FALL ROUNDS

IMPACTED CANINES

EVIDENCE BASED DENTISTRY
ORTHODONTICS

GROUP B
TEAM 4A-5
10/28/2020

ROUNDS TEAM

- **Group Leader: Dr. Grady**
- **Specialty Leader: Dr. Liu**
- **Project Team Leader: Alyssa Marchetti**
- **Project Team Participants: Eleni Langas; Suanet Negron-Valdez; Mansour Mohammed**

PATIENT: DP

Age: 14

Gender: Female

Ethnicity: Hispanic

Chief Complaint: "I have a tooth that will not come in"

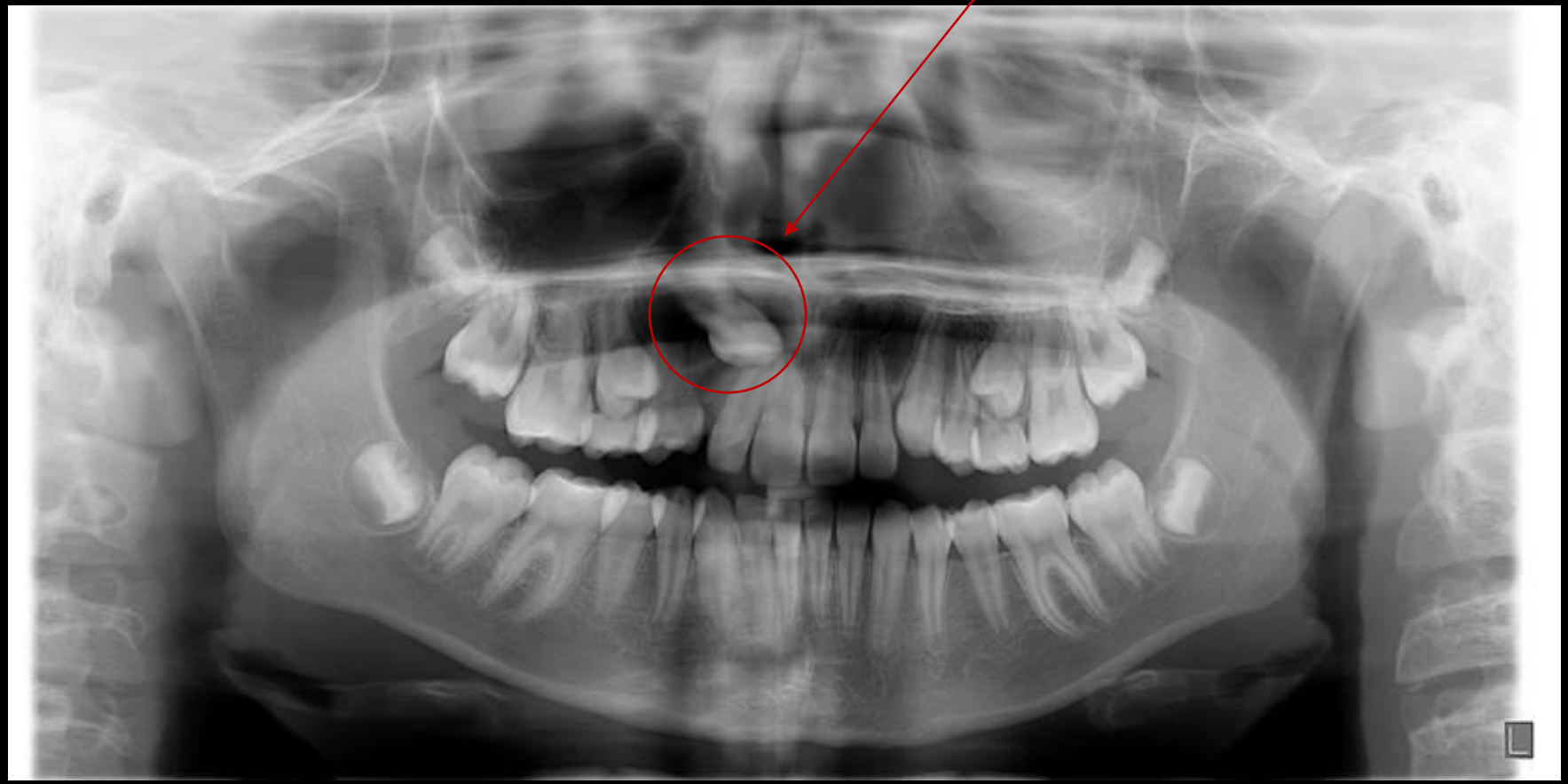
MEDICAL HISTORY

- Conditions:
  - ADD/ADHD
  - Eczema
- Medications:
  - Guanfacine
  - Methylphenidate
  - Topical steroids

