THE EFFECTS OF NEUROMUSCULAR DISORDERS ON ORAL HYGIENE

EVIDENCE BASED DENTISTRY ROUNDS
SPECIAL TOPICS/EMERGING TRENDS
9B-4
10/28/20

ROUNDS TEAM

- **Group Leader:** Dr. Derderian
- **Specialty Leader:** Mrs. Bryan and Dr. Yale
- **Project Team Leader**
  - D4: Emelia Karkazis
- **Project Team Participants**
  - D1: Jeffrey Uju
  - D2: Andrew Sedra
  - D3: Bailey Wagner

PATIENT

- 72-year-old Caucasian female
- CC: "I need to get a lot of work done on my teeth"

MEDICAL HISTORY

- Multiple Sclerosis (20+ year history), past smoker, breast cancer 2010, hypertension, hypothyroidism, rheumatoid arthritis
- Medications:
  - Imipramine
  - Methotrexate
  - Levothyroxine
  - Lisinopril
  - Adderall
  - Amantadine
  - Golimumab
  - Clonazepam
  - Diltiazem HCl
  - Plegridry—discontinued use after 24 years due to side effects

DENTAL HISTORY

- Dental history of:
  - Extractions
  - Generalized caries
  - Root canal treatment
  - Crowns
  - Removable partial dentures (maxillary and mandibular in 2017)
    - Patient was not comfortable wearing either RPD, has not worn since

