Temporomandibular Joint (TMJ) Implant Retrieval Study

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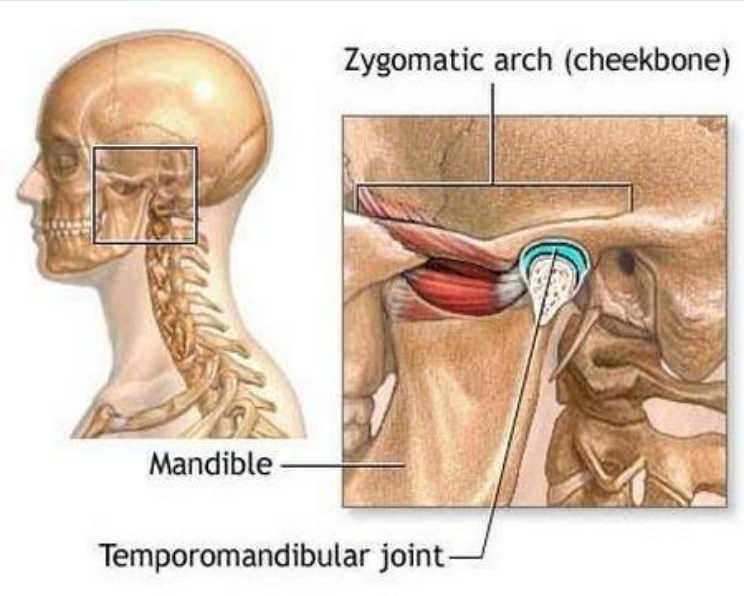
Introduction

- Temporomandibular Joint (TMJ)
  - -Condyle and fossa
  - -Ball and socket joint
  - -Mastication, speaking, etc.

- Temporomandibular Joint Disorder (TMD)
  - -Headaches, locked jaw and pain, neck pain
  - -Affects 10 million Americans [1]
  - -End-stage solution is a TMJ TJR



[1]. "TMJ disorders." http://www.nidcr.nih.gov/OralHealth/Topics/TMJ/TMJDisorders.htm.
Image adapted from: http://www.backexercisedoctor.com/journal/2010/8/25/exercises-fixes-for-tmj.html

Background

- TMJ TJR

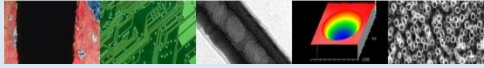
  -1,000-2,000 replacement surgeries/year in the US [2]

  -Implants expected to last 5 years, but replaced in 3 years [3], unlike hip replacement (≈15 years)

  -In order to compare failure mechanisms evaluation of all TMJ TJR that have been/currently employed:

  MoM, MoP, and TiNi Coated

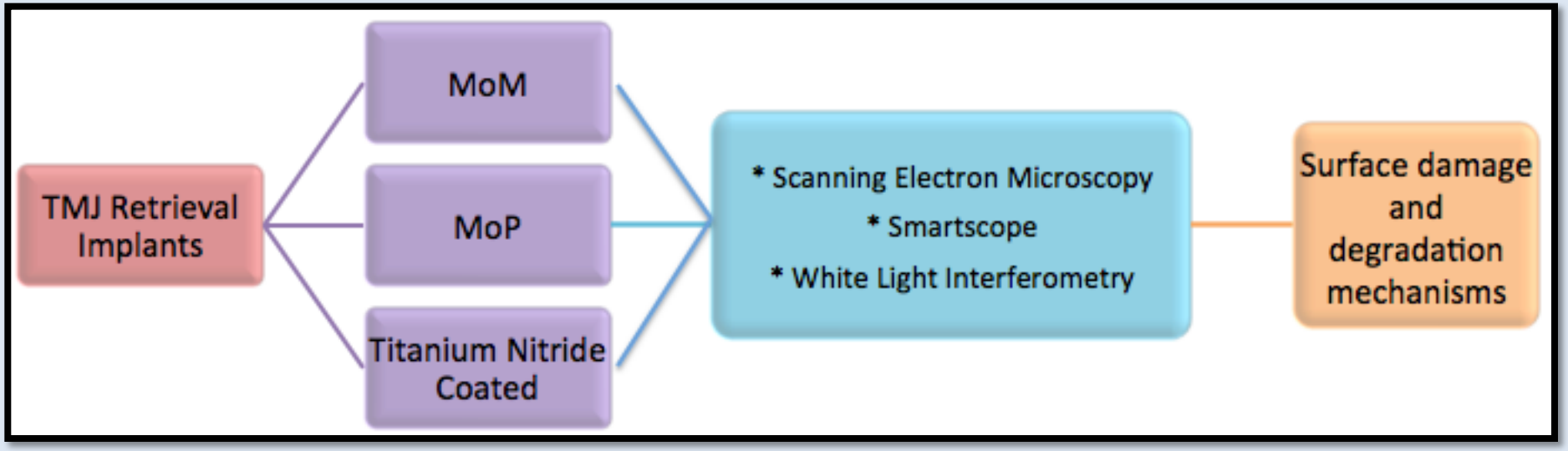
[2]. Ferreira, J. N., et al., "Evaluation of surgically retrieved temporomandibular joint alloplastic implants: pilot study." Journal of Oral and Maxillofacial Surgery. Vol. 66, no. 6, 2008.
[3]. http://www.fda.gov/NewsEvents/Newsroom/PressAnnouncements/ucm242421.htm
Image adapted from: www.sherryeudy.com/SherrysTMJSt.html.



