

## Chapter

# The Radiology of Developmental Dental Defects Demystified: An e-Based Learning System

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## Abstract

The purpose of this perspective-type chapter is to provide the readership with in-depth knowledge in the area of developmental abnormalities with special emphasis on radiology together with its clinical implications. The intention of this chapter is not only to be descriptive of the radiology of the developmental dental defects, but to provide the readership with the various possible differential diagnoses and how to arrive at a definitive diagnosis and being mindful of the fact that some of these radiological presentations can be pathognomonic while others are variable in presentation. The ultimate goal of this chapter is to provide the prerequisite knowledge to the clinicians to enable them to arrive at a definitive diagnosis based on radiology and radiographic presentation without the need of any other investigation if possible. It is as such important that in this chapter the readership will be elevated to a level of realistic, yet clinician with the reasoning and interpretation of a radiologists in the area of developmental dental defects (DDD) since by understanding the basis of utilizing radiography to arrive at the definitive diagnosis of these developmental defects amidst of the various differential diagnoses, they would have gained full knowledge and control of the pertinent use of terminologies in this specific and unique area of dentistry. Conventional radiography such as periapical radiographs, bitewings and dental panoramic tomography will be utilized largely in this chapter, without the need for computerized tomography or CBCT. Certain conditions such as concrescence (not fusion and germination) and enamel pearl may be very difficult to identify or distinguish using conventional radiography and the role of advanced imaging technique will be mentioned. It is as such the intention of this unique book chapter to display in an *Atlas work note* format, the radiology of the developmental dental defects, with the intention to bring in the knowledge required to the undergraduate students of dentistry and postgraduate dentists and inclusive of the practicing clinicians in the field of dentistry.

**Keywords:** pathognomonic, variable, features, dental, defect, differential, diagnosis, radiographic, atlas, work note

## 1. Introduction

In this chapter, the radiographs of important developmental dental defects (DDD) will be displayed and important radiologically related questions will follow

together with the answers. This is to assist the reader in understanding not only the radiology of the DDD and also the clinical significance, but also the various possible differential diagnoses. It is my intention to clinically (clinical significance) and radiographically demonstrate to the readers that correlation matters between the later and the former since some clinically obvious DDD can in fact not have any specific or pathognomonic radiological presentation. The case of multiple bilateral parapremolars that was recently managed by me is replete of this statement, *“the more you look at the X-ray, the less you see of the clinically significant presentation of the developmental dental defects.”*

In this chapter, the questions posed which follows the presented radiograph will be in black and brown and the answers are in red. This is to aid the sound understanding of the radiology of the developmental dental defects at a glance. Each radiograph is as such within a plate.

This chapter will end with the developmental dental defect called regional odontodysplasia. The regional odontodysplasia is very rare and I have decided to correlate the radiology with the clinical findings and histological findings by encouraging the readers to read the classical article of Jahanimoghadam et al. [1] on the subject and for them to utilize such knowledge obtained to present a power point lecture for presentation on regional odontoplasia with the expectation that they will be opportune, 1 day to make such presentation to an audience of dental practitioners and academics.

## **2. Methods**

The author for the first time provides a self-directed dento-maxillofacial radiology atlas with focus on the developmental dental defects. The atlas that aims at demystifying the reporting and the differential diagnosis and diagnosis of the subject area utilizes a collection of radiographs to report radiographic images and arrive at both a differential diagnosis and a definitive diagnosis.

Each radiograph is depicted as a plate and as such consecutively numbered from 1 to 37.

Each plate is given a heading that concurs to the definitive diagnosis. This heading is depicted in RED.

The radiographic images are then followed by specific questions including instructions for the reader to point at specific areas of the images. These questions are depicted in BLACK.

The questions are then repeated in BOLD BROWN with the answers to the questions displayed adjacent to it and depicted in RED.

At the foot of each radiographic plate is a reference or list of reference that is aimed at providing obvious reference to each plate. These references are highlighted in Green.

All questions are strictly radiographically oriented and has strong clinical inclination and to include the use of both the radiographic and clinical information to arrive at a definitive diagnosis and clinical treatment or management. All questions and pointers are completely answered for the benefit of the student's e-based learning without the need of a lecturer.

All the wordings of the manuscript are those of the author and have not been copied from any previous text.

The students on repeated reading of the text and correlation of such information with each preceding radiographic image will completely understand the topic without the need of a tutor.

1. Point at the anomaly.

2. What is it called?

3. List two clinical considerations of this condition.

4. Point at the anomaly.

See arrow A.

5. What is it called?

Dens invaginatus (dens in dente).

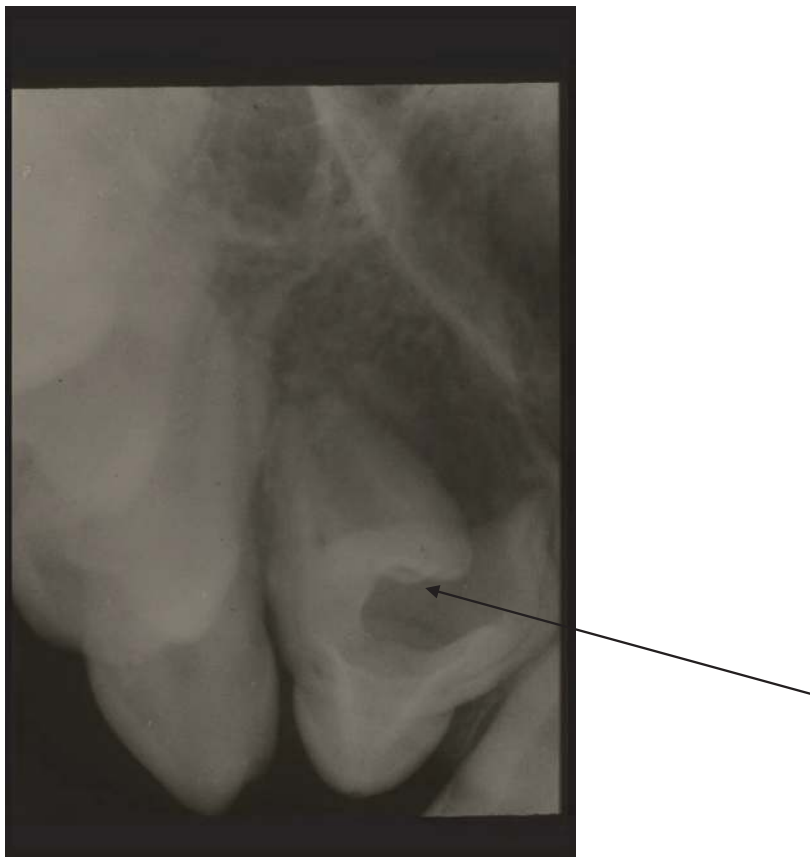
6. List two clinical considerations of this condition.

a. Dental infection without any carious lesions.

b. Inaccessible root canal, hence treatment of teeth usually infected is by extraction and replacement of extracted teeth by removable or fixed prosthesis (**Figure 1**) [2].

1. Describe the lesion.

2. What is it called?



**Figure 1.**  
*Periapical radiograph showing dens invaginatus.*

3. How is it usually discovered?

4. Is it a developmental dental defect?

5. Describe the lesion.

The occlusal radiograph shows a well-defined and well-corticated, heart-shaped unilocular radiolucent lesion with septations within it in the anterior region of the palate. The lesion is about 35 × 25 mm and intimately related to the apical region of the anterior teeth.

6. What is it called?

Nasopalatine duct cyst or the incisive canal cyst.

7. How is it usually discovered?

- a. Routine radiography (occlusal radiograph)
- b. Swelling under a denture
- c. Painful or infected swelling in the anterior maxilla

8. Is this a developmental dental defect?

No, it is actually a developmental non-odontogenic cyst? (**Figure 2**) [2].

1. Use an arrow to point at the developmental dental defect.

2. What is it called?

3. What are the clinical implications for this condition?



**Figure 2.**  
*Occlusal radiograph showing nasopalatine duct cyst (see arrows).*

4. Use an arrow to point at the anomaly.

See white arrow B.

5. What is it called?

Anodontia.

6. What are the clinical implications for this condition?

Since the permanent successor is missing the bone in the area is usually deficient and extraction and implant placement may not be effected easily unless bone grafting is done. Fortunately, this tooth may remain in occlusion throughout life despite it being prone to caries formation and periodontal disease (**Figure 3**) [2].

This patient has had no extractions

1. Point at all the anomalies with arrows.

2. What is this condition called?

3. Explain your findings.

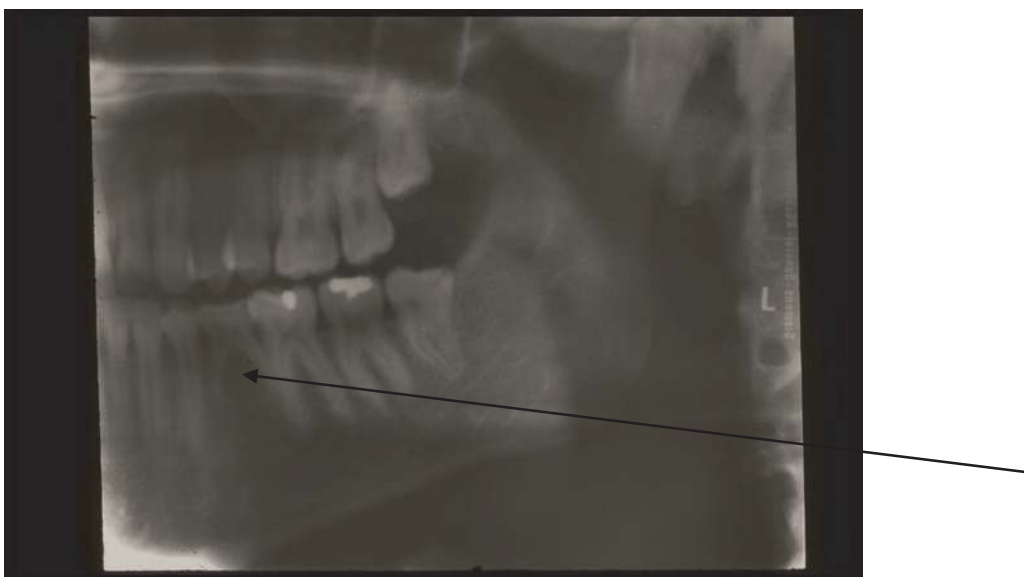
4. Point at all the anomalies with arrows.