CLINICAL PHOTOS

CLINICAL PHOTOS

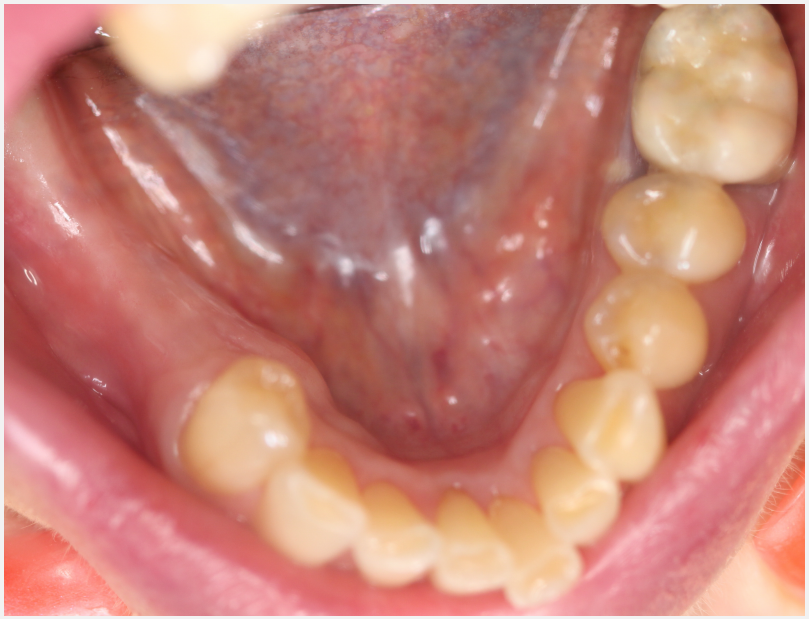
Right MIP

Left MIP

Anterior MIP

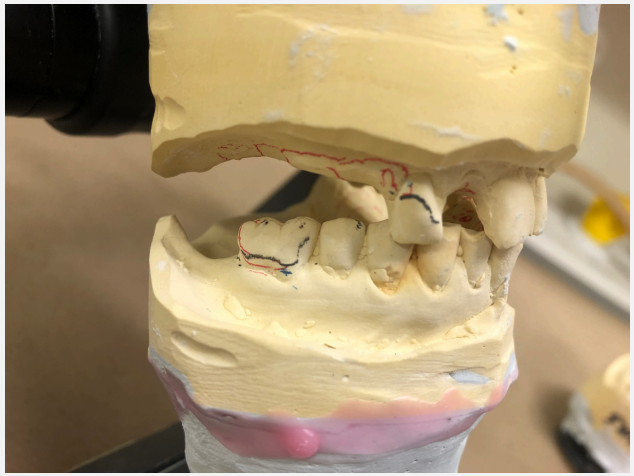
CLINICAL PHOTOS

Maxillary Occlusal



Mandibular occlusal

DIAGNOSTIC CASTS



Right lateral MIP

Anterior MIP

Left lateral MIP

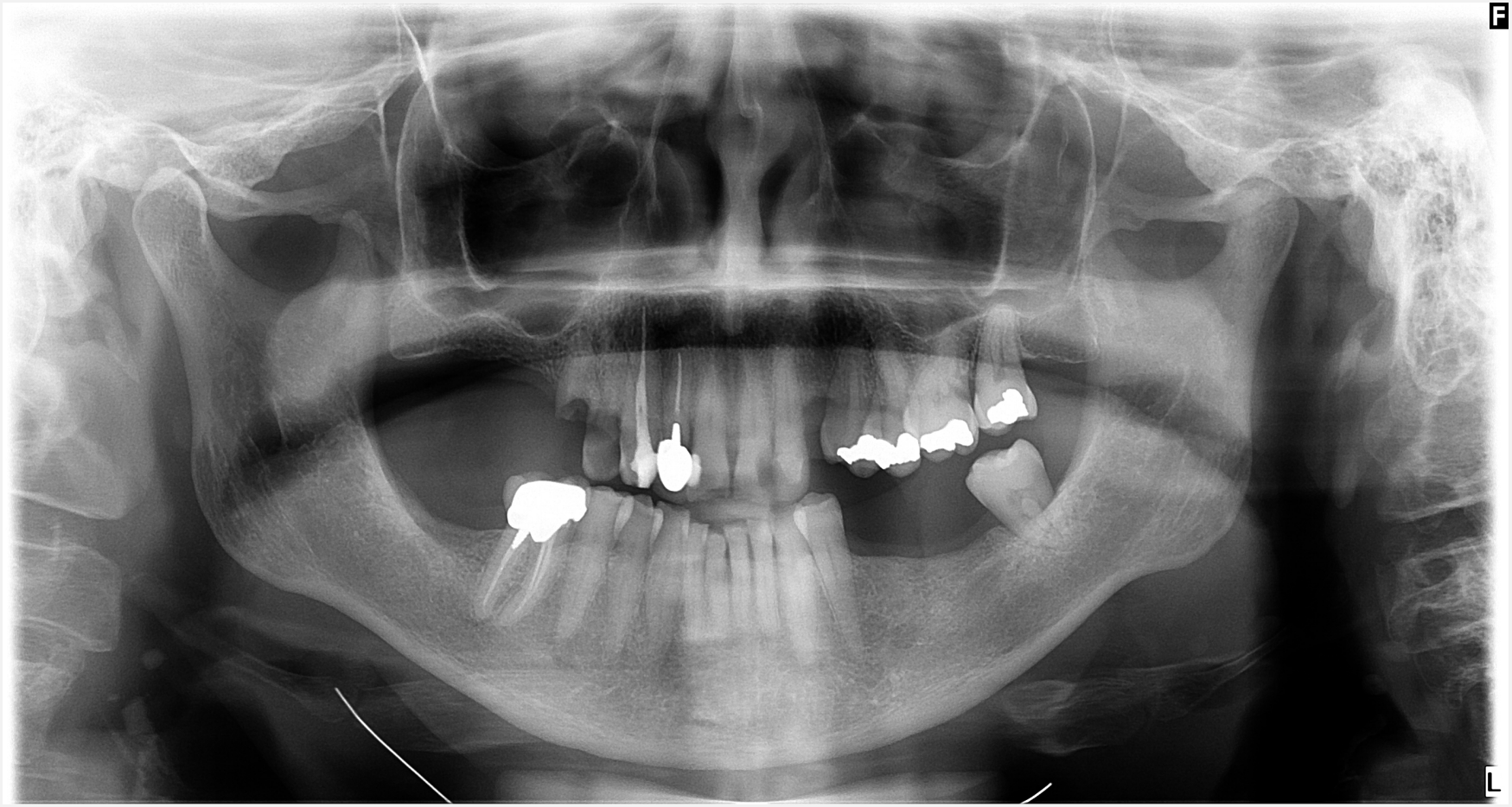
DIAGNOSTIC CASTS

Right laterotrusive

Protrusive

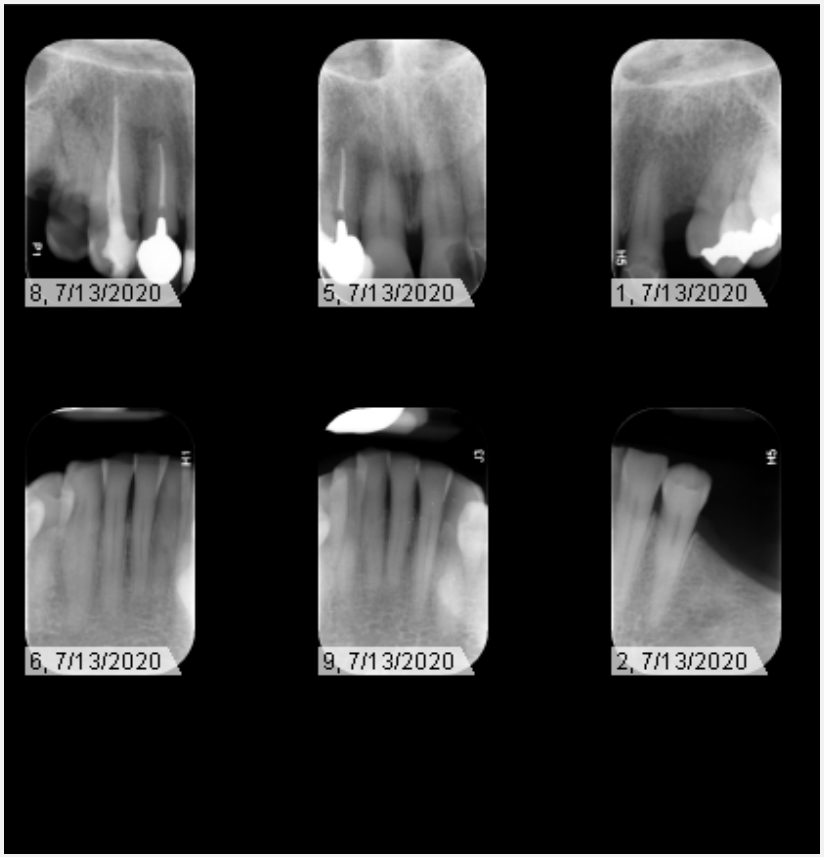
Left laterotrusive

PAN (8/7/20)



RADIOGRAPHS RIGHT

RADIOGRAPHS ANTERIOR



RADIOGRAPHS LEFT

RADIOGRAPHIC FINDINGS

- Missing: #1, 2, 3, 11, 16, 18, 19, 20, 31, 32
- Gross Decay: #4, 5 (extracted)
- RCT: #6, 7
- Recurrent decay/PARL: #7 (extracted)
- PFM crown: #6, #30
- ACC crown: #10
- Post: #6, #30
- Resin restorations: #6 MIFL, #8 ML/DL, #9 ML/DL
- Amalgam restorations: #12 DO, #13 MOD, #14 O, #15 O/B