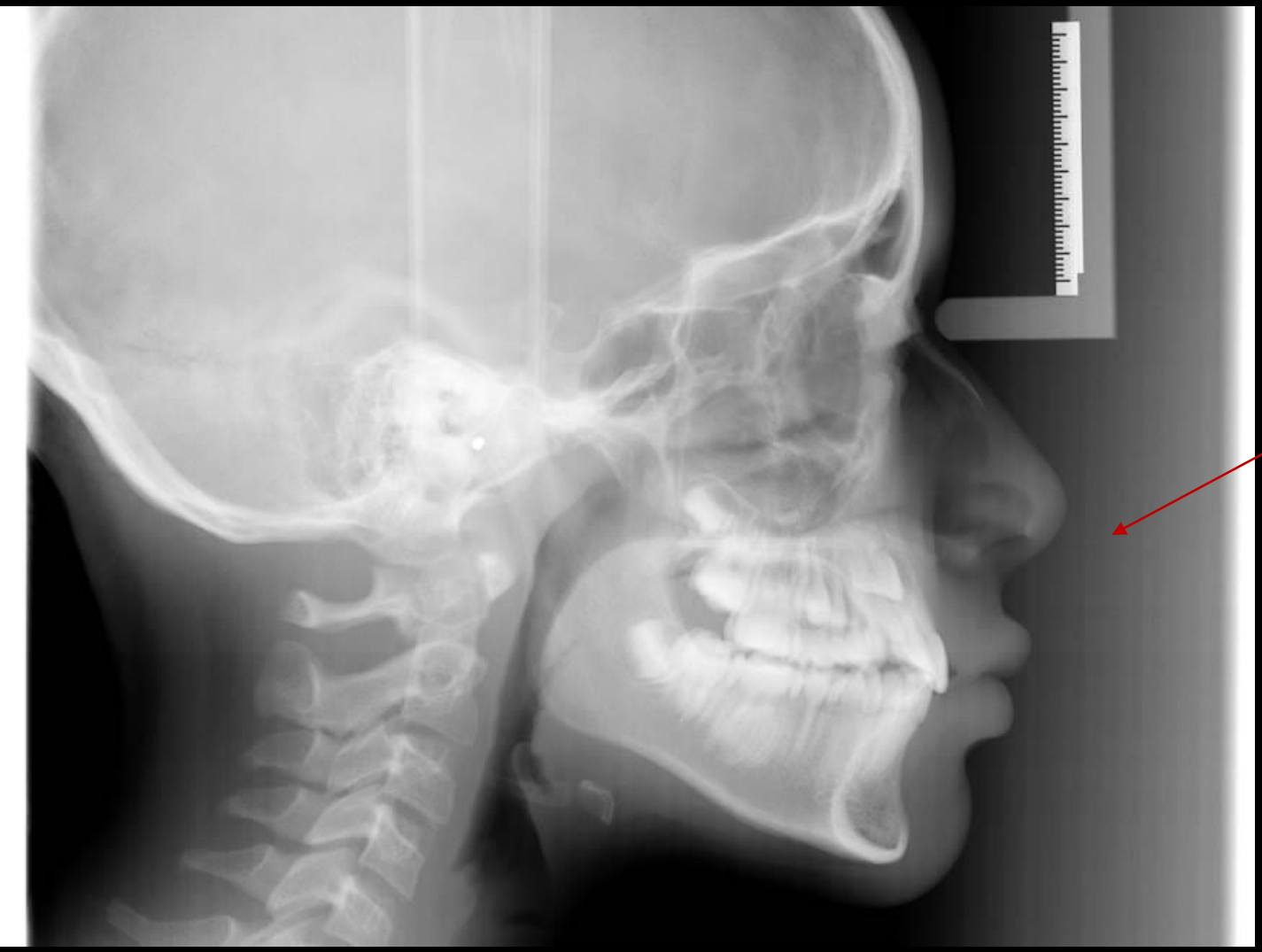
DENTAL HISTORY

- Clicking/popping upon opening
- Bruxism
- Sealants - #3,#14,#19, #30
- Resins - #2O, #15O, #18O, #31O
- Undergoing orthodontic treatment

Radiographs



Before Treatment: 2017



Before Treatment: 2017

Right Side Bitewings:2020

Left Bitewings: 2020

RADIOGRAPHIC FINDINGS

- "Impacted tooth 6: The tooth is mesioangularly impacted with the palatal aspect of its crown touching and mildly resorbing the buccal aspect of the apical one-third of the root of tooth 7. The root of tooth 7 is depressed palatally. The apex of tooth 8 appears to be spared. The root of tooth 6 is not fully formed and the apex is open and located at the junction of the lateral wall of the nasal cavity and the maxillary sinus.“