See the arrows.

5. What is this condition called?

Hypodontia.

6. Explain your findings.



**Figure 3.**  
*Part of a dental panoramic tomogram (DPT) showing over-retained deciduous second molar and missing second premolar in the lower jaw (see arrows).*

In all the four quadrants, some deciduous teeth are over retained with the permanent successors absent in the bone. These over-retained deciduous teeth are the canine teeth in the upper jaw and the first molars in the mandible. It is not unlikely that the edentulous space in the maxilla is as a result of permanent teeth that never formed (**Figure 4**) [2].

1. Point at the main anomaly.
2. What is it called?
3. What do you see clinically?
4. Do a report on this radiograph?

5. Point at the main anomaly.

See the arrow.

6. What is it called?

Mesiodens.

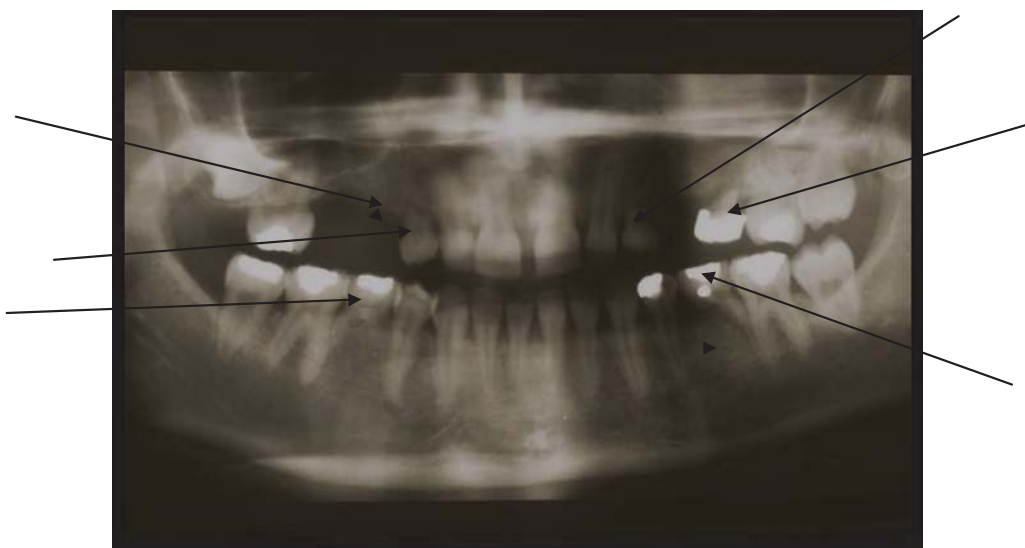
7. What do you see clinically?

A diastema caused possibly by a rotated miniature/defective supernumerary incisor.

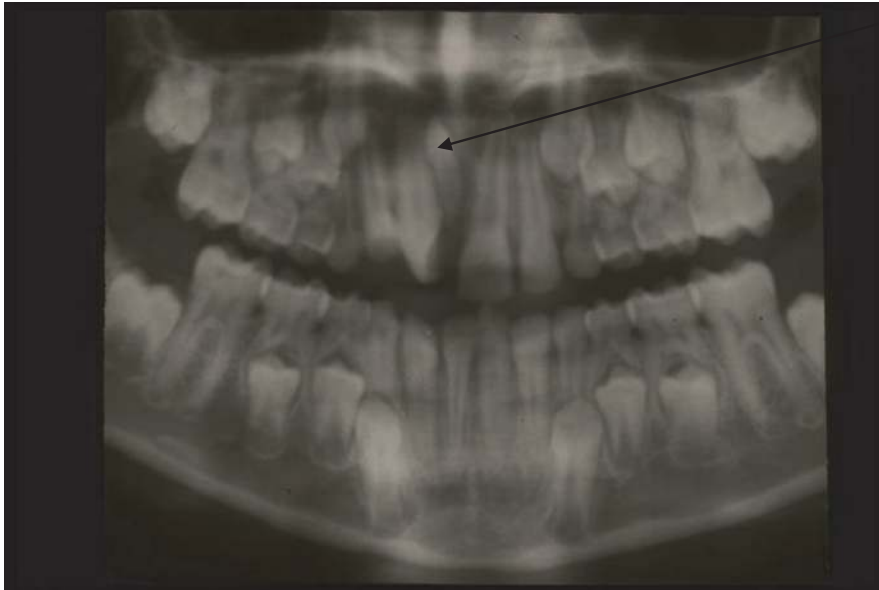
8. Do a report on this radiograph.

This is a dental panoramic tomogram (DPT) of a child in mixed dentition stage—the upper jaw in the anterior region presents with a microdont supernumerary tooth with an upwardly directed crown, which is impinging on the root of the central incisor on the right side to cause the incisor to rotate.

Diagnosis: Mesiodens that is causing a pressure effect on the central incisor (**Figure 5**) [2].

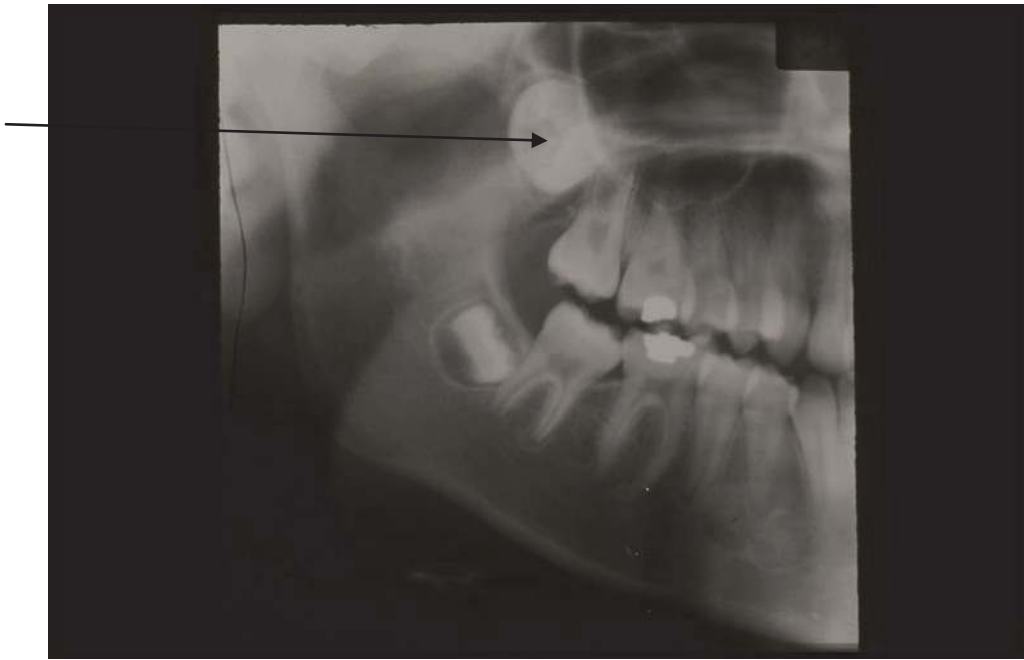


**Figure 4.** DPT showing numerous missing permanent teeth and over-retained deciduous teeth. (See arrows).



**Figure 5.**  
*DPT of a patient in mixed dentition stage showing a maxillary mesiodens tooth (see arrows).*

1. With an arrow, point at the anomaly.
2. What is this called?
3. Explain the clinical considerations of this particular situation.
4. With an arrow, point at the anomaly.  
See arrow.
5. What is this called?  
Macrodont.
6. Explain the clinical considerations of this particular situation:
  1. Inability to erupt into the arch.
  2. Possibility of forming a dentigerous cyst or ameloblastoma.
  3. Difficulty in the surgical extraction of the tooth if needed.
  4. Creation of an oro-antral communication following extraction (**Figure 6**) [2].
1. With an arrow, point at the anomaly.
2. What is this called?
3. What are the clinical considerations for this particular case?
4. With an arrow, point at the anomaly.  
See the arrow.



**Figure 6.**  
*Part of a DPT showing a Macrodon (see arrows).*

5. What is this called?

Microdon.

6. What are the clinical considerations for this particular case?

1. High possibility of development of periodontal disease.
2. High possibility of forming a carious lesion.
3. Technical extraction, should it be a part of the surgical extraction of four wisdom teeth (**Figure 7**) [2].

1. Use an arrow to pin point at the anomaly.

2. Give two differential diagnosis.

3. What is the common name for the conditions you have named?

4. How do you confirm a diagnosis?

5. Use an arrow to pin point at the anomaly.

See arrow.

6. Give two differential diagnoses:

1. Germination

2. Fusion





**Figure 7.**  
*Periapical radiograph showing a microdont tooth (see arrows).*

7. What is the common name for the conditions you have named?

Both differential diagnosis above are called double teeth or twinning.

8. How do you confirm a diagnosis?

The confirmation is purely clinical—this is by counting the number of teeth in the arch. If the numbers of teeth is normal, then it is fusion; however, it is germination if the number of teeth is more (**Figure 8**) [2].

1. Apart from the buried canine tooth, point at the anomaly on the periapical radiograph.

2. What is it called?

3. What are the clinical implications of this condition?

4. Apart from the buried canine tooth point at the anomaly on the periapical radiograph

See the arrow.

5. What is it called?

Dens invaginatus.

6. What are the clinical implications of this condition?

1. Infection of the periapical tissues without any carious lesion.

2. This infection may spread fast leading into cellulites.

3. Inability to access the root canal during a proposed endodontic treatment, hence the need for extraction and immediate implant or crown and



**Figure 8.**  
*Periapical radiograph double teeth in relation to the upper central incisor tooth (see arrows).*

bridge. Usually, root canal treatment is commenced, only to fail because of the structural defect (DDD), which existed and was undetected before the commencement of root canal (**Figure 9**) [2].

1. Explain the anomaly and point at it.
2. What is it called?
3. What are the clinical implications of this condition?
4. What other implication is this condition ascribed to?
5. What is it termed?
6. Explain the anomaly and point at it.
  1. Large root canal of the tooth (pointed to).
  2. Large pulp chamber and canal.