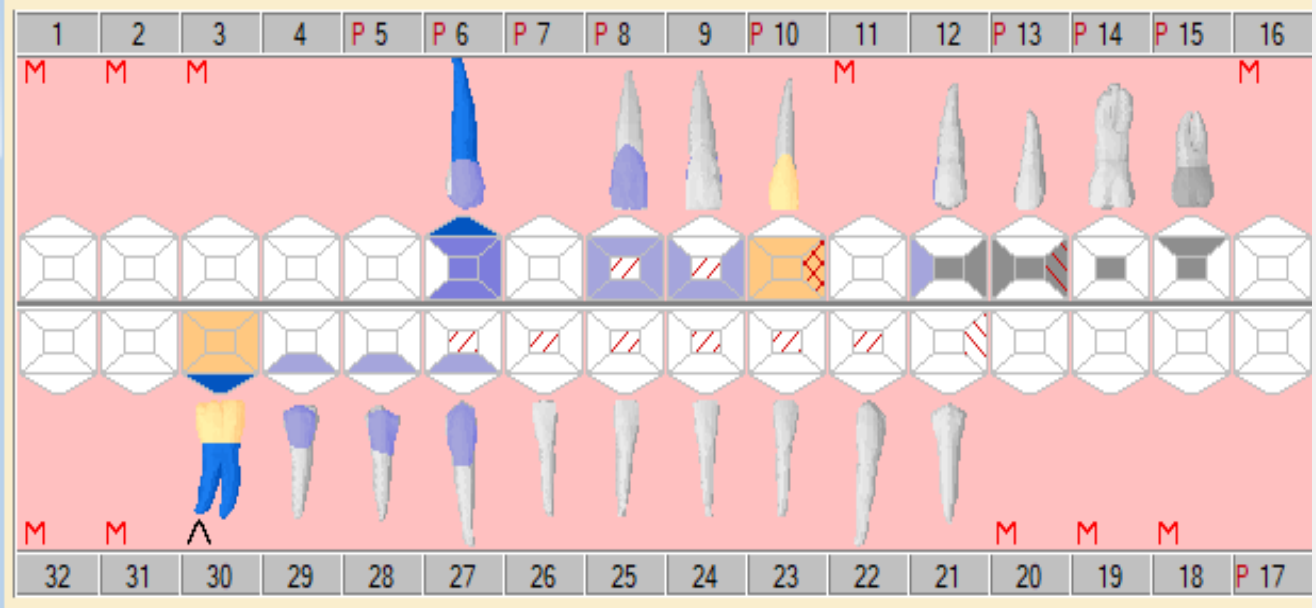
CLINICAL FINDINGS

- Class II mobility #17 (extracted)
- Attrition/parafunctional habits: mandibular/maxillary incisal edges
- Defective restoration: #8 ML, #9 DL
- Generalized Decay: #8 M/D, #9 M/D, #10 D recurrent, #12 M #27 F, #28 B, #29 B

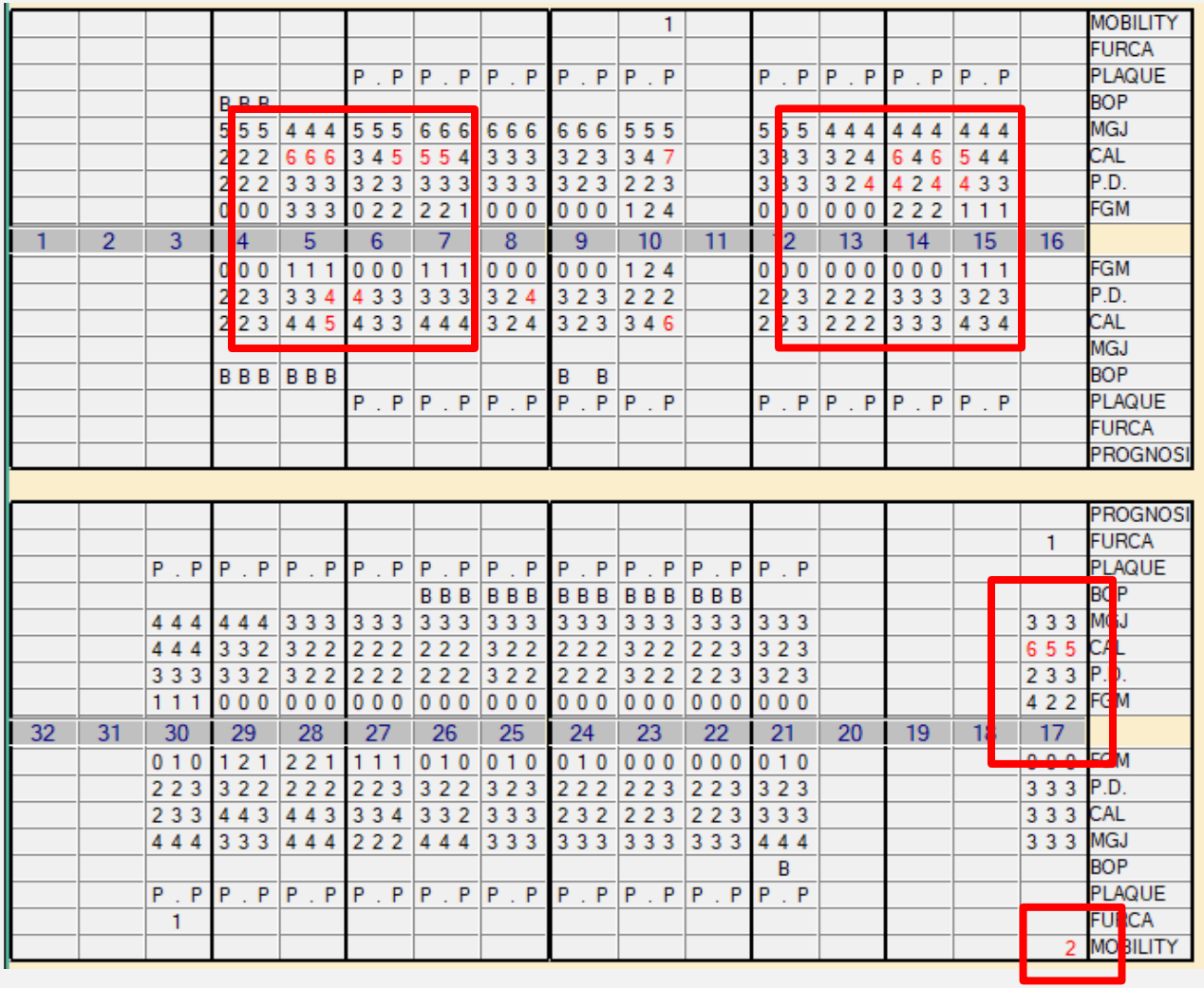
SPECIFIC FINDINGS

- Class I furcation and Class II mobility #17
- Class I mobility #10
- 5-6 mm CAL #5, 6, 17
- Decay #8 M/D, #9 M/D, #10 D recurrent, #12 M, #27 F, #28 B, #29 B
- Parafunctional habits

