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## Patient Examination

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# Case 1

## Examination and Documentation

### CASE STORY

A 55-year-old Caucasian female presented with a chief complaint of: "My mouth is always dry, and I have difficulty swallowing." She said, "I was recently diagnosed with scleroderma, and my doctor told me I should see a dentist." The vital signs were blood pressure: 159/92 mmHg; respiration: 16 breaths/min; pulse: 72 beats/min, temperature: 98°F; and nonsmoker.

### PROBLEM-BASED LEARNING GOALS AND OBJECTIVES

- Discuss the role of the patient's medical, social, and dental histories (comprehensive health history) in the patient examination
- List and describe the five parts of a comprehensive clinical examination
- Differentiate between types of findings in a clinical examination including signs and symptoms, and significant and insignificant findings
- Discuss the definition, purpose, and methods of documentation
- Identify the components of care documented in the patient's permanent record

### Medical History

The patient was diagnosed with scleroderma and gastroesophageal reflux disease (GERD). She is taking antacids for GERD and immunosuppressant medications and a calcium channel blocker for scleroderma.

### Dental History

The patient reported that her last dental visit was one year ago. She has a history of childhood caries but has been caries free since college. Also, she has symptoms of dry mouth and difficulty opening her mouth and swallowing.

### Social History

The patient is a self-described over-achieving professional concerned about her health and the appearance of her teeth. She lives with her husband in a suburb of Manhattan, has three adult children, and enjoys reading.

### Review of Systems (Physical Examination)

#### Gastrointestinal Examination

The patient has difficulty swallowing (dysphagia) and GERD.

#### Cardiovascular Examination

The patient has a history of Raynaud's phenomenon and hypertension (BP: 159/92).

#### Cutaneous Examination

The patient stated that her fingers are extremely sensitive to the cold. The skin of her hands appeared shiny and stretched with varying degrees of pigmentation. The patient struggled to hold the pen while signing consent forms.

### Head and Neck Examination

#### Extraoral

The patient exhibited microstomia restricting her mouth opening (<20 mm), and the lips were thin and stretched.

#### Intraoral

Examination of the major and minor salivary gland duct openings showed loss of quality and quantity of saliva.

Periodontal charting showed areas of bleeding on probing without CAL (clinical attachment loss).

Generalized fibrotic changes in mucosal tissues were noted with mucogingival paresthesia. Oral mucosal tissues appeared pale and tight with hardening of the soft palate. The patient's GI score was 2. Several restorations and crowns were noted. No caries present. Generalized moderate biofilm accumulation

was apparent. The debris index (DI-S) and the calculus index (CI-S) were both scored as 1 (debris and calculus covered less than 1/3 of the examined tooth surfaces).

Class I: right and left sides; teeth #7 and #10 are in torso version and overlap slightly with #8 and #9.

### Radiographic Examination

No significant findings.

## Dental Hygiene Diagnosis

Problems	Related to Risks and Etiology
Xerostomia	Loss of quality and quantity of saliva and scleroderma Goal: The patient will experience relief from xerostomia due to scleroderma immediately upon initiation of local and systemic measures to stimulate saliva flow
Increased periodontal disease risk	Insufficient daily biofilm management, limited hand strength and mouth opening as evidenced by gingival inflammation and a high GI score Goal: The patient will reduce the GI score from 2 to <1.0 by the next visit
Increased caries risk	Low salivary flow, inadequate biofilm management and fluoride intake, an acidic environment created by GERD, and a soft, high carbohydrate diet because of dysphagia Goal: The patient will suppress potential bacterial activity by increasing caries protective factors
Blood pressure elevated above treatment goal for patients <65 years old	Blood pressure readings of 159/92 Goal: Patient will report having blood pressure evaluated by a physician before rescheduled visit