- Bone level = <2mm

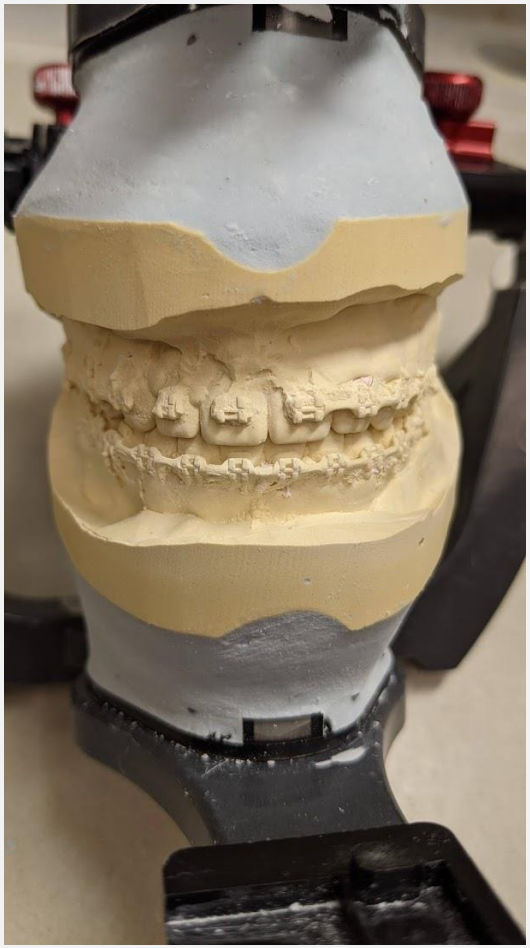
CLINICAL PHOTOS

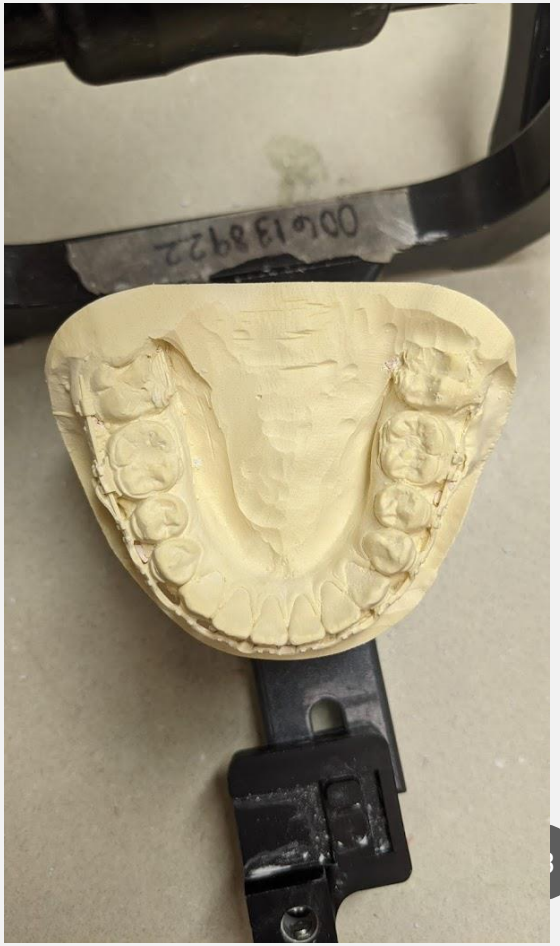
[redacted]