ODONTOGRAM


1 2 3 4 P 5 P 6 P 7 P 8 9 P 10 11 12 P 13 P 14 P 15 16
32 31 30 29 28 27 26 25 24 23 22 21 20 19 18 P 17

PERIODONTAL CHARTING



										1							MOBILITY
																	FURCA
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		1															FURCA
															2		MOBILITY

DIAGNOSIS

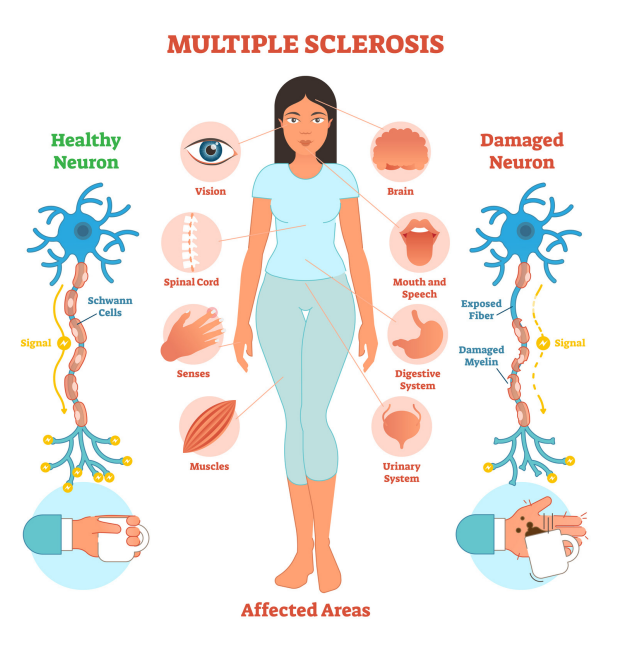
- Diagnosis
  - ADA IV: Advanced Chronic Periodontitis

PROBLEM LIST

- Caries
- Crowding
- Defective restorations
- Existing dentures are defective
- Fractured tooth
- Home Care
- Missing teeth
- Mobility
- Pain
- Perio Disease

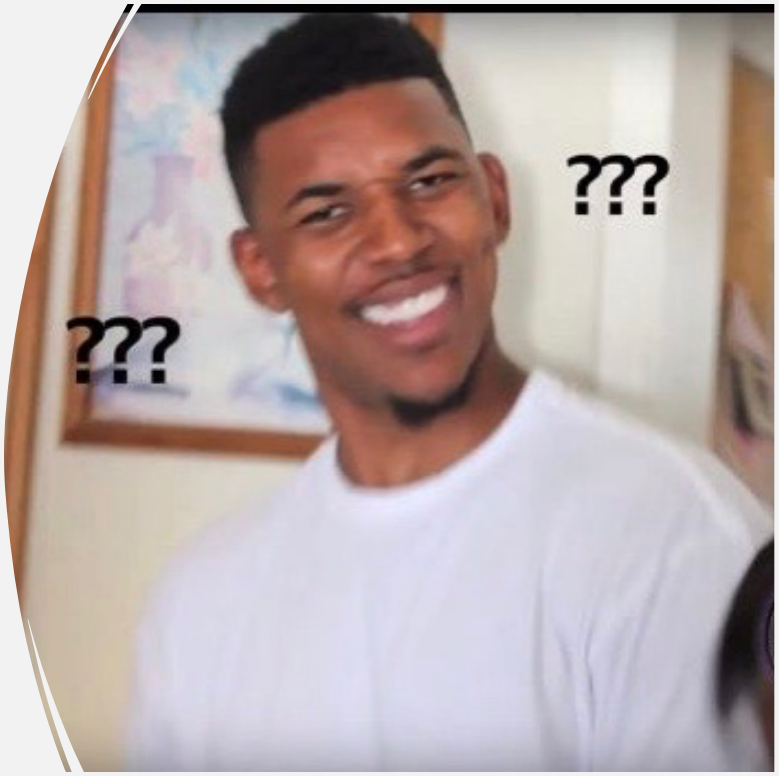
D1 BASIC SCIENCE: WHAT IS THE ETIOLOGY OF MS?