## Planned Interventions

Planned Interventions (to arrest or control disease and regenerate, restore, or maintain health)		
Clinical	Education/Counseling	Oral Hygiene Instruction
BP was taken at every visit	Significance of management of xerostomia	Use of prescribed cholinergic agonist agent
Initial exam, FMS radiographs,	Determine patient's motivation to reduce plaque accumulation and oral disease risks:	Frequent use of water and saliva substitutes (Tolle 2012)
Adult prophylaxis	"What are possible benefits of removing plaque?"	Use of chlorhexidine for reduction of bacterial and gingival inflammation and prevention of Candida (Spolarich 2011) and a daily 1.1% sodium fluoride (prescription) mouthrinse for caries reduction (Featherstone 2000; Tolle 2012)
In-office 5% sodium fluoride varnish	"On a scale of 1–10, how confident are you that you can reduce your plaque score?"	Use of pump-type toothpaste dispenser and a power toothbrush with child-size brush inserts, interdental aids with elongated and enlarged handles or flosser with a toothbrush-like handle (Yuen et al. 2011)
Three-month continuing care interval because of scleroderma and associated medicine risks	Increased risk of caries because of lack of fluoride and soft, high carbohydrate diet	
Referral to primary care physician for blood pressure evaluation	Provide information on alternative self-care aids such as an enlarged or extended toothbrush handle, a powered toothbrush and flossing device	
Referral to occupational therapist to manage symptoms of scleroderma	Correlation of hypertension to general health	

## Progress Notes

The patient arrived on time for her appointment and was treated without delay. A complete medical, social, and dental history was taken. An initial exam, FMS and adult prophylaxis were performed followed by an application of 5% sodium fluoride varnish. The patient was advised to see her physician for a BP evaluation and an occupational therapist for effects of scleroderma on daily living.

## Discussion: Examination and Documentation in Patient Assessment

Patient assessment represents the most important step in the dental hygiene process of care because it provides a baseline of information, opens a dialogue between the patient and provider, and establishes trust and confidence in their relationship (Figure 1.1.1). All information collected during the assessment process is inextricably bound to each other. Information from the



Assessment is a form of detective work that involves putting together findings from:

1. Questioning patients
2. Reviewing histories
3. Identifying risks
4. Consulting with other health professionals
5. Observing and examining structures
6. Performing diagnostic tests
7. Incorporating significant facts into a database (ADHA 2016)

Figure 1.1.1: Assessment as detective work.

patient history is used to distinguish significant from insignificant findings in a clinical examination, helps generate a list of dental hygiene diagnoses, and ultimately leads to the formation of an individualized care plan.

During an examination, the dental hygienist documents findings as signs of health or disease. On the other hand, findings revealed by the patient are referred to as symptoms of their problems. The chief complaint or concern is the primary reason that patients present for treatment and should be the first diagnostic statement in the care plan (Wilkins et al. 2017). Typically, the chief complaint is a symptom or a request and may need to be elicited by asking open-ended questions such as, “What brought you to the dental office?” or “Is there anything you hope I can do for you?” Paying close attention to a patient’s chief concern(s) serves many purposes: it alerts the provider to relevant diagnostic information; it offers insight into a patient’s perception regarding his or her problems; and finally, it provides insight into the patient’s health literacy including their level of knowledge about dentistry.

A comprehensive clinical exam is made up of five parts (Figure 1.1.2).

1. **The Physical Exam or Review of Systems (ROS)** is a list of questions, by organ system, intended to uncover disease or dysfunction. The list is often given to patients before treatment. Along with the medical history, the ROS assists in determining a patient’s MCS or ASA (methods for