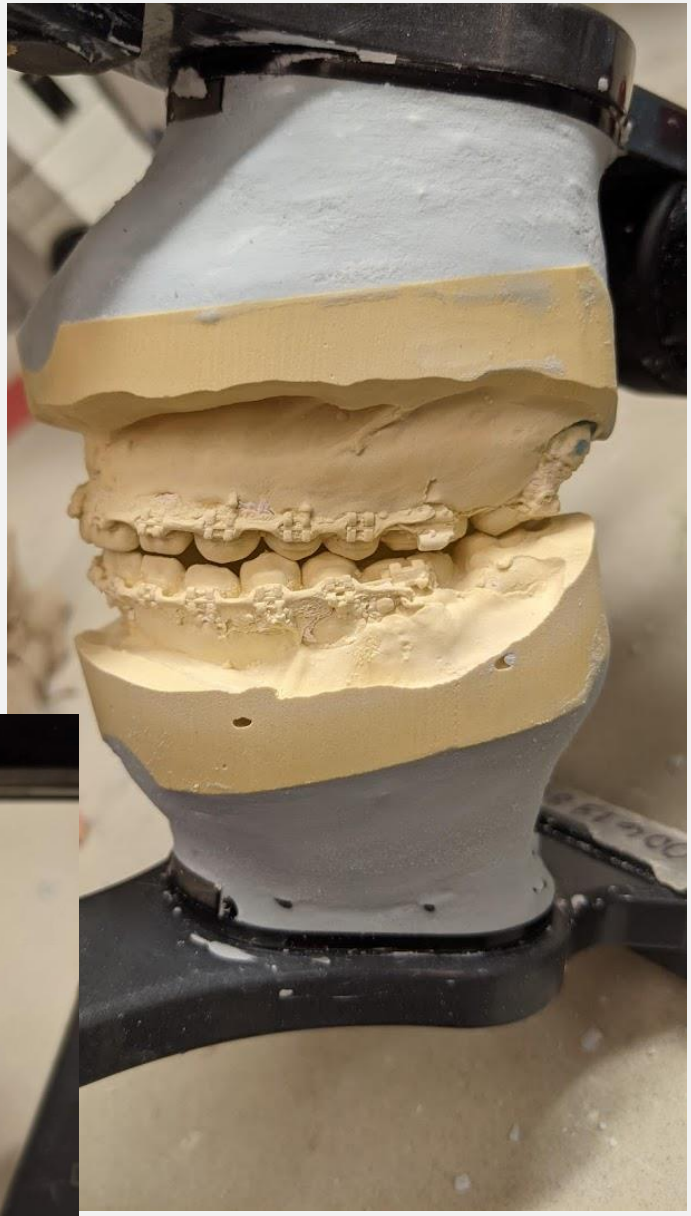
6/30/2017

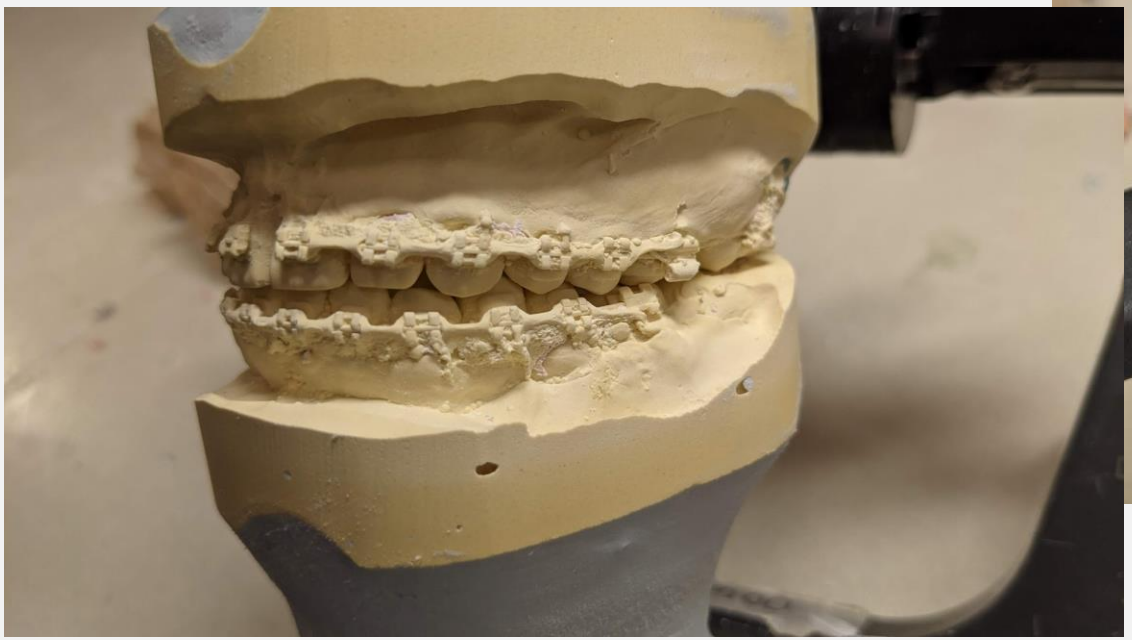
Printed: 10/14/2020

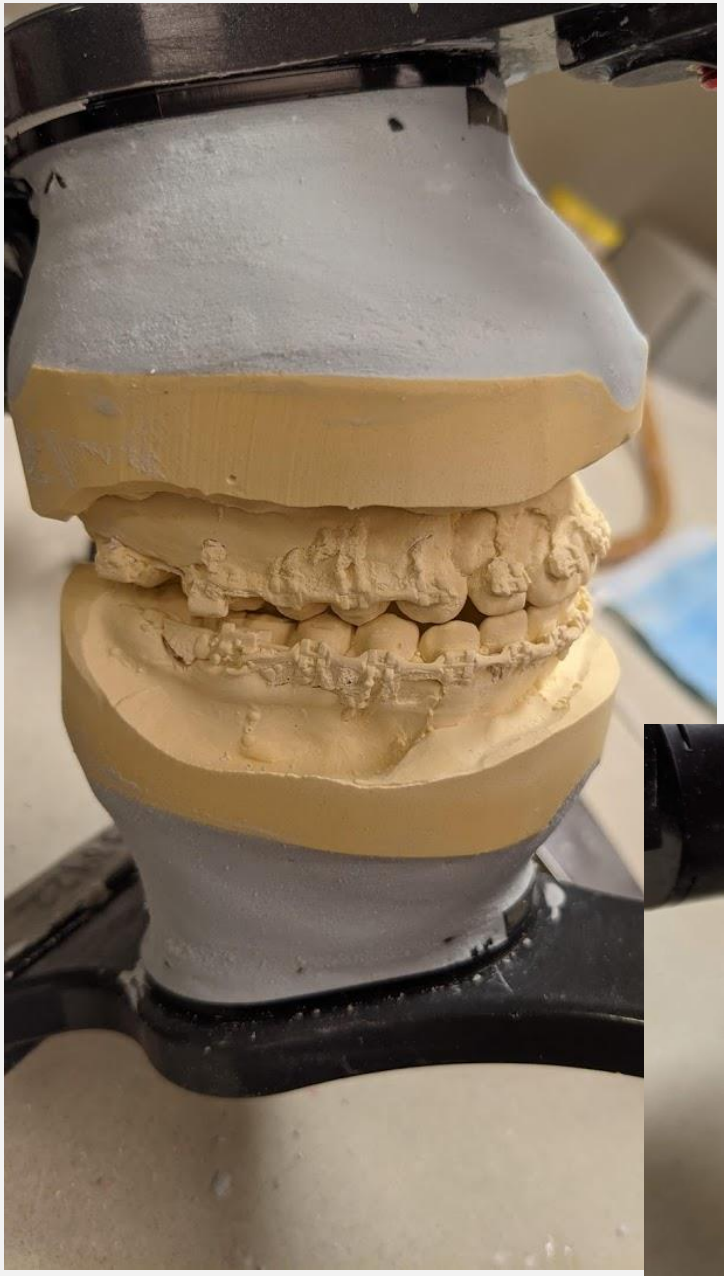
DIAGNOSTIC CASTS



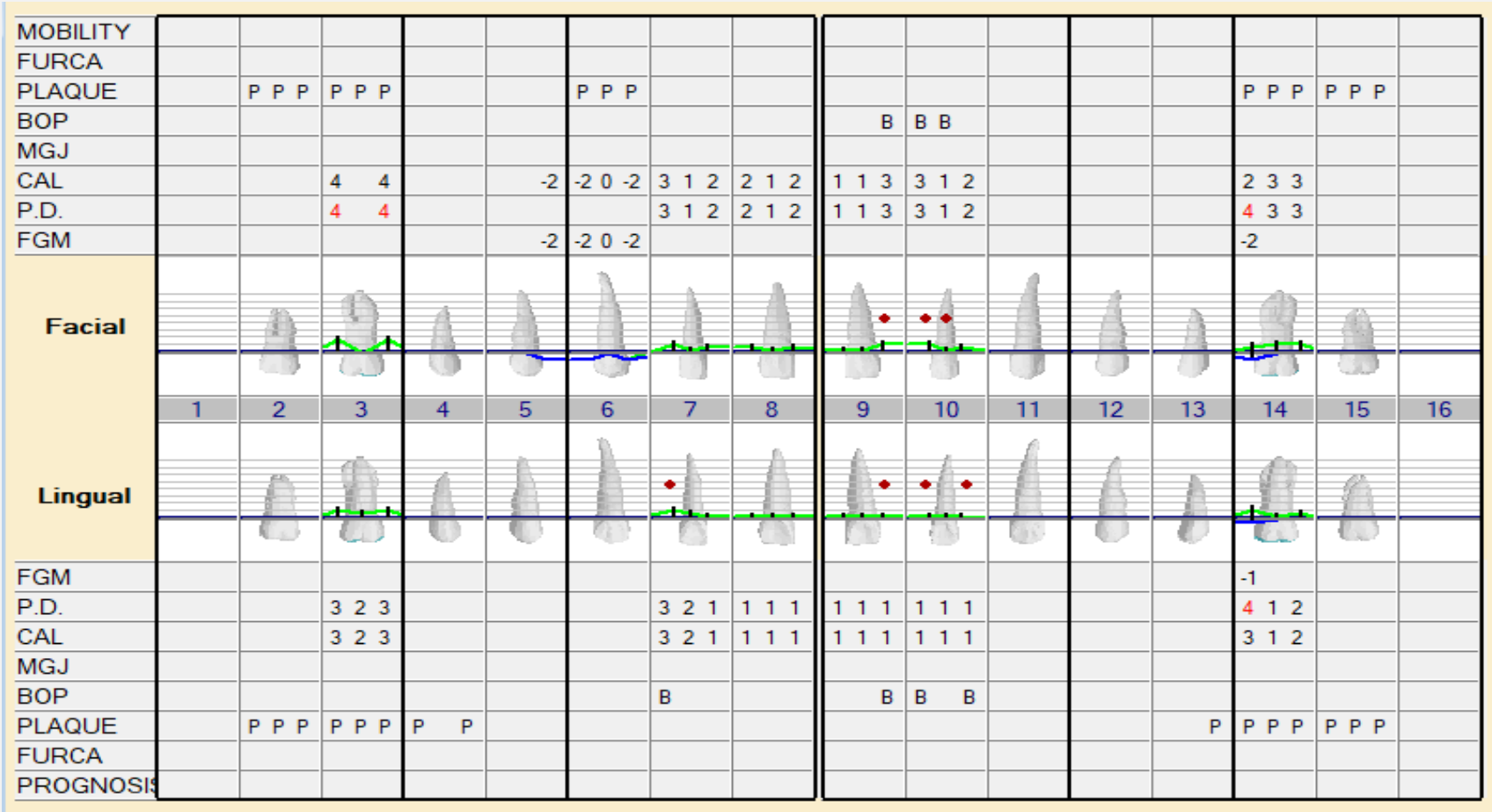




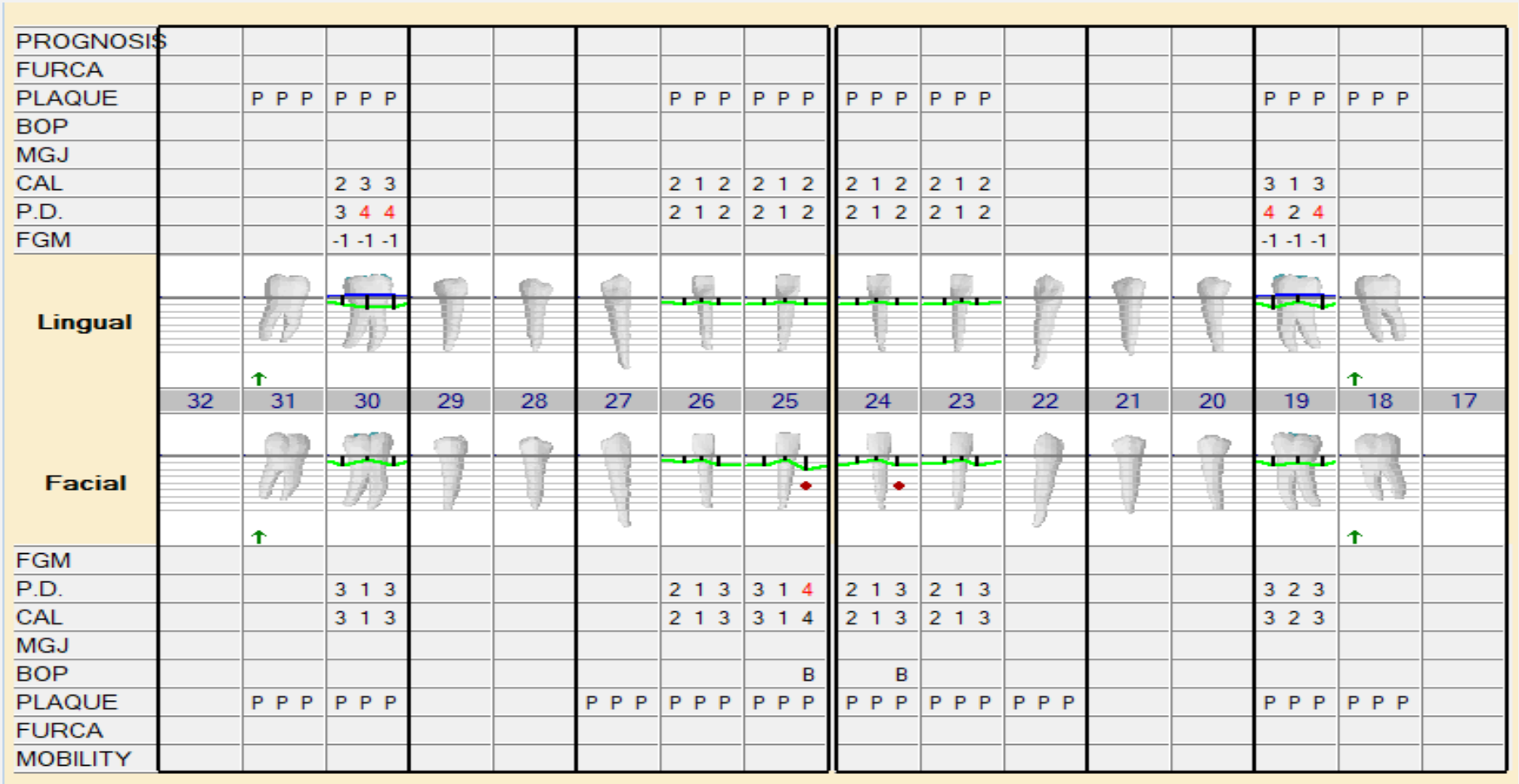




PERIODONTAL CHARTING



PERIODONTAL CHARTING



DIAGNOSIS

Impacted #6

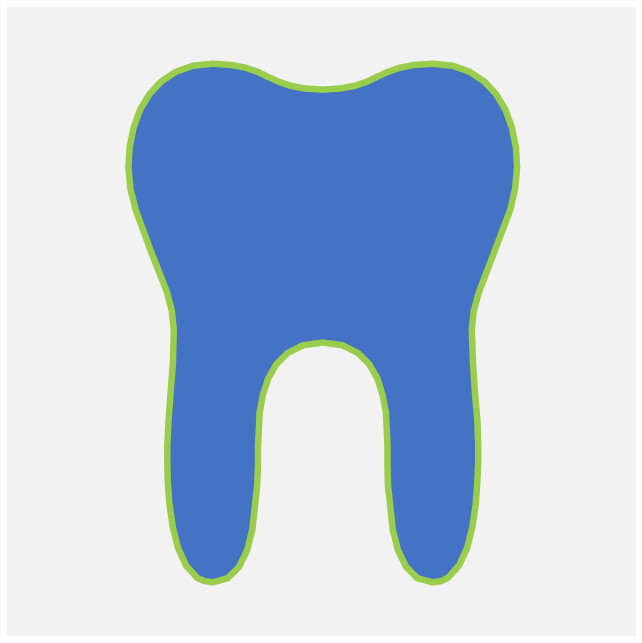
PROBLEM LIST

- Caries
- Impacted Teeth
- Hx of TMD

D1 BASIC SCIENCE

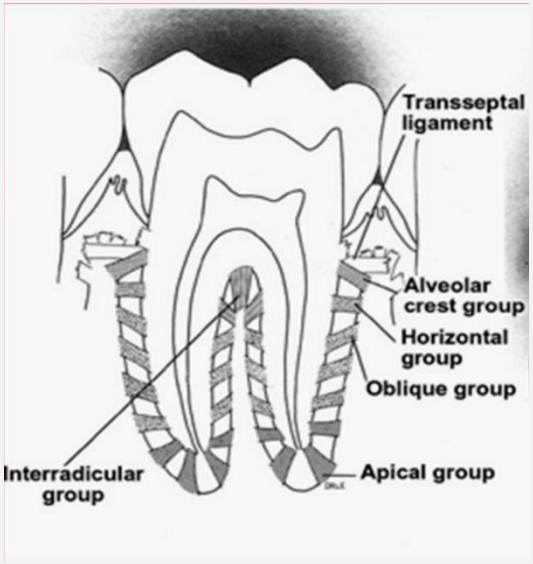
WHAT ARE THE DIFFERENT PERIODONTAL FIBERS? WHAT DO THEY DO?