**Figure 9.**  
*Periapical radiograph showing dens invaginatus (see arrows).*

3. Rectangular pulp cavity.
4. The inter-radicular bone/furcation area is low in location.
5. Triangular inter-radicular bone.
7. What is it called?  
Taurodontism.
8. What are the clinical implications of this condition?
  1. Difficulty in extraction.
  2. Difficulty in endodontic treatment (obvious).

9. What other implication is this condition ascribed to?

Forensic implication.

10. What is it termed?

Unique non-coincidental forensic finding at postmortem (**Figure 10**) [2].

1. List five differential diagnosis of the above condition.

2. What are they collectively called?

3. Use an arrow to point to a tooth tissue that will require radiological monitoring for the progression of this disease.

4. Which of these list in #1 above are developmental dental defects?

5. What do you expect to see in this tissue?

6. Do you now understand that tooth tissue loss is both a clinical and radiological diagnosis and that amelogenesis and dentinogenesis imperfecta are tooth tissue loss?

7. List five differentials diagnosis of the above condition:

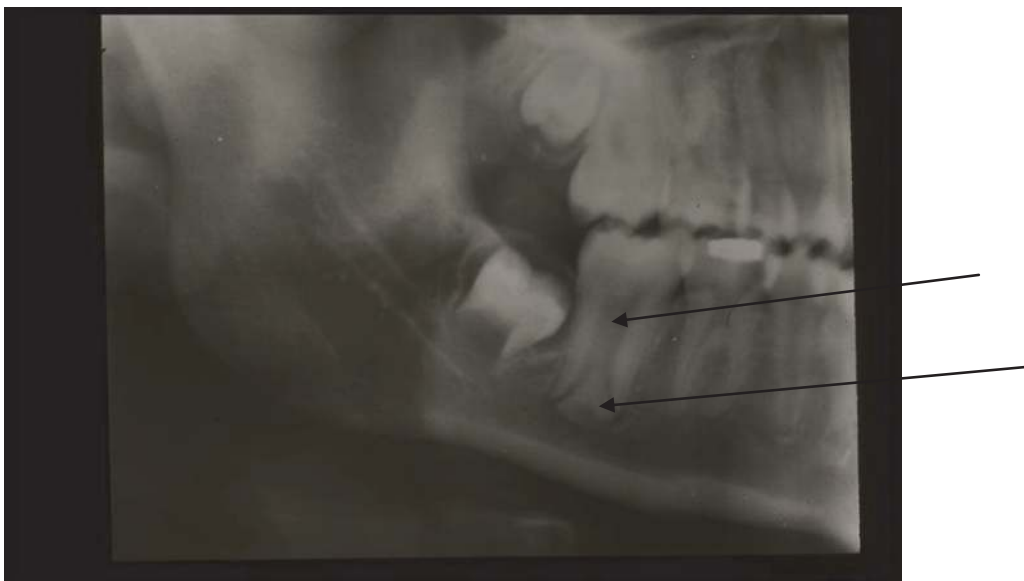
1. Attrition,

2. Abrasion,

3. Dentinogenesis imperfect,

4. Amelogenesis imperfect,

5. Erosion.



**Figure 10.**

*Part of a DPT showing the lower second molar affected with taurodontism (see the arrow showing the enlarged and rectangular pulp chamber and low furcation involvement).*

8. What are they collectively called?

Tooth tissue loss.

9. Use an arrow to point to a tooth tissue that will require radiological monitoring for the progression of this disease

See the three arrows pointing to the pulp.

10. Which of this list in #1 above are the developmental dental defects?

Amelogenesis imperfecta and dentinogenesis imperfecta.

11. What do you expect to see in these teeth?

Obliteration of pulp canal/cavity.

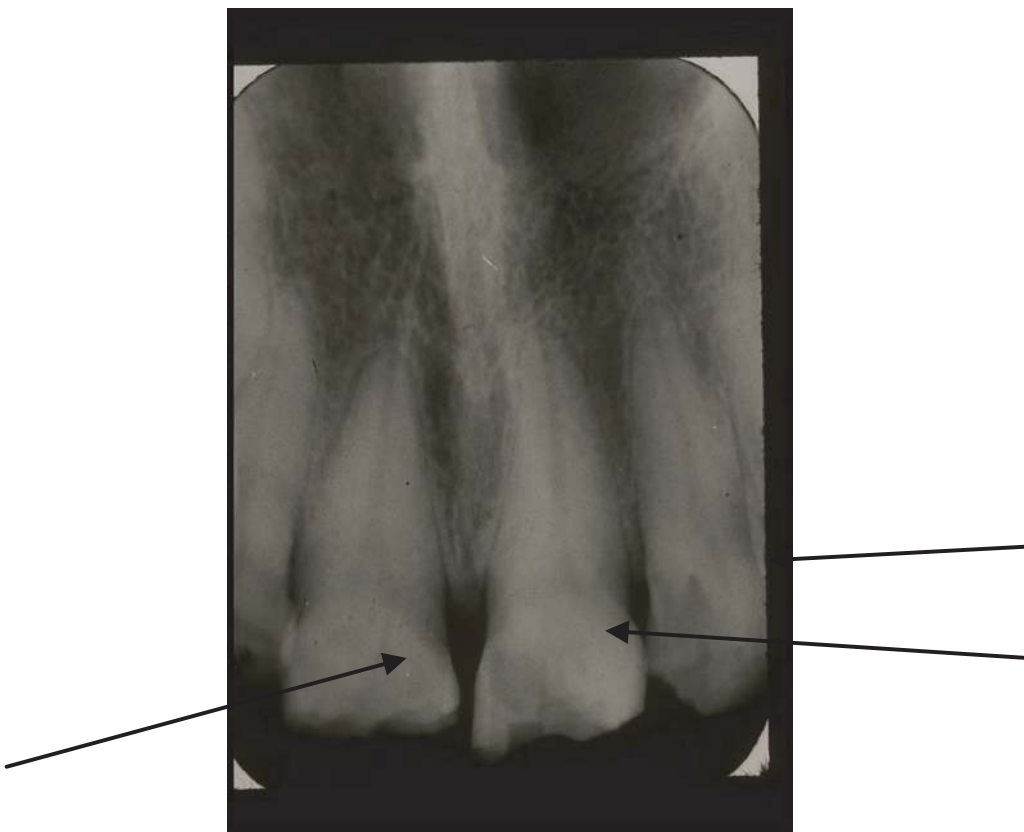
12. Do you now understand that tooth tissue loss is both a clinical and radiological diagnosis and that amelogenesis and dentinogenesis imperfecta are conditions with tooth tissue loss?

Yes! (**Figure 11**) [2].

1. What is the arrow pointing at?

2. Is this tooth still developing?

3. Why do you think it is or not developing?



**Figure 11.**  
*Periapical radiograph showing tooth tissue loss (see arrows).*

4. Point to other pathology relating to this tooth and explain it briefly.

5. What is the arrow pointing at?

A microdont tooth (third molar).

6. Is this tooth still developing?

Yes.

7. Why do you think it is not developing?

The roots are not fully formed.

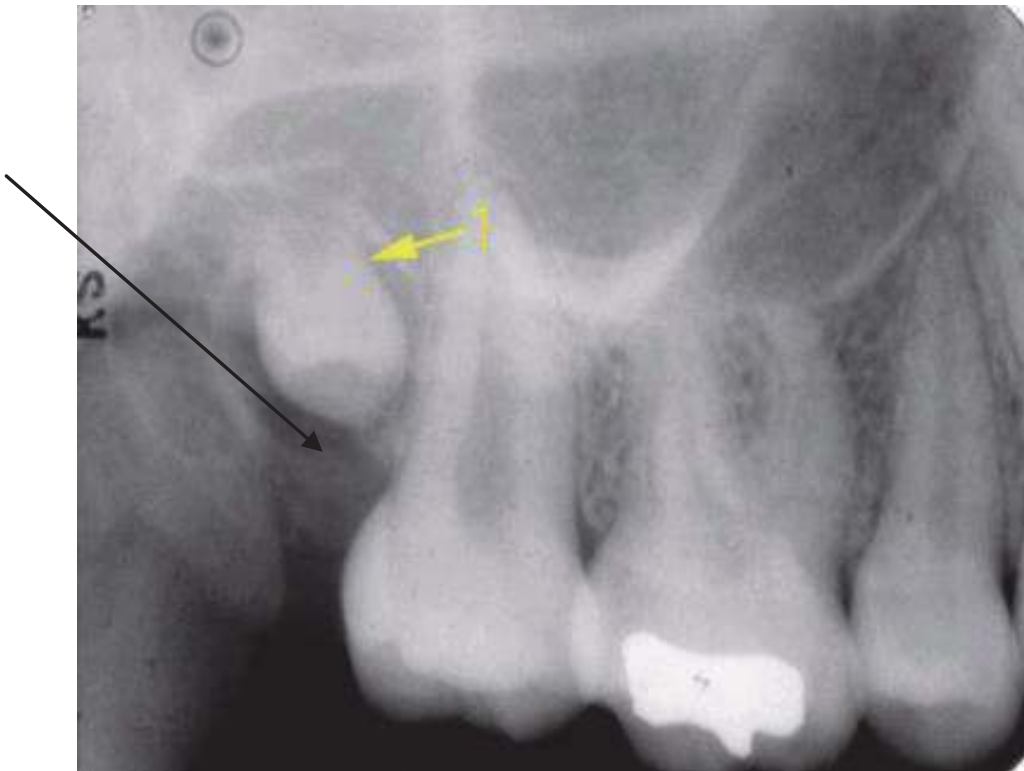
8. Point to other pathology relating to this tooth and explain it briefly?

There is a pericoronal radiolucency (arrow #1), which may be the initial stage of a cystic degeneration—should a cyst form, it is likely to be a dentigerous cyst. Also, an ameloblastoma may develop around the tooth. However, because the roots are still developing, there may be some eruptive force, which may direct the tooth to occlusion (**Figure 12**) [2].

1. Point to the main anomaly in this radiograph.

2. What is it called?

3. Indicate three (3) clinical considerations of this anomaly.



**Figure 12.**

*Periapical radiograph showing a microdont third molar tooth. See the yellow and black arrow delineating the boundaries of the developing cyst. (see arrows).*

4. Point to the main anomaly in this radiograph.

See arrow pointing to the bent tooth.

5. What is it called?

Dilaceration of an upper central incisor tooth.