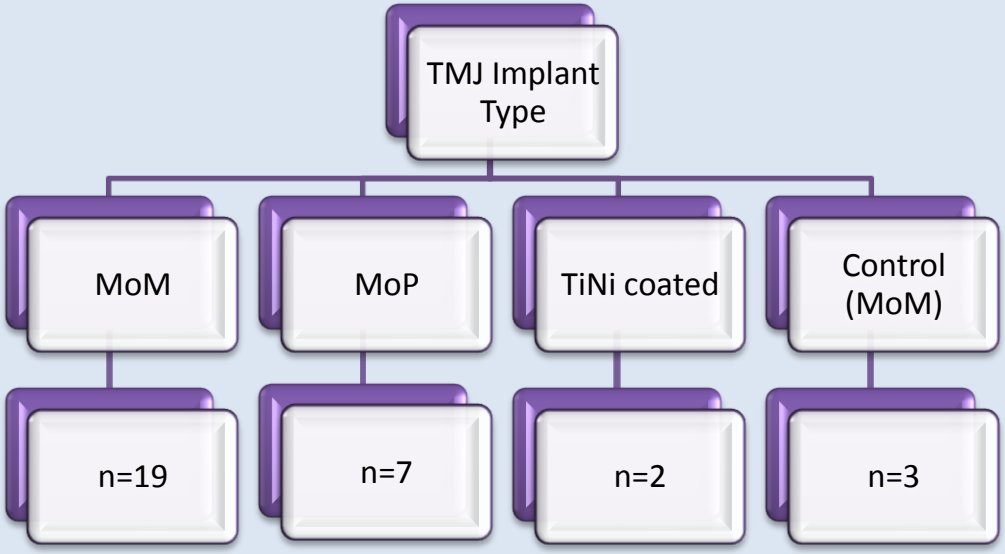
Objectives/hypothesis

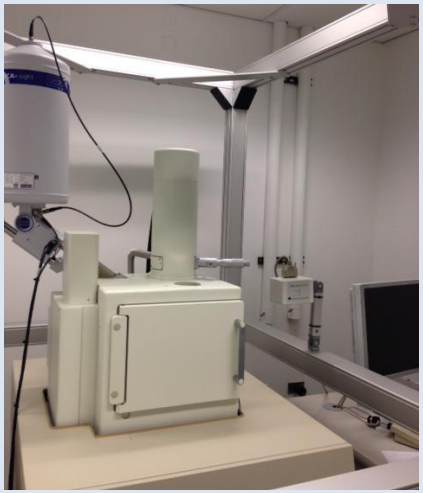
- ***Aim*:** Investigate and compare degradation mechanisms of failed metal-on-metal (MoM), metal-on-polymer (MoP), and titanium-nitride coated TMJ TJR implants to control TMJ TJR implants by analyzing alloy microstructure using an established orthopedic TJR device retrieval protocol.

Experimental design



Materials and methods





SEM

SmartScope

WLI

Results

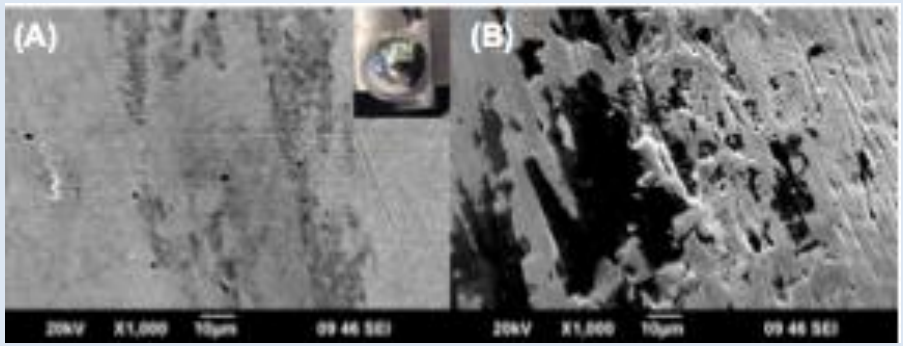


Fig 1. Retrieved MoM Implant A. SEM at 1000X, hard phases evident and pitting; **B.** SEM at 1000X, pitting corrosion.