- There are six different types of Periodontal Fibers.
- All six types are composed of collagen.
- They are classified by location and orientation around the tooth.



WHAT ARE THE DIFFERENT PERIODONTAL FIBERS? WHAT DO THEY DO?

- **Transseptal**: Located in the interproximals, these fibers reach over the alveolar bone and embed in the cementum of adjacent teeth to keep them in line.
- **Alveolar Crest**: These fibers extend obliquely just from cementum to the alveolar crest. They resist lateral movement and extrusion of teeth.
- **Horizontal**: Similar to the alveolar crest fibers but are located more apically in a perpendicular manner.
- **Oblique**: Most numerous fibers, these fibers start in the cementum and run obliquely to attach in the alveolar bone.
- **Apical**: Located at the apex of the tooth, these form the base of the of socket.
- **Interradicular** : Exclusive to multi-rooted teeth, located in between the roots, they attach the cementum to the nearest alveolar bone.

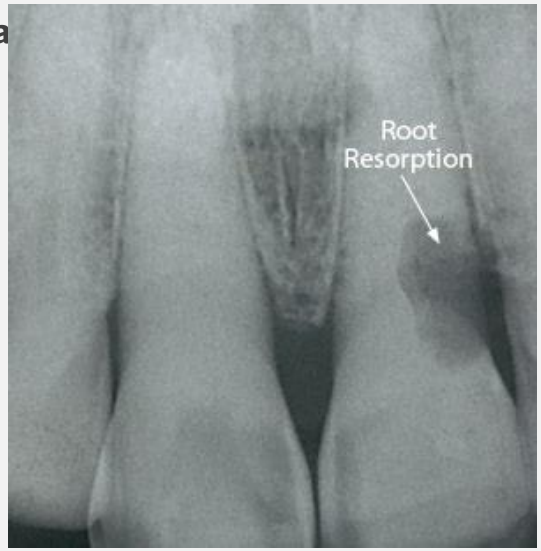


D2 PATHOLOGY

EXTERNAL TOOTH RESORPTION

What is it?