6. Indicate three (3) clinical considerations of this anomaly:

1. The need for a surgical extraction,

2. Difficulty in the surgical extraction with the possibility of fracture of the apical 1/3rd of the roots,

3. Inability to effect a root canal treatment (**Figure 13**) [2].

1. Point at the developmental dental defects.

2. What is it called?

3. Explain it.

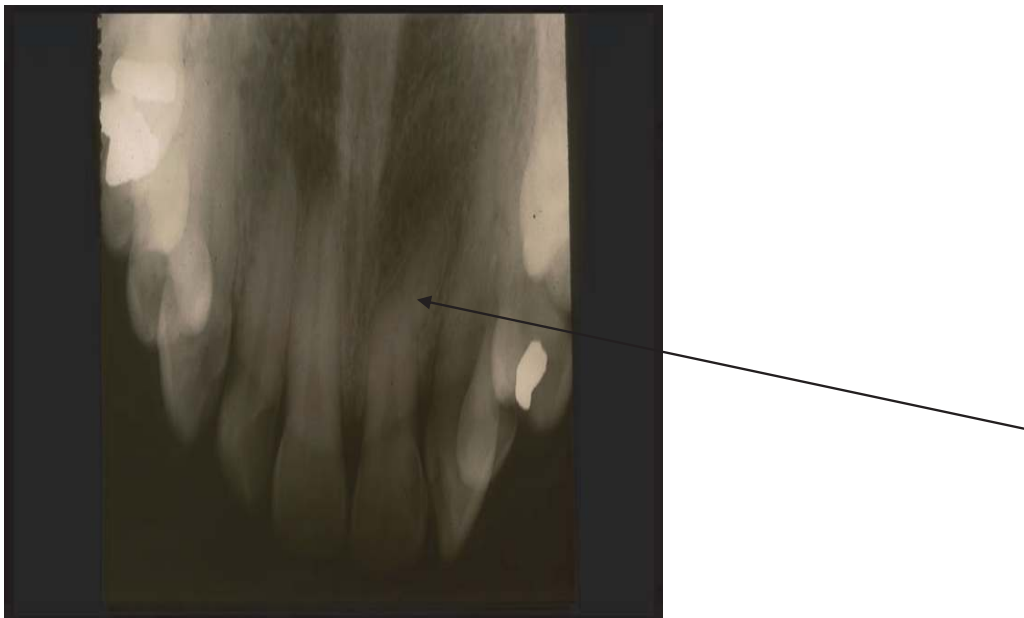
4. What other name is this condition called?

5. Point at the developmental dental defects.

See the two arrows.

6. What is it called?

Regional odontodysplasia.



**Figure 13.**  
*Occlusal radiograph showing a dilacerated maxillary central incisor (see arrows).*

7. Explain it.

This is a very uncommon developmental dental defect that is usually localized to a quadrant of the mouth/jaw. It is a condition with no hereditary affiliations, with no race predilection, but affecting more females than males. The enamel, dentine, and pulp of the teeth are affected to the extent that the affected teeth do not develop properly. The teeth will as such appear more radiolucent than normal.

8. What other name is this condition called?

Ghost teeth (**Figure 14**) [2].

1. Describe this radiograph.

2. What is your diagnosis?

3. What are the main reasons for making this diagnosis?

4. What are your differential diagnoses?

5. Describe this radiograph.

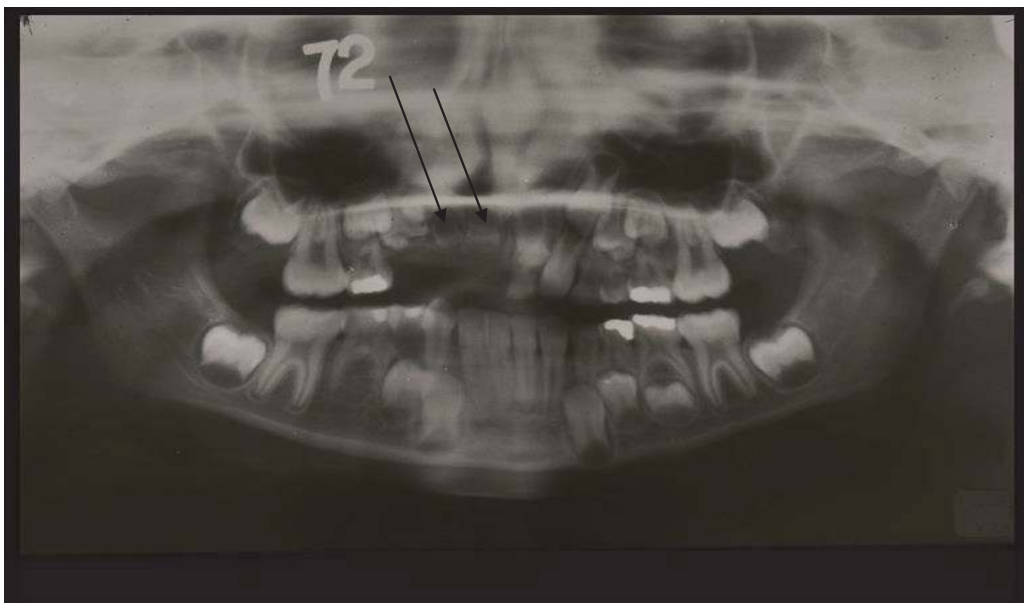
A dental periapical radiograph of the anterior teeth showing malformed central and lateral incisors with enlarged pulp cavity and with severe teeth tissue loss of developmental origin. The coronal enamel is very inadequate; the dentine and pulp cavities are also poorly developed.

6. What is your diagnosis?

Regional odontodysplasia or dentinogenesis imperfecta.

7. What are the main reasons for making this diagnosis?

Poorly developed enamel, dentine, and pulp tissue with tooth tissue loss. The changes in the pulp cavity can be construed as obliteration of the pulp cavity.



**Figure 14.** DPT of a child showing ghost teeth in the anterior region of the maxilla. (See arrows).



8. What is your differential diagnosis?

1. Non-syndrome dentine dysplasia.
2. Osteogenesis imperfect.
3. Dentinogenesis imperfect (**Figure 15**) [2].

1. Point at the buried tooth.

2. What is it called?

3. List the possible causes of this situation.

4. List the possible sequel of this condition.

5. Point at the buried tooth.

See the pointing arrow.



**Figure 15.**  
*Periapical radiograph showing upper central incisors with obliterated pulp cavity, tooth tissue loss as in dentinogenesis imperfecta.*

6. What is it called?

Wondering tooth.

7. List the possible causes of this situation:

1. Infection,
2. Loss of coronal eruptive force,
3. Associated lesion/tumor,
4. Congenital or hereditary.

8. List the possible sequel of this condition:

1. Resorption of adjacent root,
2. Bucco-lingual expansion/swelling of the mandible,
3. Formation of dentigerous lesion,
4. Ameloblastoma formation,
5. Weak point in which fracture can easily occur following slight trauma (**Figure 16**) [2].



**Figure 16.** *Periapical radiograph showing a wondering tooth (note the beginning of cystic degeneration around the tooth).*

1. Which dentition is shown in the above bitewing radiograph?
2. What is the condition of the patients teeth called?
3. How did you arrive at this diagnosis?
4. What are your differential diagnoses?
5. In this case are the permanent teeth involved?

6. Which dentition is shown in the above periapicals?

Mixed dentition.

7. What is the condition of the patients teeth called?

Tooth tissue loss.

8. How did you arrive at this diagnosis?

Imperfect enamel of all the molar teeth (both primary and secondary dentitions).

9. What are your differential diagnoses?

1. Amelogenesis imperfect,
2. Dentinogenesis imperfect,
3. Dentine dysplasia.

10. In this case are the permanent teeth involved?

Yes (**Figure 17**) [2].

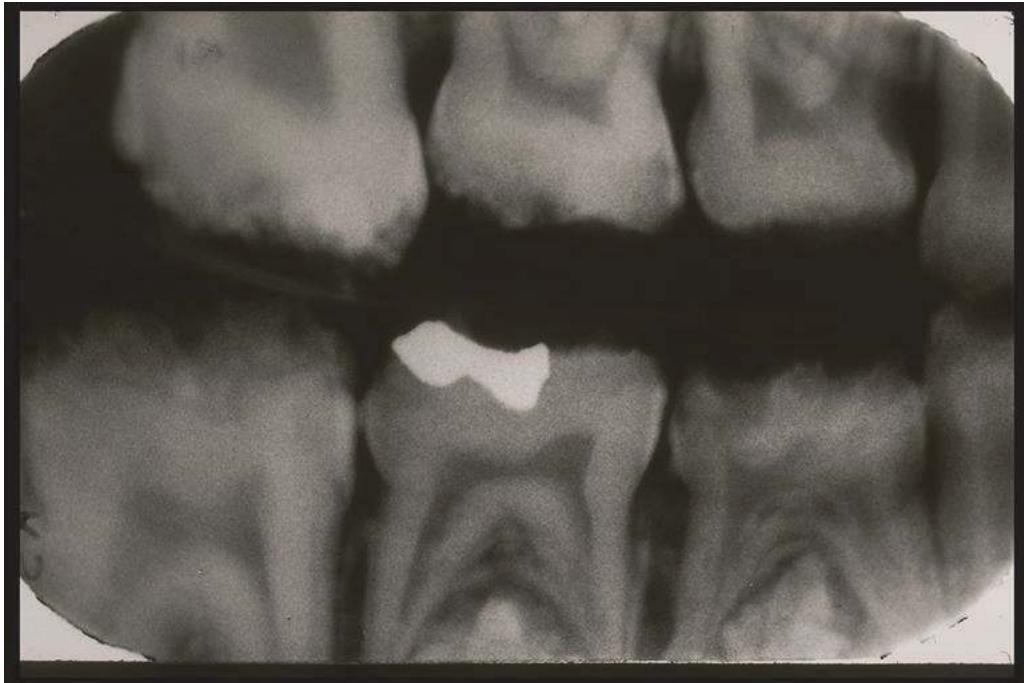
1. What is your diagnosis?
2. Why have you made this diagnosis?
3. What are your differential diagnosis?
4. Describe the radiograph.
5. Point arrows to all the areas affected by this DDD.
6. What is your diagnosis?
7. Why have you made this diagnosis?

Oligodontia.

There are six or more missing teeth.