- Multiple Sclerosis is an autoimmune disease, resulting in chronic inflammatory lesion of the nerve or destruction of myelin, the white substance of the brain, spinal cord and optic nerves.
- Symptoms Include
  - Spasticity
  - Fatigue
  - Cognitive dysfunction
  - Depression,
  - Bladder, Bowel and Sex dysfunction
  - Pain



D1 BASIC SCIENCE: WHAT IS THE ETIOLOGY OF MS?

- The Cause of Multiple sclerosis is Unknown
- The main agents responsible for the MS development includes exogenous , environmental and genetic factors
- Strong Evidence that infection with Epstein-Barr virus (EBV) is important factor



D1 BASIC SCIENCE: WHAT IS THE ETIOLOGY OF MS?

References

- Ascherio, A., & Munger, K. L. (2010). 99th Dahlem Conference on Infection, Inflammation and Chronic Inflammatory Disorders: Epstein–Barr virus and multiple sclerosis: epidemiological evidence. *Clinical & Experimental Immunology*, *160*(1), 120–124. https://doi.org/10.1111/j.1365-2249.2010.04121.x
- Crayton, H., & Rossman, H. (2006, June 06). Managing the symptoms of multiple sclerosis: A multimodal approach. Retrieved October 11, 2020, from https://www.sciencedirect.com/science/article/pii/S0149291806000932
- Kamińska J, Koper OM, Piechal K, Kemona H. Multiple sclerosis - etiology and diagnostic potential. Postepy Hig Med Dosw (Online). 2017 Jun 30;71(0):551-563. doi: 10.5604/01.3001.0010.3836. PMID: 28665284.

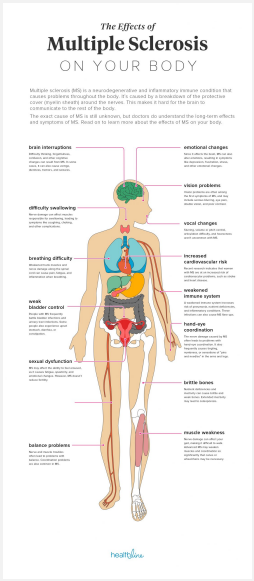
D2 PATHOLOGY:
HOW DOES MS AFFECT A PATIENT'S ORAL HEALTH AND WHAT ARE SOME ORAL MANIFESTATIONS?

- Multiple Sclerosis
  - Autoimmune CNS demyelinating inflammatory disease
  - First signs: Numbness, pain, muscle weakness, and spasms.
- Dental care becomes difficult
- Harder to maintain good oral health
- May require physical assistance
- Appointments should be short and in the a.m.

D2 PATHOLOGY:
HOW DOES MS AFFECT A PATIENT'S ORAL HEALTH AND WHAT ARE SOME ORAL MANIFESTATIONS?

Oral Manifestations:

- Dysarthria
  - Nerve damage to facial and oral muscles
- Paresthesia
  - Tingling in the mouth, hands, and feet
- Trigeminal neuralgia
  - Associated with excruciating pain
- Gingival Hyperplasia
  - Pain managements from Dilantin
- Numbness of orofacial structures



D2 PATHOLOGY: REFERENCES

- Fallata, A., Salter, A., Tyry, T., Cutter, G., & Marrie, R. (2017). Trigeminal Neuralgia Commonly Precedes the Diagnosis of Multiple Sclerosis. Retrieved October 22, 2020, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5649347/
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D3 PICO

- **Clinical Question:**
  - In patients with neuromuscular disorders, will traditional or customizable oral self care devices be more effective in the patient's ability to achieve adequate hygiene?

PICO FORMAT

P: Patients with neuromuscular disorders

I: Customizable oral hygiene devices

C: Traditional oral hygiene devices

O: Achieving adequate oral hygiene

PICO FORMATTED QUESTION

- In patients with neuromuscular disorders, will customizable or traditional oral hygiene devices be more effective in the patient's ability to achieve adequate oral hygiene?

CLINICAL BOTTOM LINE

- How can a dental professional customize oral self care devices in patients with neuromuscular disorders?

SEARCH BACKGROUND

- **Date(s) of Search:** 10/13/20
- **Database(s) Used:** Pubmed, textbook
- **Search Strategy/Keywords:** I searched for systematic reviews, meta-analyses, randomized controlled trials, and clinical trials relevant to the topic of oral hygiene in patients with motor deficits. This includes, but is not limited to, patients with cerebral palsy, multiple sclerosis, and stroke patients.