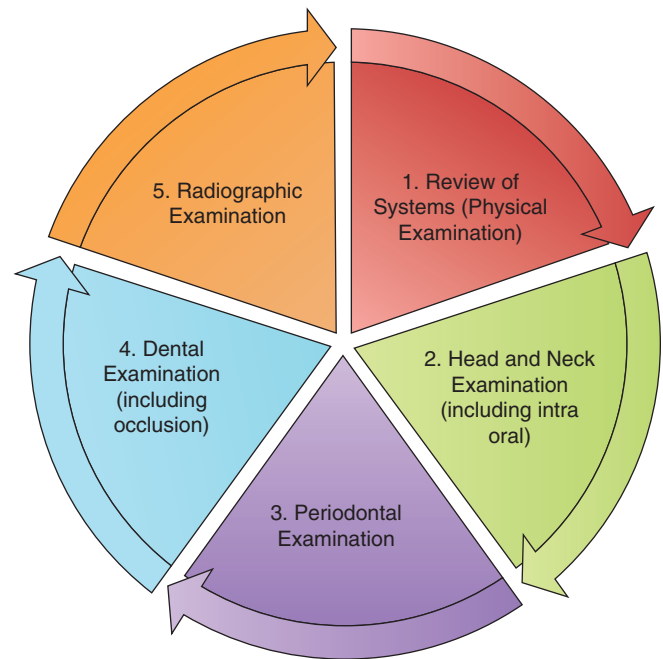


Figure 1.1.2: Five parts of the clinical examination.

physical status classification). When using the ROS, clinicians must be aware of associations between noncommunicable diseases and oral disease because they share common risk factors as well as underlying infection/inflammation pathways (Jin et al. 2016).

## 2. The Extraoral and Intraoral Soft Tissue Examination

**Examination** evaluates head and neck structures for abnormalities or lesions. The examinations are performed systematically through a process of observation and palpation to detect variations from normal and abnormalities. Patients provide important historical context for clinical findings, such as timelines for lesions, whether the lesions are painful or tender, or can be linked to repeated exposure to sun or tobacco products.

3. **The Periodontal Examination** evaluates the patient’s oral hygiene and the clinical appearance of the periodontal soft tissue. Deviations from normal healthy tissue are noted such as gingival recession, redness, suppuration, and swelling. A thorough examination requires a mouth mirror, a periodontal probe, and radiographs. A periodontal assessment provides information for long-term monitoring of a patient’s periodontal disease activity (Armitage 2004).
4. **Examination of the Teeth (and Occlusion)** Before beginning the dental examination, the clinician



should review the dental history, particularly the chief complaint(s) involving the teeth. The exam is performed in conjunction with radiographs so that imaging findings can be correlated with those found clinically.

- a. First note any missing teeth and type of replacement such as implants, fixed and removable partial and complete dentures. If removable prostheses are present, they are evaluated in the mouth and then removed.
- b. Each tooth is evaluated visually with an excellent light source. Assess all teeth for overall condition, irregularities of color, morphology, and function.
  - i. It is recommended to use the air/water syringe, with transillumination and a dull probe to detect enamel changes. However, the probe is not a better method than visual inspection alone (Newbrun 1993).
  - ii. A study concluded that explorers did not improve the validity of a caries diagnosis as compared to visual detection alone (Lussi 1991); and consequently, leaders in caries research no longer support the use of a sharp explorer in caries detection (Van Dorp et al. 1988; Braga et al. 2010).
- c. Document the numbers, shape, and type of existing restoration. Dental floss is used to check the integrity of interproximal contacts,

and the explorer evaluates restoration margins for defects.

- d. An occlusal examination is conducted by recording the intraarch and interarch relationships of adjacent teeth in the same and opposing arches. Both right and left sides are included when classifying teeth according to Angle's Classifications in the permanent dentition and when using the terminus of second primary molars.

5. **The Radiographic Examination** Radiographs are considered an essential adjunct to the visual clinical examination. They accurately detect proximal caries lesions and estimate the depth of lesion penetration into the underlying dentin (Bindra et al. 2016; Keenan and Keenan 2016). Also, radiographs are useful for monitoring the growth and development of the teeth and jaws as well as for the diagnosis and treatment of periodontal diseases and oral pathologies (American Dental Association Council on Scientific Affairs 2012).