- A pathological consequence that mainly occurs due to **orthodontic thera**
- Caused by odontoclasts
- Leads to permanent loss of tooth structure around root apex
  - Cementum-like and bone-like tissue in its place
- External surface → Internal surface



https://www.deardoctor.com/inside-the-magazine/issue-28/root-resorption/

Risk Factors

- Patient related
  - Genetics, old age, chronic alcoholism, and low alveolar bone density
- Orthodontic related
  - Magnitude of applied force, treatment duration, and method of force application

Diagnosis

- Most reliable: Periapical radiographs
- Additionally Panoramic radiographs

Topkara, Ahu et al. 2012. Apical root resorption caused by orthodontic forces: A brief review and a long-term observation. *European journal of dentistry. 6 (4):445-53.*
White, Stuart C. And Pharoah, Michael J. Oral Radiology: Principles and Interpretation. Sixth edition. Mosby Elsevier, 2009, pp 318.

EXTERNAL TOOTH RESORPTION AND ORTHODONTICS

Etiology in Orthodontics

- Continuous, compressive forces
- Heavy forces
- Intrusion = more resorption than extrusion
- Longer duration of treatment

Management and Prevention

- Light, intermittent forces rather than heavy, continuous
- Radiographs every 6-12 months = early detection
- If detected:
  - 2- 3 month pause in treatment
  - Placement of a passive arch wire
- Proper oral hygiene highlighted due to higher risk of periodontitis

https://wildforasmile.com/orthodontic-treatment

Topkara, Ahu et al. 2012. Apical root resorption caused by orthodontic forces: A brief review and a long-term observation. *European journal of dentistry. 6 (4):445-53.*
White, Stuart C. And Pharoah, Michael J. Oral Radiology: Principles and Interpretation. Sixth edition. Mosby Elsevier, 2009, pp 318.

D3 PICO

CLINICAL QUESTION

- When should impacted canines be uncovered and what is the best way to go about it?

PICO FORMAT

- P: Impacted canines in adolescents undergoing orthodontic therapy
- I: Surgical intervention for labially impacted canines
- C: Treatment modalities for labially impacted canines
- O: Correction of malocclusion

PICO FORMATTED QUESTION

- In adolescents with impacted canines undergoing orthodontic therapy, would surgical intervention or nonsurgical intervention be more effective in correcting malocclusion of labially impacted canines?

CLINICAL BOTTOM LINE

Early interceptive therapy, such as primary canine extraction, is the most effective way to treat impacted canines, however, for canines in a less favorable position, surgical intervention may be necessary.

ARTICLE SEARCH

- Date of searches: 10/17/2020 and 10/19/2020
- Database(s) used: PubMed
- Search Strategy: labially impacted canines, treatment, surgery
- MESH Terms: Tooth, impacted, therapy

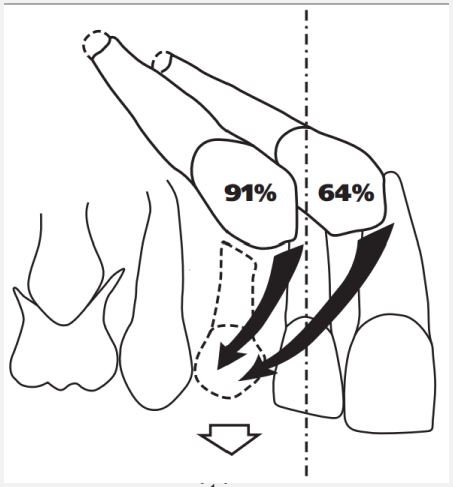
ARTICLE 1

- Bedoya MM, Park JK. A Review of the Diagnosis and Management of Impacted Maxillary Canines. *J Am Dent Assoc*. 2009 Dec; 140 (12):1485-93. Doi: 10.14219/jada.archive.2009.0099. PMID: 19955066.
- Study Design: A Literature Review
- Purpose: Diagnosis and therapy used to prevent or treat impacted canines.

ARTICLE 1 SYNOPSIS

- Methods
  - Literature was found using PubMed, Cochrane Library and bibliographies from relevant reviews
  - Clinical and radiographic studies involving impacted maxillary canines
  - Literature reviews and case reports on the prevalence, etiology and diagnosis of impacted canines
  - Literature reviews and case reports from the past 10 years addressing surgical and orthodontic techniques for management.
- Results
  - Impacted canines can be detected early and may be prevented by means of proper diagnosis, radiographic evaluation and timely interceptive treatment.
  - Surgical techniques vary depending on the position of the canine

ARTICLE 1 SYNOPSIS



- Conclusions
  - 17 % of labially impacted canines had sufficient space to erupt
    - Arch length discrepancy is the primary etiologic factor for labially impacted canines
  - Extracting the primary canine before age 11 to guide the permanent impacted canine into position
    - 91% of canine crowns distal to the midline of the lateral will erupt into proper position
    - 64% of canine crowns mesial to the midline of the lateral will erupt into proper position.
  - Gingivectomy, apically positioned flap and closed eruption techniques are some of the surgical techniques to expose labially impacted canines that are not in ideal position.
- Limitations
  - Not the highest level of evidence
  - Needs to include more recent studies

ARTICLE 1 SELECTION

- This article related to the PICO question and it specifically discussed labially impacted canines
- The article addressed the etiology of impacted canines as well as various treatment options.