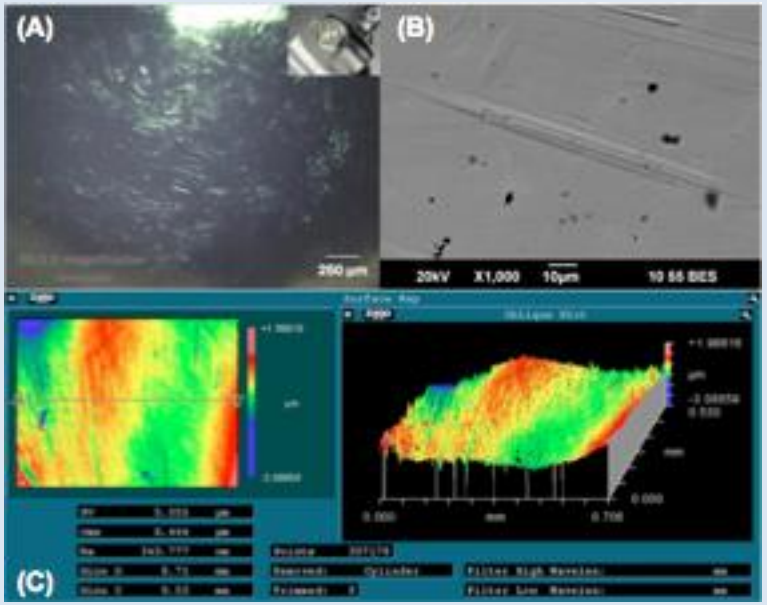


Fig 2. Control condyle A. SmartScope image at 95.3X, scratching evident; **B.** SEM image at 1000X, pitting and hard phases evident source of third body particles; **C.** WLI, surface roughness of 343.77 nm.

Results

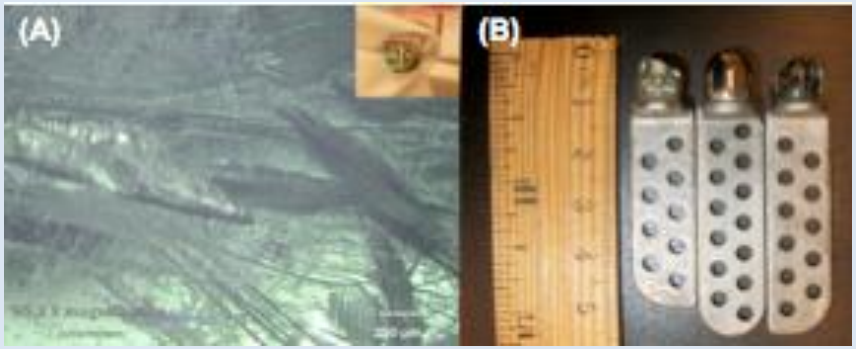


Fig 3. Retrieved Polymer A. SmartScope, 95.3X; **B.** A gross comparison between retrieved MoM and MoP implants, MoP exhibited a larger surface wear.

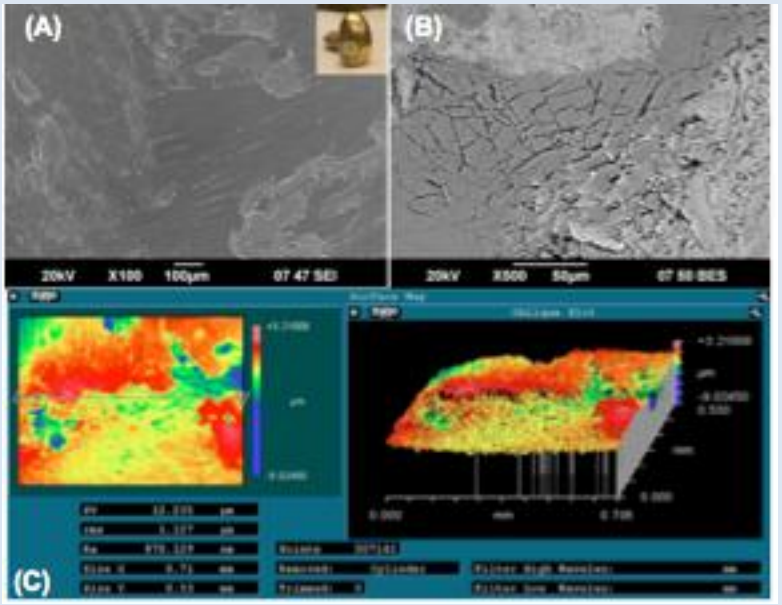
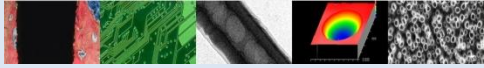


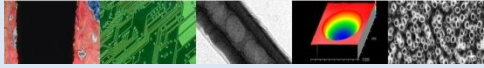
Fig 4. TiNi Coated A. SEM at 100X, coated vs. uncoated surfaces seen; **B.** SEM at 500X, cracking visible in underlying Ti alloy and loss of TiNi coating; **C.** WLI, surface roughness of 870.12 nm.



Progresses

- Peripheral Tissue Sample Microscopic Images and Composition

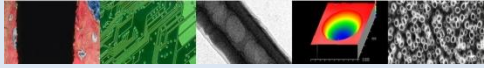
- This research is still in progress
  - SEM (retrieved MoM)
  - WLI (retrieved MoM)



Future work

- As part of a translational study, a comparison to observations of the HIP system will also be made to this study's findings.

- This study is still in progress, a series of *in-vitro* tests under mechanical loading is under construction.



Acknowledgements

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