Thorough and accurate documentation of the patient's record occurs during the assessment process and at every phase of patient care. As a result, documentation has been adopted as the sixth standard in the Standards for Clinical Dental Hygiene Practice (Figure 1.1.3) that guide practice and are designed for hygienists as a resource for providing patient-centered and evidence-based care (ADHA 2016). The patient's

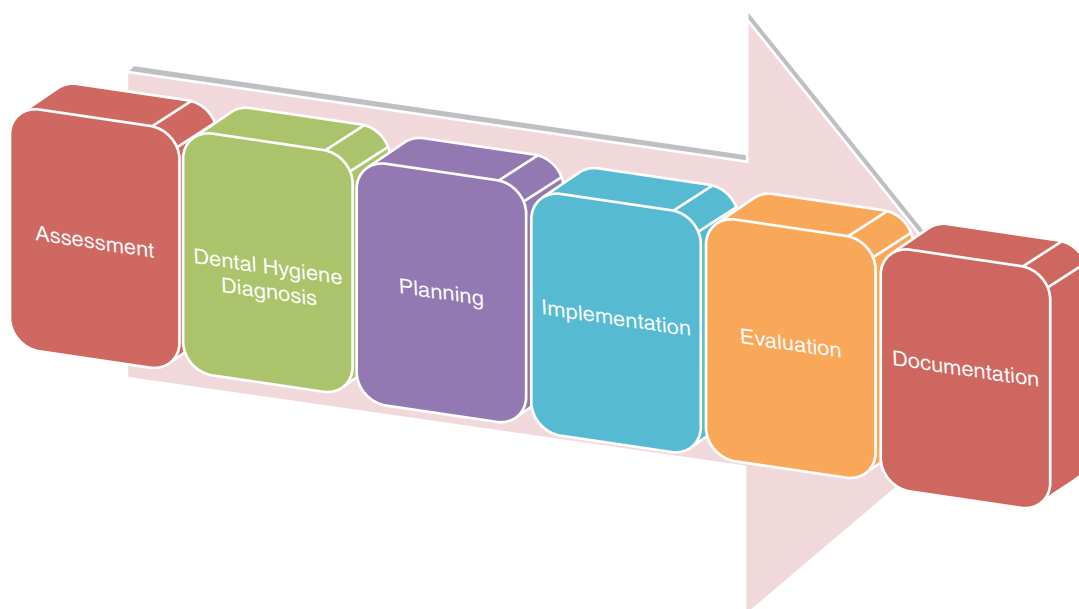


Figure 1.1.3: Standards for clinical dental hygiene practice.

record should be brief and to the point, objective (nonjudgmental) and comprehensible. Taking and documenting *all* patient data – the list of problems, planned and provided treatment, and relevant patient conversations – in a humanistic manner (with clarity, professionalism, and empathy) is an indicator of professional competence and represents the highest standard of patient care.

Using open-ended questions during a patient assessment (as opposed to direct or leading questions) results in a more nuanced examination picture (Iversen et al. 2014). Skillful clinicians elicit in-depth information about previous dental experiences and what dental care and preventive care mean to the patients. They find out how and why patients did or did not adopt prescribed preventive care, and they determine ways in which social context influences their patients' health behaviors. Humanizing the dental care experience by contextualizing clinical facts with our patients' narratives (their personal stories about general health and oral diseases) provides a bridge between evidence-based dental practice and the art of applying the knowledge to a single case (Kalitzkus and Matthiessen 2009), improves the visual exam and enriches dental hygiene practice.

Advances in technology such as imaging techniques, oral/facial photography and electronic health records (EHR) have brought improvements to the data collection and documentation processes. Proper documentation records:

- collected data from the patient interviews and clinical examination
- services planned and provided
- recommendations, and
- relevant information to the patient's case.

The process accurately and concisely records all information and interactions between the patient and provider and provides evidence that the services performed reflect the patient's specific needs. A critical part of the documentation process and a legal risk management strategy is to include the patient's acceptance or rejection of the treatment options and recommendations (after a presentation of a proposed care plan and the consequences of not receiving care by the dental hygienist) referred to as informed consent and informed refusal. After patients have agreed to and signed for treatment, errors can be corrected. However, clinicians must initial all corrections, and *any* alterations to the treatment plan require a new patient signature.