ARTICLE 2

- Chiara, Cassina, Spyridon N Papageorgiou, Theodore Eliades, Open versus closed surgical exposure for permanent impacted canines: a systematic review and meta-analysis. *European Journal of Orthodontics*, Volume 40, Issue 1, February 2018, Pages 1-10
- Study Design: A systematic review and meta-analysis
- Purpose: To critically assess whether significant differences exist in the outcomes of the open or closed surgical exposure of impacted canines.

ARTICLE 2 SYNOPSIS

- Methods
  - Electronic search of nine databases dated from December of 2016
  - Randomized or prospective non-randomized studies were selected
  - 433 patients included
  - Average age of the patients was 15.2
  - Total of 453 impacted canines evaluated
- Results
  - Lower odds of ankylosis and reduced duration of treatment for open exposure techniques
  - Palatally impacted canines took significantly longer to align than labially impacted canines
    - An average of 8.87 months for palatally impacted canines vs 4.17 months for labially impacted canines

ARTICLE 2 SYNOPSIS

- Conclusions
  - Open expose technique reduced the duration of treatment by 2.14 months compared to closed exposure
  - Open exposure techniques were associated with lower odds of ankylosis
  - There were no statistically significant secondary outcomes such as canine discoloration, post-op pain and difficulty eating between open and closed exposure techniques
  - Less bone removal was needed for labially impacted canines than palatally impacted canines
  - Higher reported alignment failure when impacted canines are treated with closed techniques due to increased scar tissue formation, improper traction direction and presence of dense connective tissue.
- Limitations
  - Non-randomized trials were included which may have affected the results
  - Small trials were included

ARTICLE 2 SELECTION

- This article has a high level of evidence as a systematic review and a meta analysis
- The article related to the PICO question and to the patient
  - The focus was about surgical intervention for impacted canines

ARTICLE 3

- Grisar K, Luyten J, Preda F, Martin C, Hoppenreijs T, Politis C, Jacobs R. Interventions for impacted maxillary canines: A systematic review of the relationship between initial canine position and treatment options. *Orthod Craniofac Res.* 2020 Aug 15. Doi: 10.1111/ocr.12423. Epub ahead of pring. PMID: 32799419
- Study design: A Systematic Review
- Purpose: To critically assess the existing literature on the relationship between the initial position of impacted canines and treatment options

ARTICLE 3 SYNOPSIS

- Methods
  - Used available literature until February 2020 using MEDLINE, Cochrane Central, Web of Science and PubMed databases
  - Prospective and retrospective studies of randomized controlled trials, cohort studies and longitudinal follow up studies
  - 17 studies were reviewed (2 RCTs and 15 non-RCTs)
  - 1247 patients with an average age of 14.1 years
  - 1597 impacted canines were included in the study
- Results
  - Higher alpha angle, higher vertical position and more mesial sector are related to less successful interceptive treatment and prolonged duration of treatment

ARTICLE 3 SYNOPSIS

- Conclusions
  - Buccally impacted canines are most often associated with arch length discrepancy, thus interceptive therapy is a successful treatment option if completed in the mixed dentition
  - The open surgical technique was proven to be more statistically successful than the closed surgical technique
  - Mesiodistal and vertical location influence treatment duration
  - Buccally impacted canines are easier to put back into position but they more frequently have long term periodontal consequences.
- Limitations
  - Included retrospective studies and non-randomized trials
  - The research was not exclusively about labially impacted canines

ARTICLE 3 SELECTION

- The article had a high level of evidence as a systematic review
- The article addressed labial impaction, which is how our patient presented, and the implications on treatment outcomes

LEVELS OF EVIDENCE

Levels of Evidence: (For Therapy/Prevention, Etiology/Harm)

See http://www.cebm.net/index.aspx?o=1025

☒ **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)

Strength of Recommendation Taxonomy (SORT) For Guidelines and Systematic Reviews

See article **J Evid Base Dent Pract 2007;147-150**

☒ **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

CONCLUSION

- The most successful treatment for impacted canines is early intervention via early diagnosis and extraction of the primary canine.
- For late intervention, surgical open and closed exposure techniques are successful treatment options with open exposure being more favorable

CONCLUSIONS: D4

Due to the positioning of the canine – surgical uncovering was needed.

After Treatment: 2019

CLINICAL PHOTOS

[redacted]

9/9/2020

Printed: 10/14/2020

DISCUSSION QUESTIONS

- How long does a nonsurgical intervention take to correct impacted canines?
- What etiological factors are associated with impacted canines?
- How common is external resorption in patients that have had orthodontic therapy?
- A longer orthodontic treatment time leads to external resorption. Is there a specific time frame where the chance of external resorption increases dramatically?
- Are there any other permanent teeth that require intervention if they are impacted?
- Have the impactions of 6 and 11 caused any complications to adjacent teeth?

DISCUSSION QUESTIONS

- At what age should intervention of impacted canines be considered versus waiting for them to come in on their own?
- What are the risk associated with not uncovering an impacted tooth?
- What can be done to minimize the risk of external resorption?
- How long should you allow orthodontic therapy to take place before considering other measures?
- What role does the PDL play in tooth movement?

THANK YOU