Look at the arrows and circles.

The arrows points to the over-retained deciduous teeth without any permanent successor and also edentulous spaces.



**Figure 17.**  
*Bitewing radiograph showing tooth tissue loss in both the upper and lower molar teeth (both the deciduous and permanent dentition are involved).*

The circular corticated regions around the third molar attest to the developing status of the third molars, which can also be used as a mark for the determination of the age of this patient.

8. What is your differential diagnosis?

1. Sporadic hypodontia,
2. Hypodontia/hypodontia associated with syndrome (i.e., ectodermal dysplasia),
3. Non-syndromal hypodontia or oligodontia.

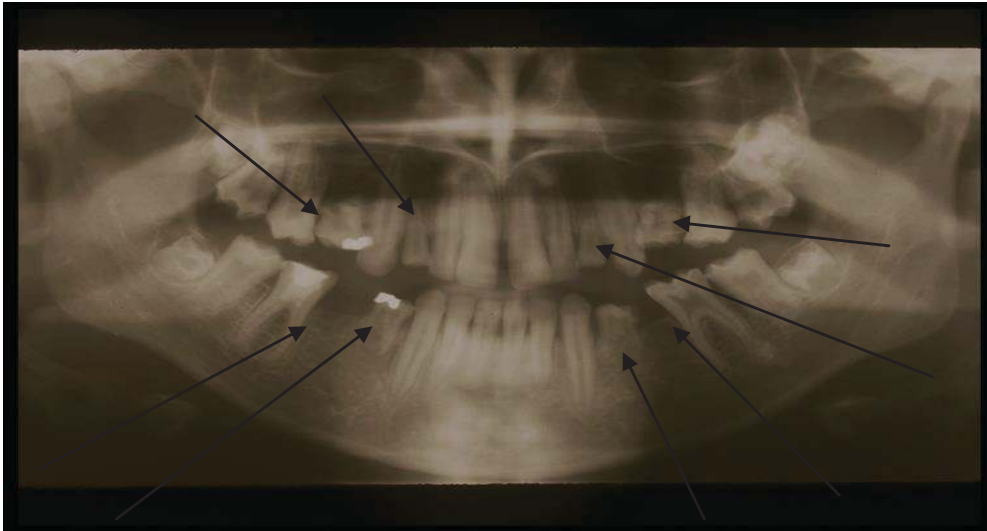
9. Describe the radiograph.

This is the dental panoramic tomogram of a child who is partially edentulous.

The deciduous teeth pointed to by the arrows are over-retained with the permanent successors absent within the bone.

The third molars are forming within the bone. Some edentulous spaces are present due to non-development of teeth. The errors in this radiograph are that of severe bowing due to the fact that the patients neck is far too in and down in the machine (**Figure 18**) [2].

1. Describe this radiograph.
2. List the most significant single diagnostic finding.
3. What is your diagnosis?



**Figure 18.**  
*DPT showing various over-retained deciduous teeth and edentulous regions (areas where no permanent teeth erupted) (see arrows).*

4. Could this be related to a syndrome?

5. What is the name of the syndrome?

6. Describe this radiograph.

The periapical radiograph shows the bulbous roots of teeth #16 and 18, with complete obliteration of the pulp cavity. The retained roots of the tooth #15 have its pulp cavity also obliterated. The edentulous space of tooth #17 is too long but has adequate amount of bone height to receive an implant. The in-standing teeth have no carious lesions or periodontal lesions.

7. List the most significant single diagnostic finding.

Pulp obliteration.

8. What is your diagnosis?

Dentine dysplasia or dentinogenesis imperfect.

9. Could this be related to a syndrome?

Yes.

10. What is the name of the syndrome?

Osteogenesis imperfecta (**Figure 19**) [2].

1. Describe this radiograph.

2. List the most significant single diagnostic finding.

3. What is your diagnosis?

4. Make a list of differential diagnosis.



**Figure 19.**  
*Periapical radiograph showing molar teeth and retained roots with pulp obliteration.*

5. Describe this radiograph.

This dental periapical radiograph of the anterior teeth shows all the four anterior teeth to have suffered tooth tissue loss. These teeth also have complete obliteration of the pulp cavity.

6. List the most significant single diagnostic finding.

Tooth tissue loss and complete obliteration of the pulp cavity.

7. What is your diagnosis?

Dentinogenesis imperfecta.

8. Make a list of differential diagnosis.

1. Amelogenesis imperfect.

2. Dentine dysplasia.

9. What makes it not an amelogenesis imperfecta?

Presence of pulp obliteration (**Figure 20**) [2].

1. Point to the anomalies on this periapical.

2. Describe the radiograph.

3. Point to the anomalies on this periapical

See the short arrows pointing to the teeth tissue loss and the longer arrows pointing to the obliteration of the pulp cavities.



**Figure 20.**  
*Periapical radiograph showing tooth tissue loss and pulp obliteration.*

4. Describe the radiograph.

This is a periapical radiograph of the maxillary anterior teeth showing tooth tissue loss of #11, 12, 21, 22 and obliteration of the pulp cavity/canal of all the four incisors. The periodontal membrane space and periapical regions are intact (**Figure 21**) [2].

1. Utilize an arrow to point at all the developmental dental defects.
2. Describe the radiographic findings.
3. What is your diagnosis?
4. How did you arrive at this diagnosis?
5. Name one differential diagnosis.
6. Utilize an arrow to point at all the developmental dental defects.

See all the arrows.



**Figure 21.**  
*Periapical radiograph showing tooth tissue loss and pulp obliteration of upper incisors.*

7. Describe the radiographic findings.

Bilaterally is a set of double horizontally impacted third molars, with evidence of pressure effect on the second molars bilaterally with resultant crowding of the anterior teeth. The main issue is that instead of 16 teeth in the mandible, there are a total of 18 teeth. The maxilla is not exempted from these findings except that the bilateral distomolar are microdont and are not putting any pressure on the second molars.

8. What is your diagnosis?

1. Bilateral germination of the third molars with double horizontally impacted teeth on each side of the mandible.
2. Bilateral unerupted maxillary microdont third molars.

9. How did you arrive at this diagnosis?

By counting the number of teeth in the jaw.

10. Name two differential diagnoses.



1. Fusion.

2. Concrescence (that is to say, the roots of each of the double teeth could be joined) (**Figure 22**) [2].

1. List two important complications of the surgical removal of all the impacted 3rd molars in the lower jaw.

2. How can you prevent such complications from occurring?

3. List two important complications of the surgical removal of all the impacted third molars in the lower jaw:

1. Damage to the inferior dental nerve and

2. Fracture of the mandible (unilateral or bilateral).

4. How can you prevent such complications from occurring?

1. By surgically fracturing the jaw and dissect out the wisdom teeth (orthognathic surgical removal) and

2. Removal of the more occlusal third molar and leaving the deeper ones in place (**Figure 23**) [2].

1. What is the most obvious generalized anomaly?

2. List all the possible differential diagnosis based on this generalized anomaly.

3. What is the resultant effect of all these differential diagnosis?

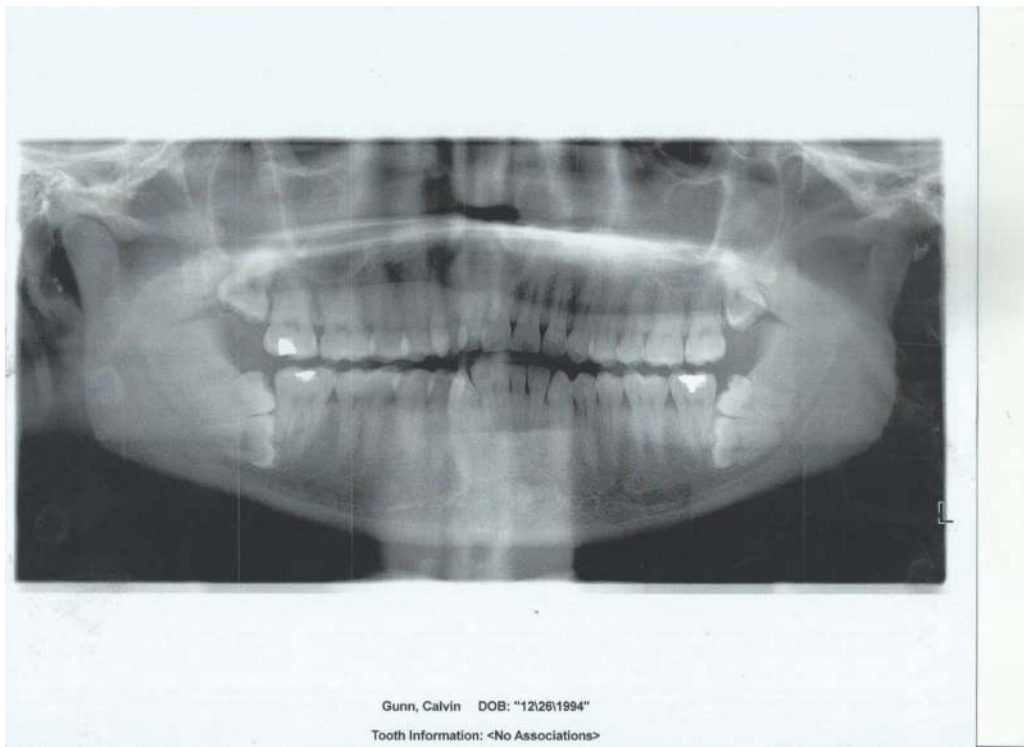
4. If I provide you with a family history of multiple fractures of long bone and hip bones, what would your diagnosis be?

5. What is the most obvious generalized anomaly?

Obliteration of the pulp cavity/chamber.



**Figure 22.**  
*DPT showing bilateral double third molar teeth, consistent with germination.*



**Figure 23.**  
*DPT showing bilateral double third molar teeth, consistent with germination.*

6. List all the possible differential diagnosis based on this generalized anomaly:

1. Dentinogenesis imperfect,
2. Dentine dysplasia,
3. Attrition,
4. Erosion.

7. What is the resultant effect of all these differential diagnoses?

Tooth/teeth tissue loss and progressive pulpal obliteration.

8. If I provide you with a family history of multiple fractures of long bone and hip bones, what would your diagnosis be?

Dentinogenesis imperfecta with or without dentine dysplasia in a patient with osteogenesis imperfecta (**Figure 24**) [3].