A patient's health information and clinical records are confidential and legally protected by The Health Insurance Portability and Accountability Act (<https://www.hhs.gov/hipaa/for-professionals/index.html>). Additionally, the ADHA Code of Ethics provides members with professional standards for ethical and moral behavior and reminds us of our professional responsibility in that regard. Hence, maintaining patient privacy when documenting information throughout the process of care and when collaborating interprofessionally on a case is critical in the application of technology to patient care.

The patient assessment process requires attention to the facts of the case but likewise, should include meaning, context (cultural and otherwise), and understanding of the patient's needs. Dental professionals conduct a patient-centered interview and examination that put the patient where she/he needs to be in the process of care, front-and-center.

Interviewing and asking questions continue throughout the patient examination to include the patient's point of view and to lend meaning to the process. The way in which questions are asked can encourage intimacy and frankness; and even though responses are typed on a computer, written on a page, or recorded, it is important to maintain eye contact with the patient, to be friendly, interested, to ask questions requiring more than a one-word response, and to reiterate for clarity and understanding.

Professionals can restore a sense of narrative into the assessment process by creating a more humanistic environment during the assessment. The patient narrative is not only a description of the facts of a case. The narrative in healthcare provides meaning, context and perspective for the patient's problem (Greenhalgh and Hurwitz 1998). Throughout the interview and examination, clinicians watch the patient's expressions, interact comfortably, engage patients verbally while simultaneously managing documentation. Consequently, patients may be more comfortable about telling their story; they may have more confidence in their provider; and they may be more willing to share in the responsibility for their health outcomes.

Health professionals cannot be detached, removed, or uncaring in what they do. Paying attention, exploring things a little bit, getting at it slowly, but carefully and thoroughly will get results throughout the entire process of care (Pirsig 1974).

**Take-Home Hints**

1. Assessment identifies patients' needs and oral health problems and is the first of six of the *Standards for Clinical Dental Hygiene Practice* (Figure 1.1.3).
2. The patient examination never stands alone. The clinical examination is tied to all information-gathering activities. For example, a diagnosis of scleroderma elicited during the patient interview provides historical context for changes in the patient's oral tissues.
3. The American Dental Hygienists' Association (ADHA) defines patient-centered as an approach that focuses attention on the patient and recognizes the importance of their values, beliefs, and needs in the provision of care (ADHA Standards for Clinical Dental Hygiene Practice 2016).
4. Risk assessment identifies certain behaviors, characteristics, or exposures that put our patients at risk for developing diseases. Risk factors are assessed as high, moderate, or low and are used to prevent and manage dental diseases (ADHA 2017).

**Self-Study Questions**

**1. Findings revealed to the dental hygienist by the patient during assessment are called**

- A. Signs
- B. Symptoms

**2. Recently, a sixth standard has been added to the Standards for Clinical Dental Hygiene Practice. It is:**

- A. Assessment
- B. Dental Hygiene Diagnosis
- C. Documentation
- D. Implementation

**3. The six standards for Clinical Dental Hygiene Practice follow the dental hygiene process of care. The correct order of the six components is:**

- A. Assessment
- B. Evaluation
- C. Implementation
- D. Dental Hygiene Diagnosis
- E. Documentation
- F. Planning

**4. A thorough examination is made up of \_\_\_\_\_ parts. (Fill-in-the-blank).**

- A. Three
- B. Four
- C. Five
- D. Six

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## Answers to Self-Study Questions

1. B symptoms
2. C documentation
3. Assessment, Dental Hygiene Diagnosis, Planning, Implementation, Evaluation, and Documentation (ADPIED)
4. Five. The five parts of the dental hygiene examination are
  - Review of Systems
  - Head and Neck exam (including intraoral exam)
  - Periodontal exam
  - Dental exam (including occlusion), and
  - Radiographic exam

# Case 2

## Head and Neck Examination

### CASE STORY

A 29-year-old female, recently employed as an elementary special education teacher, presented with a chief complaint of, “I am concerned about white spots on my teeth and red areas on my neck.” She has been unable to see a dentist for seven years because of “a large college loan debt.”