SEARCH BACKGROUND

- **MESH terms used:**
  - Neuromuscular disorders
  - Toothbrush
  - Oral health care
  - Devices
  - Dental hygiene
  - Multiple sclerosis
  - Cerebral palsy
  - Stroke
  - Motor deficits
  - Disability

ARTICLE 1 CITATION, INTRODUCTION

- **Citation:**
  - Ikeda T, Yoshizawa K, Takahashi K, Ishida C, Komai K, Kobayashi K, Sugiura S. Effectiveness of electric toothbrushing in patients with neuromuscular disability: A randomized observer-blind crossover trial. Spec Care Dentist. 2016 Jan;36(1):13-7. Doi: 10.1111/scd.12141. Epub 2015 Sep 21. PMID: 26390226.

- **Study Design:** Randomized Controlled Trial

- **Study Need/Purpose:** This study's purpose was to evaluate the oral hygiene in patients with neuromuscular disabilities using electric toothbrushes versus manual toothbrushes.

ARTICLE 1 SYNOPSIS

Methods

- 28 patients with neuromuscular disabilities were randomly assigned to use either a manual or electric toothbrush and were evaluated for 4 weeks. Data collection included plaque status, periodontal pocket depths, oral status, salivary bacterial count, and tooth brushing time.

Results

- Electric toothbrush patients had significantly shallower pocket depths and plaque status
- No significant differences in oral status and salivary bacterial count
- Manual toothbrush patients had significantly longer brushing time

Conclusions

- The study concluded that electric toothbrushes are beneficial overall to help maintain oral health in patients in neuromuscular disorders

Limitations

- Low number of patients in study
- No method of personalizing brushing style based on each person's level of ability
- No clarification of whether or not patient were actually effectively using the toothbrush, whether it be manual or electric

ARTICLE 1 SELECTION

- **Reason for selection**
  - I chose this article because it measured the effectiveness of a regular toothbrush and a toothbrush with added oscillation/vibration. Some patients with motor deficits may have issues with the precise motions of manipulating the bristles, which the vibration may mimic.
- **Applicability to your patient**
  - Reasonably relevant, since this patient has lessened ability to perform precise movements required with brushing
- **Implications**
  - This patient would likely benefit from electric tooth brushing because vibration would disrupt biofilm more efficiently. However, this could apply to any patient.

ARTICLE 2 CITATION, INTRODUCTION

- **Citation:**
  - Rai T, Ym K, Rao A, P AN, Natarajan S, Joseph RM. Evaluation of the effectiveness of a custom-made toothbrush in maintaining oral hygiene and gingival health in cerebral palsy patients. Spec Care Dentist. 2018 Nov;38(6):367-372. Doi: 10.1111/scd.12334. Epub 2018 Oct 23. PMID: 30350870

- **Study Design:**
  - Randomized controlled trial

- **Study Need / Purpose:**
  - This study's purpose was to compare the efficacy of manual versus custom made toothbrushes in patients with cerebral palsy, a common neurologic disorder that results in a wide range of neurologic deficits.

ARTICLE 2 SYNOPSIS

Methods

- 30 patients ages 6-18 were divided into two groups and assigned to a manual toothbrush or a custom made toothbrush. Patients were instructed to brush twice per day. Plaque index and modified gingival index were recorded at baseline and again at 3 weeks.

Results

- Regular toothbrush patients: 8.34% drop in plaque index and 14.51% drop in modified gingival index
- Custom toothbrush patients: 31.55% drop in plaque index and 30.23% drop in modified gingival index

Conclusions

- Results were significant and supported that custom made toothbrushes increase a patient with cerebral palsy's ability to achieve adequate oral hygiene

Limitations

- Low number of patients in study
- Must rely on patient compliance (majority of patients were minors)
- No telling on length of time each patient brushed

ARTICLE 2 SELECTION

- **Reason for selection**
  - I chose this article because it measured the effectiveness of a regular toothbrush versus a custom made toothbrush in patients with cerebral palsy, which is a common neurologic disorder that causes a wide range of neuromuscular deficits.
- **Applicability to your patient**
  - Moderate relevancy. Cerebral palsy is similar to multiple sclerosis in that it produces motor deficits, but they are not the same disease.
- **Implications**
  - This patient would likely benefit from using a toothbrush that is custom made to serve her unique needs.