1. Point to one developmental dental defect using a small sized arrow.
2. Point to one non developmental dental defect using a medium size arrow.
3. What is the non-DDD called \_\_\_\_\_
4. Give one differential diagnosis for the non DDD \_\_\_\_\_

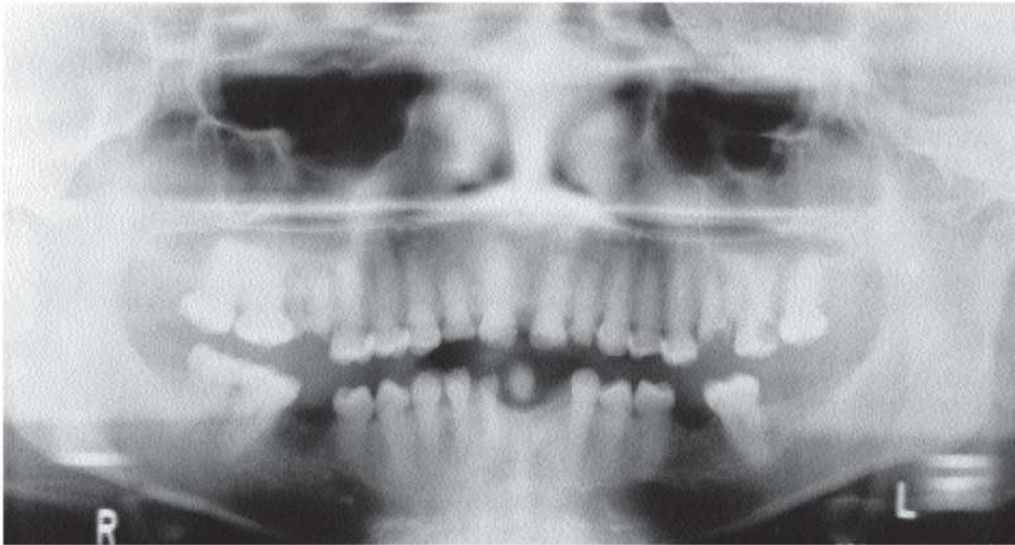


Fig. 2.-Panoramic radiograph showing complete obliteration of the pulp excepting 37 and 47.

**Figure 24.**

*DPT showing obliteration of pulp of all the teeth, a feature consistent with dentinogenesis imperfect in this case of osteogenesis imperfecta.*

5. Why is it that in this situation this differential diagnosis will not be considered further?
6. Point to one developmental dental defect using a small sized arrow.  
See arrow.
7. Point to one non-developmental dental defect using a medium sized arrow.  
See arrow.
8. What is the non-DDD called?  
Cervical abrasion.
9. Give one differential diagnosis for the non DDD.  
Cervical burnout.
10. Why in this situation this differential diagnosis will not be considered any further?  
There is no other tooth distal to the tooth affected by the cervical abrasion.
11. What are the three possible differential diagnoses for the DDD that you pointed to with the small-sized arrow?
  1. Fusion,
  2. Germination,
  3. Concrescences.

12. What are they collectively called?

Double teeth or twinning.

13. The propositus family pedigree shown in Appendix I depicts the familial history of this DDD. On clinical examination of the index case, the number of teeth counted in the mandible is not increased. Provide one definitive diagnosis (**Figure 25**) [2–4].

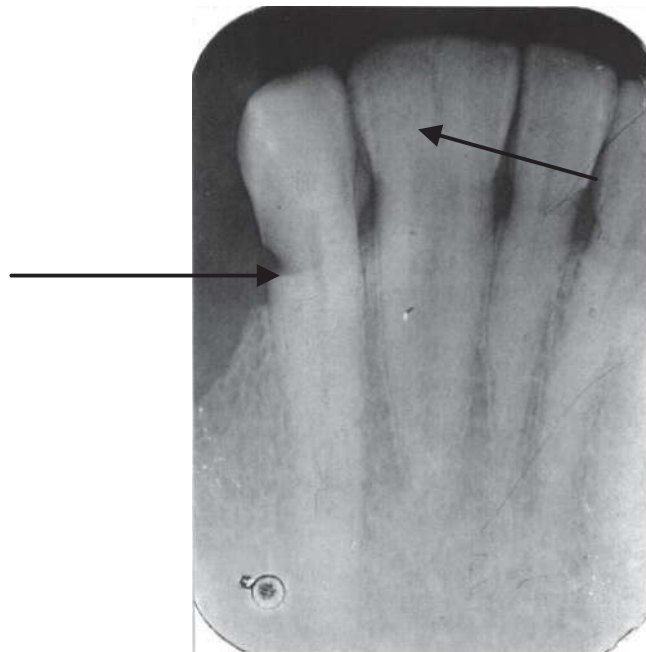
Fusion.

This is a 37-year-old female. The only tooth ever removed by this patient is the upper first molar on the left side.

1. What is your diagnosis?
2. Can this diagnosis be related to a syndrome?
3. Name one such syndrome.

This is a 37-year-old female. The only tooth ever removed by this patient is the upper first molar on the left side.

1. What is your diagnosis?  
Hypodontia or ologidontia.
2. Can this diagnosis be related to a syndrome?  
Yes?



**Figure 25.** *Periapical radiograph showing twinning of lower incisor. Also note the cervical tooth tissue loss of the distal aspect of the canine tooth due to tooth brushing abrasion. The teeth involved in the twinning have been protected from the abrasion. (See arrows).*

3. Name one such syndrome.

Ectodermal dysplasia (**Figure 26**) [2–4].

Point at the developmental dental defects in the periapical radiographs shown above.

1. What are they called? \_\_\_\_\_
2. What other names have they acquired? \_\_\_\_\_
3. In which teeth are they most commonly found?  
\_\_\_\_\_
4. Can multiple teeth be involved? \_\_\_\_\_
5. Give three (3) differential diagnosis  
\_\_\_\_\_



**Figure 26.**  
*DPT showing various missing permanent teeth, both in the mandible and maxilla.*

6. What problems can this developmental defect pose?

1. \_\_\_\_\_

2. \_\_\_\_\_

7. Is there a role for cone beam CT imaging modalities?

8. What are they called?

Enamel pearl or ectopic enamel.

9. What other names have they acquired?

Enamel droplet, enamel globules, enamel nodules, etc. as stated in the introductory section of article on the subject, above.

10. In which teeth are they most commonly found?

Maxillary and mandibular molars.

11. Can multiple teeth be involved?

Yes?

12. Give three (3) differential diagnosis

1. Pulp stone.

2. Dens exverginatus.

3. Calculus.

13. What problems can this developmental defect pose?

1. Can lead to chronic localized or generalized periodontitis,

2. Can obscure a furcation involvement.

14. Is there a role for cone beam CT Imaging modalities?

Yes, a confirmatory role.

Point at the developmental dental defects in the periapical radiographs shown above (**Figure 27**).

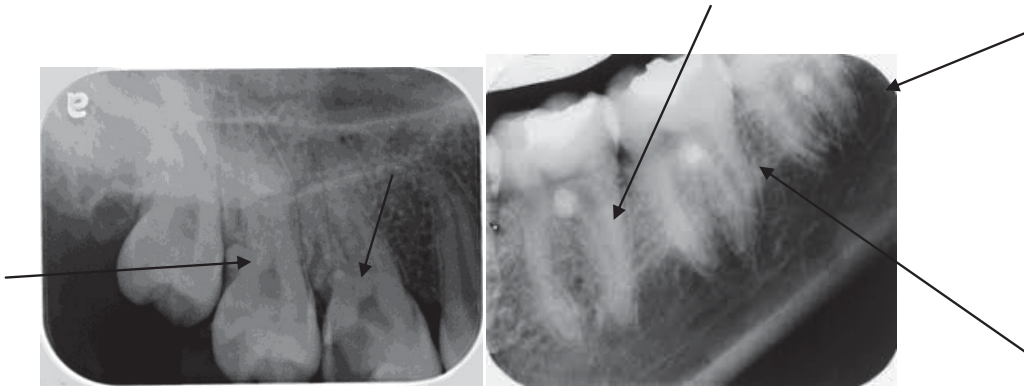
1. Make a diagnosis based on this radiograph.

2. Which other names that also constitutes differential diagnosis can you give this condition?

3. What is the clinical significance of this developmental dental defect?

4. What advantage does it have and why is it so?

5. Make a diagnosis based on this radiograph.



**Figure 27.**  
*Periapical radiograph showing multiple enamel pearls (these can be easily misdiagnosed on radiograph as pulp stones. (See arrows)).*

Concrescence, because the roots appears to be joined, the entire resultant tooth structure is big and the structure has two distinct pulp separated by a tooth tissue with the radiodensity of the dentine.

6. Which other names that also constitutes differential diagnosis can you give this condition?

1. Fusion,
2. Germination,
3. Double teeth,
4. Twinning.

In actual fact, double teeth and twinning can be used to express fusion, germination, and concrescence.

7. What is the clinical significance of this developmental dental defect?

1. Difficulty in confirmatory diagnosis until extraction or CBCT is done.
2. Difficulty in extraction.
3. Difficulty in effecting a root canal treatment.
4. Unnecessary spacing of the teeth.
5. Likely oro-antral communication following non-surgical extraction.

8. What advantage does it have and why is it so?

Because it is extremely rare in occurrence and its presentation is very unique, it has a positive role in identification of the deceased, thus giving it a forensic significance and use. It is as such called a *Unique, non coincidental forensic finding* in the antemortem and postmortem correlations and evaluation (**Figure 28**) [2–4].



**Figure 28.**  
*Periapical radiograph showing concrescence of the maxillary molars (see arrows).*

1. Utilize a blue arrow to point at the main developmental dental defect.
2. Utilize a red arrow to point at the third molar.
3. Utilize a green arrow to point at the second molar.
4. Utilize a brown arrow to point at the distomolar.
5. Use these three arrows to deduce an etiology for this condition (at least in this case).
6. Is your deduced etiology consistent with the literature?
7. Utilize a blue arrow to point at the main developmental dental defect.  
Proceed with the blue arrow to point at the main developmental dental defect.
8. Utilize a red arrow to point at the third molar.  
Proceed with the red arrow to point at the third molar.
9. Utilize a green arrow to point at the second molar.  
Proceed with the green arrow to point at the second molar.
10. Utilize a brown arrow to point at the distomolar.  
Proceed with the brown arrow to point at the distomolar.
11. Use these four arrows to deduce an etiology for this condition (at least in this case).  
The mesial root of the second molar seems to be fused with the distal roots of the first molar with an obscured root canal of the joined roots. Since a



developing third molar is present and a distomolar is present, a diagnosis of concrescence of the first and second molar teeth can be made.