### PROBLEM-BASED LEARNING GOALS AND OBJECTIVES

- Explain the steps in the head and neck exam
- State the objectives of the head and neck examination
- State the relevance of the head and neck and intraoral examinations to general health and physical wellbeing
- Identify risk factors for cancer

### Medical History

Review of the patient’s medical history revealed allergies to most animals, dust, and mites. The patient takes one capsule Benadryl (Diphenhydramine HCL) 25mg every four to six hours at least four days per week for allergies. Her vital signs are within normal limits.

### Dental History

The patient grew up in the Kingston, New York area without fluoride. She brushes twice daily and uses

toothpaste without fluoride. The patient states she flosses once daily. Minor occlusal restorations were placed during college.

### Social History

The patient teaches at a residential institution for children with emotional and academic problems. Also, she plays the violin with a local symphony orchestra. She drinks several bottles of sweetened ice tea daily and snacks on candy before, during, and after work.

### Head and Neck Examination

The extraoral exam revealed hyperpigmented areas under the patient’s left mandible and erythematous plaques on the left lower neck and no enlarged or palpable lymph nodes (Figure 1.2.1). The patient states that she practices violin one hour on weekdays and two hours on weekends and holds the violin against her chin and collar bone. The three lesions are slightly raised, erythematous, broad, and rough in appearance and conform to the placement position of the violin. Each lesion measures 5 × 5 mm, 3 × 7 mm, 7 × 3 mm. The patient states violinists stabilize their instrument with the sternocleidomastoid muscle (Figure 1.2.2). It is the muscle that passes diagonally across the front and side of the neck beginning at the top of the sternum and ending behind the ear. The lesions known as “fiddlers neck” are a common skin problem found on violinists (Jue et al. 2010) and conform to the performance position of the violin as described by the patient.

Intraorally, visual examination and transillumination of teeth revealed noncavitated white spot lesions on the proximal surfaces of teeth #8, #9, and #10. There is localized slight supragingival biofilm on affected tooth