ARTICLE 3 CITATION, INTRODUCTION

- **Citation:**
  - Soncini JA, Tsamtsouris A. Individually modified toothbrushes and improvement of oral hygiene and gingival health in cerebral palsy children. J Pedod. 1989 Summer;13(4):331-4. PMID: 2534698.
- **Study Design:**
  - Randomized Controlled Trial
- **Study Need/Purpose:**
  - This study aimed to measure the effectiveness of regular toothbrushes and individually modified toothbrushes in children with motor deficits caused by cerebral palsy.

ARTICLE 3 SYNOPSIS

Methods

- 28 patients were monitored using either a regular or individually modified toothbrush at 4 separate dental visits. The study went over a course of 35 days, at which plaque index was recorded at days #7, #21, and #35. Patients using the modified brushes were also evaluated on their efficacy of correctly using them at each visit. This was measured by evaluating the percentages of tooth surfaces cleaned.

Results

- It was found that the patients using the individually modified toothbrushes had a significant plaque reduction after each use
- Patient ability to properly use the modified brushes significantly improved at all visits (a higher percentage of tooth surfaces had been de-plaqued).

Conclusion

- The study concluded that individually modified toothbrushes are an effective way to improve oral hygiene and gingival health in patients with cerebral palsy

Limitations

- Data based on plaque removal right after brushing – no data on plaque accumulation throughout the day. Patients with neuromuscular disorders have a higher risk of plaque accumulation.
- Though more tooth surfaces may have been cleaned at each evaluation, that does not say whether or not they ever get some surfaces (think of distal second molar!)

ARTICLE 2 SELECTION

- **Reason for selection**
  - I chose this article because it measured the effect I ness of a regular toothbrush versus an individually modified toothbrush in patients with cerebral palsy (a common disorder resulting in motor deficits). Unlike article #2, this study also evaluated the level of patient efficacy to learn and improve their technique.
- **Applicability to your patient**
  - Moderate relevancy. Same concept as article #2 that cerebral palsy is a different disease than multiple sclerosis.
- **Implications**
  - This patient would likely benefit from a toothbrush modified to meet her unique needs. She would also likely benefit from frequent evaluation and oral hygiene instruction while using the device.

LEVELS OF EVIDENCE

- ☐ **1a** – Clinical Practice Guideline, Meta-Analysis, Systematic Review of Randomized Control Trials (RCTs)
- ☒ **1b** – Individual RCT
- ☐ **2a** – Systematic Review of Cohort Studies
- ☐ **2b** – Individual Cohort Study
- ☐ **3** – Cross-sectional Studies, Ecologic Studies, "Outcomes" Research
- ☐ **4a** – Systematic Review of Case Control Studies
- ☐ **4b** – Individual Case Control Study
- ☐ **5** – Case Series, Case Reports
- ☐ **6** – Expert Opinion without explicit critical appraisal, Narrative Review
- ☐ **7** – Animal Research
- ☐ **8** – In Vitro Research

STRENGTH OF RECOMMENDATION TAXONOMY (SORT)

☐	**A** – Consistent, good quality patient oriented evidence
☒	**B** – Inconsistent or limited quality patient oriented evidence
☐	**C** – Consensus, disease oriented evidence, usual practice, expert opinion, or case series for studies of diagnosis, treatment, prevention, or screening

CONCLUSIONS: D3

How does the evidence apply to this patient?

- Evidence based research did not bring up a ton of information that would directly cater to our patient. However, it seems clear that modifying oral hygiene devices to meet the specific needs of a patient with motor deficits is a useful tactic.

Based on the above considerations, how will you advise your D4?

- This patient would likely benefit from a modified dental hygiene device that suits her specific level of mobility. She would also likely benefit from added oscillation to effectively remove plaque. I would suggest to try using a toothbrush with a wider handle or a longer shaft to help her grip and reach her teeth effectively. Once you find a device that works, give thorough OHI and witness her use the device. Help her improve and master her oral hygiene regimen throughout her treatment.

CONCLUSIONS: D4

Based on your D3's bottom line recommendations, how will you ***advise*** your patient?

I will advise my patient to try different oral hygiene adjuncts to test which one is the most comfortable for her while providing maximum benefits at maintaining her existing dentition and oral hygiene.

How will you ***help*** your patient?

I will keep reinforcing the importance of home care at each appointment and continue to encourage her to work hard to maintain her hygiene. I will provide the necessary restorative work to control her caries and get her dentition to a state where we can then start the process of RPD fabrication on the maxilla and mandible.

DISCUSSION QUESTIONS

DISCUSSION QUESTIONS

THANK YOU!