Diagnosis: Concrescences of the first and second molars. It could, however, be fusion, but it is not germination.

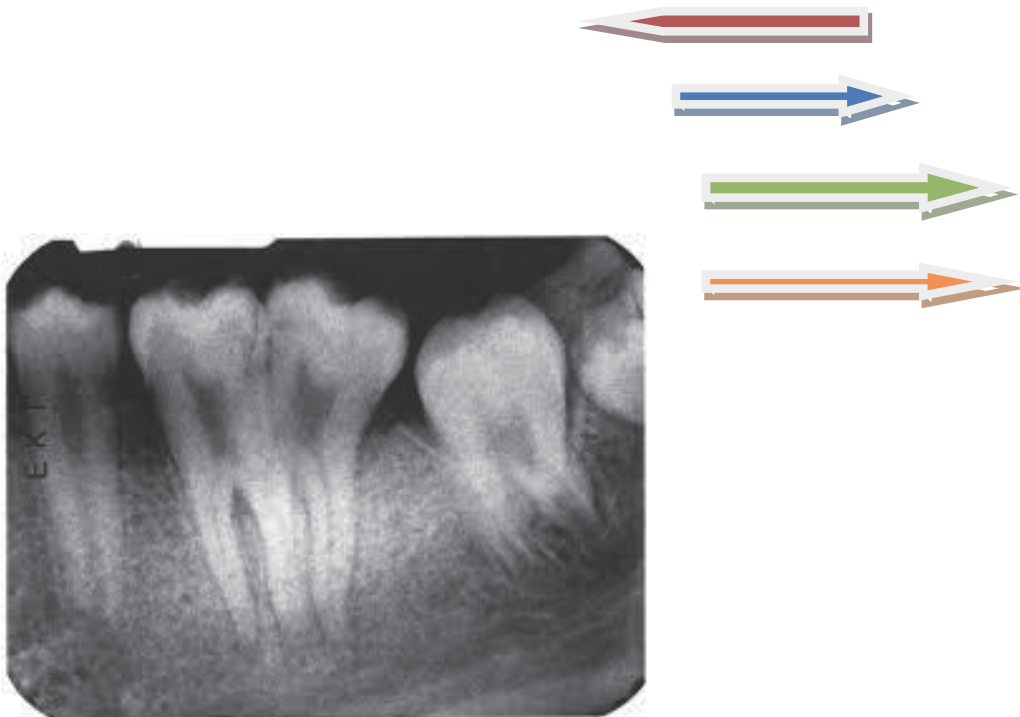
12. Is your deduced etiology consistent with the literature?

Yes (**Figure 29**) [2–4].

1. This patient has never had a tooth removed before. Point at the DDD.
2. Utilize this radiograph to discuss the diagnosis and clinical significance of the main radiographic feature.
3. Discussion of the diagnosis and clinical significance of the main radiographic feature.

The main radiographic finding is a larger than normal lower incisor, which has a coronal pit (upper arrow) to simulate two crowns joined together (bifid crown); however, the tooth has one root, which is larger than that of the other incisors (see the lower arrow). The pulp cavity of this large tooth is also larger than the other pulp (see the middle arrow). A count of the teeth shows only the normal number (four incisors). Since this patient has never removed a tooth before, it is reasonable to say that the central and lateral incisors on the left side have fused together during dentinogenesis.

Diagnosis: Fusion of the central and lateral incisors on the left side of the lower jaw.



**Figure 29.** Periapical radiograph showing germination of the first molar with possible concrescence of the germinated teeth. (See arrows).

Differential diagnosis:

1. Germination,
2. Concrescence (**Figure 30**) [2–4].

1. Describe both the radiographic findings in A and B above.

2. What is your diagnosis?

3. What is the main difference in the two cases?

4. Advise the dentist on the treatment or management.

5. Describe both the radiographic findings in A and B above.

A and B are periapical radiographs of the upper anterior teeth. Very obvious is the presence of a miniature tooth or tooth-like structure, erupting in the opposite direction (i.e., inverted).

6. What is your diagnosis?

Inverted mesiodens.

7. What is the main difference in the two cases?

The mesiodens in B is not only creating pressure effect on the roots of one of the upper centrals, but it is also responsible for the rotation of one of the developing lateral incisors and it is responsible for the creation of the diastema seen.

8. Advise the dentist on the treatment or management.

Both mesiodens must be removed surgically by raising a flap and skillfully drilling out the surrounding bone before elevation so as not to damage the



**Figure 30.**

*Periapical radiograph showing double teeth which is consistent with fusion of the lower central and lateral incisors.*

roots and crowns of the central incisors. Additionally, the situation in B may warrant endodontic treatment of upper central incisor on the right and also orthodontic treatment to correct anterior crowding and the elimination of the diastema (**Figure 31**).

1. Utilize the three radiographs to arrive at just one diagnosis

---

2. List the radiographic findings that have made you arrive at this diagnosis.

3. What type of developmental dental defect is this? \_\_\_\_\_

4. Point at all the anomalies using multicolored arrows.

5. Utilize the three radiographs to arrive at just one diagnosis.

This patient has cleidocranial dysostosis.

6. List the radiographic findings that have made you arrive at this diagnosis.

1. Extremely short/almost absent clavicle (hypoplasia or aplasia of the clavicle).
2. Bossing of the forehead (the head actually looks big because of frontal and parietal bossing).
3. Multiple unerupted supernumerary teeth.
4. Premature fusion of the coronal suture (brachycephaly).



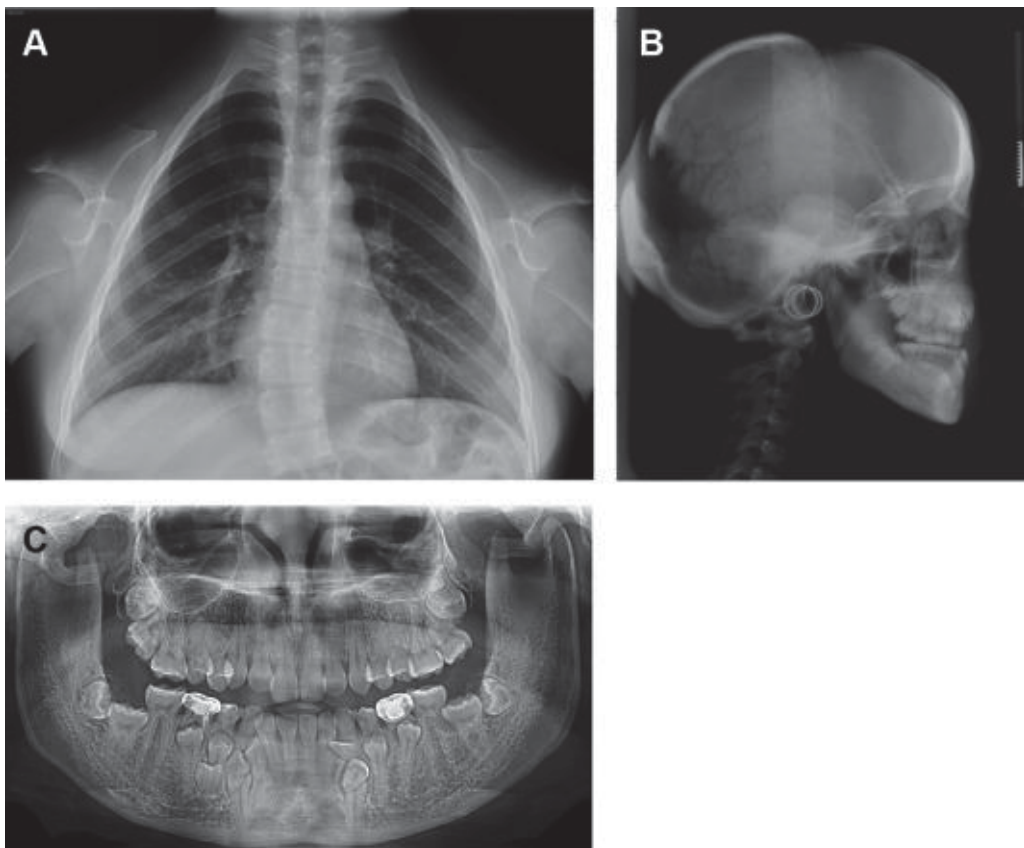
**Figure 31.**  
*Periapical radiographs showing inverted mesiodens of the upper jaw.*

7. What type of developmental dental defect is this Syndrome-associated DDD (**Figure 32**) [2].

The clinical picture above is that of a 27-year old radiographer who presented for the surgical removal of the impacted third molars and also all the four parapremolars (supernumerary teeth) shown.

1. Utilize an arrow to point at the problem already caused by the presence of the parapremolars.
2. Would you consider any form of radiography\_\_\_\_\_?
3. List the possible radiographic investigations to be done.
  1. \_\_\_\_\_
  2. \_\_\_\_\_
  3. \_\_\_\_\_
4. Utilize an arrow to point at the problem already caused by the presence of the parapremolars.

See arrow pointing at the carious lesion on the first premolar on the right side.



**Figure 32.** Chest radiograph, lateral skull view radiograph and DPT showing, absence of clavicle, bossing of the cranial bones and multiple unerupted supernumerary teeth respectively in a patient with cleidocranial dysostosis.

5. Would you consider any form of radiography?

Yes.

6. List the possible radiographic investigations to be done:

1. Panoramic radiography,
2. Periapical imaging,
3. Bite wing imaging,
4. Cone beam CT [2–4].

1. Focusing only on the bilateral premolar regions, identify the parapremolars on the radiographs or any other radiographic changes that may bring about a suspicion of something abnormal.

2. Focusing only on the bilateral premolar regions, identify the parapremolars seen clinically on the radiographs or any other radiographic changes that may bring about a suspicion of something abnormal.

