolated TMJ arthritis as well as the optimal therapy.

Merci,
Dr Proffit