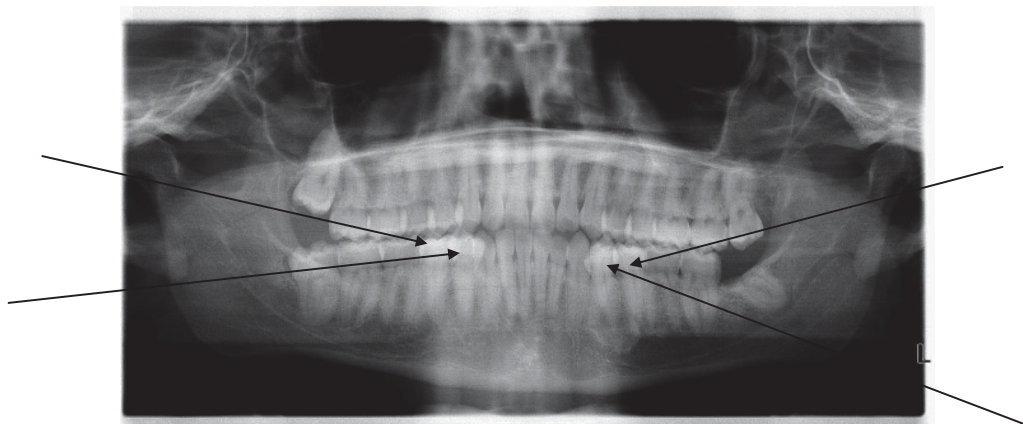
There are no parapremolars seen on this radiograph.

The following are a list of radiographic changes of suspicion:

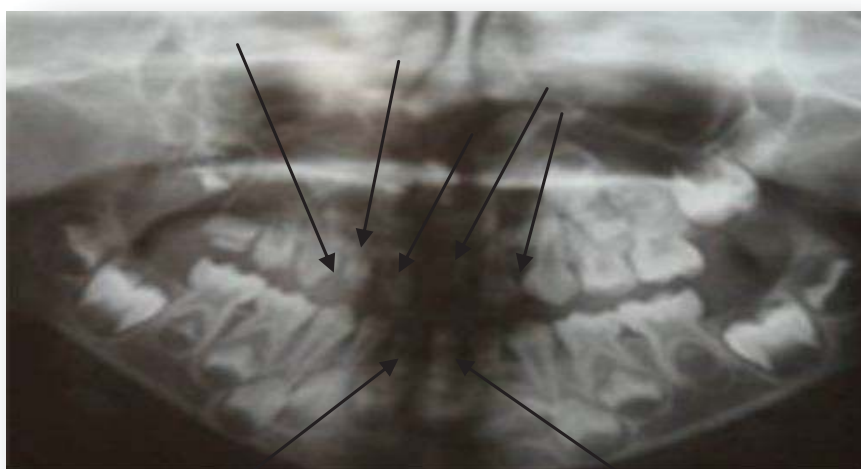
1. Loss of the radiolucency of the mental foramen.
2. Increased uniformed radiopacification of the crowns of all the presumed normal premolars when compared with all the other teeth in the jaw, without the presence of a radiopaque restoration.



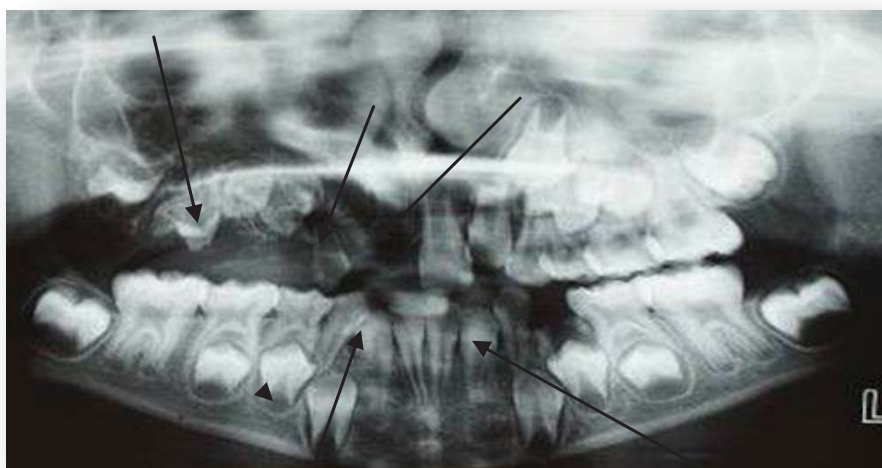
**Figure 33.**  
*The clinical picture of a patient showing bilateral doubling of the first and second premolar which is not unlike germination.*



**Figure 34.**  
*DPT of a the patient shown in Figure 33 above, showing increased radiopacification of the first and second premolar bilaterally as the only radiographic finding to justify the clinical presentation shown in Figure 33.*



(a)



(b)

**Figure 35.**  
*DPT of a patient with regional odontodysplasia (both DPT'S)*

3. The absence of the large carious lesion seen clinically on the first premolar on right side on the radiograph (**Figure 34**) [2–4].

This condition is exceedingly rare in occurrence (**Figure 35a and b**). It is a DDD which has no hereditary attribute. There is no sex predilection, but females seem to be more affected by regional odontoplasia. The literature is replete of the clinical, radiological and histological information on regional odontoplasia [5].

Now, read the article below and utilize the information obtained to present a power point presentation on the following: The Investigation of Regional Odontoplasia against the background of the following:

1. Accurate diagnosis of regional odontoplasia.
2. Long-term management and follow-up.
3. Reason for histopathology [1].

### 3. Conclusion

This book chapter is very significant for the learning of the radiology of developmental dental defects with an aim of demystifying the topic without the need of a lecturer or tutor. By extension, the various areas of the write-up have touched on the use of the radiograph in not only diagnosing the case, but also to understand the basis for the management.

Without much deliberation, this is the way radiology of any topic should be taught and disseminated in online teaching, especially amidst the sudden changes in the modalities of teaching that has been introduced as a result of COVID-19 pandemic. In rounding up let us look at the diverse developmental dental defect that the case in **Figure 36** is depicting.

The dental panoramic tomogram shown in radiographic **Figure 36** is showing a fourth molar (which is a duplication of the third molar), this is not a distomolar. The only possible explanation is that this has occurred as a result of *Germination* of the third molars. What I am trying to emphasize is that despite the fact that this duplication has resulted in the fourth molar tooth on each side, the pathogenesis is actually different from the fourth molar that developed and ascribed as a distomolar!



**Figure 36.**  
DPT of a patient showing multiple germination of molar teeth in all the four quadrants of the jaw.

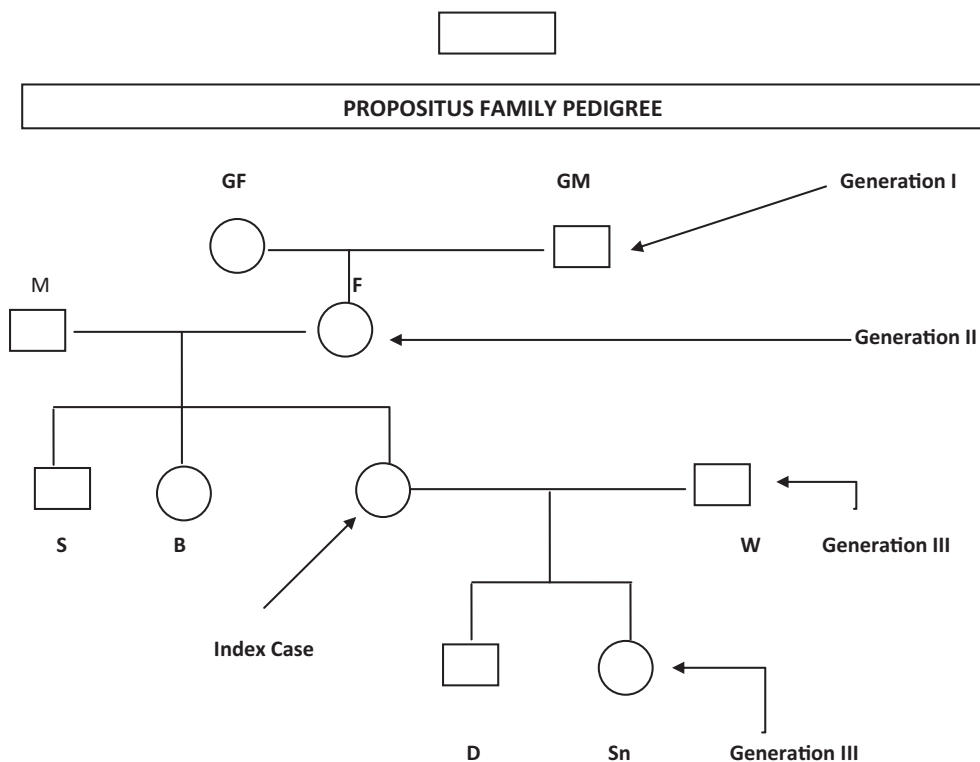
The questions to be asked at this stage are as follows:

1. Why the sizes of each of the fourth molar are smaller than the third molar (that is to say why are the germinated teeth of different sizes)?
2. Why are the fourth molars in the maxilla in different state of eruption from each other and even smaller than the fourth molars in the mandible?
3. Can we make a diagnosis of concrescences with the relationship seen for teeth #28 and 48 and its fourth molar.
4. However, for a postgraduate student to pass and for a distinction undergraduate student we will expect the following diagnosis:
  - a. Germination of all the third molars leading to multiple impacted double molars.
  - b. Dilaceration of the roots of #47, mesial root.
  - c. Concrescence of #28 and 48 and its fourth molar (possible concrescence).

In conclusion, radiology is the key to the diagnosis of most dental defects. It also has a role to play in the suggestion of the etiology and most definitely in the *eventual management* of the particular defect.

## A. Appendix

### A.1. Appendix I





### **A.1.1. Key**

GF: Grandfather  
GM: Grandmother  
M: Mother  
F: Father  
S: Sister  
B: Brother  
W: Wife  
D: Daughter  
Sn: Son

### **A.2. Appendix II**

Power Point on Regional Odontoplasia: In your power point you must include the \* on your first slide and the \*\* on your last slide.

\*Name\_\_\_\_\_.

\*Position\_\_\_\_\_.

\*Institution\_\_\_\_\_.

\*Qualifications\_\_\_\_\_.

\*\*Audience\_\_\_\_\_.

\*\*Number of people in the audience\_\_\_\_\_.

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