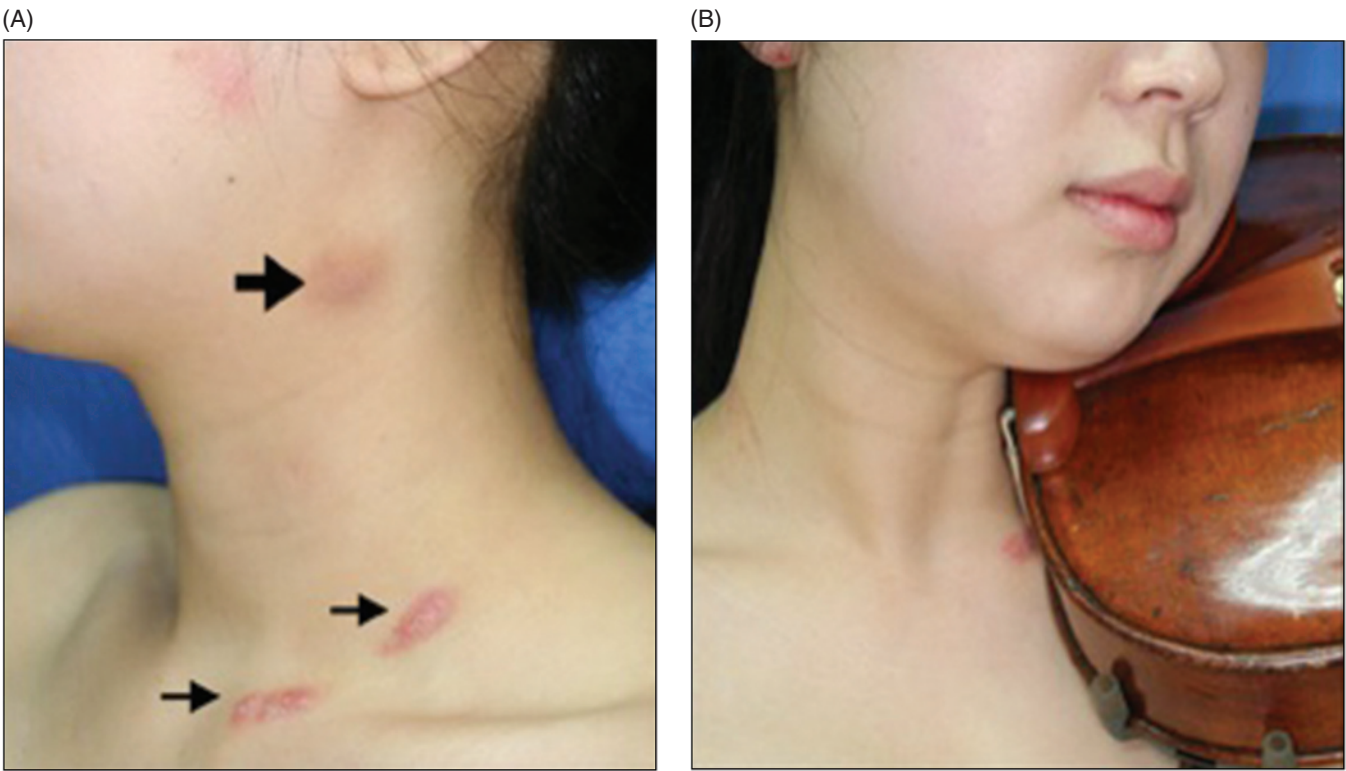


Figure 1.2.1: Extraoral image of neck with erythematous areas.

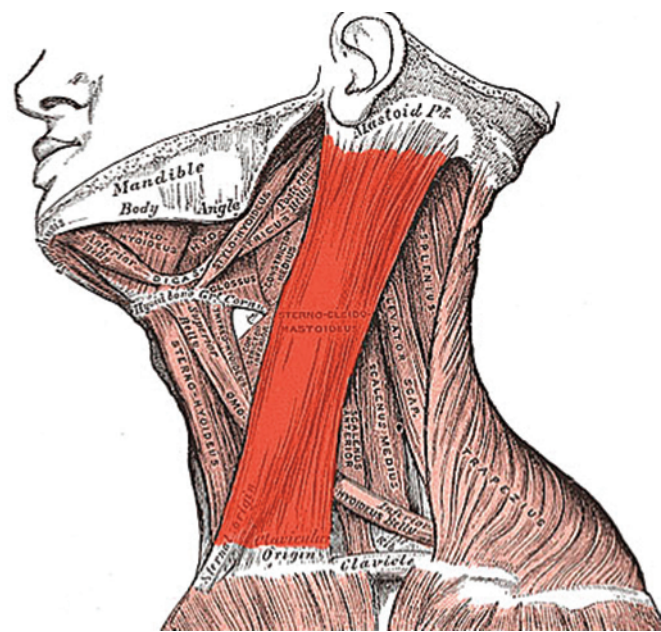


Figure 1.2.2: Sternocleidomastoid muscle.

surfaces. Supplemental oral findings indicate the patient is a mouth breather. Class I malocclusion with anterior open bite present.

**Radiographic Examination**

Caries lesions are visible radiographically but confined to the enamel. Partially erupted third molars are visible.

**Dental Hygiene Diagnosis**

Problems	Related to Risks and Etiology
Increased caries	Localized slight supragingival biofilm, frequent sugar intake, nonexistent use of fluoridated dentifrice or fluoride rinses and xerostomia (side effect of medication and mouth breathing).
Three red callus-like areas below the chin and along the neck	Violin placement, frequency of violin practice, possible allergy to varnish

## Planned Interventions

### Planned Interventions (to arrest or control disease and regenerate, restore, or maintain health)

Clinical	Education/Counseling	Oral Hygiene Instruction
Initial exam, radiographs, and adult prophylaxis	The importance of regular dental visits. Increased risk for caries.	Modified Bass brushing technique Recommend use of 1.1% NaF toothpaste and 0.05% NaF rinse 2X daily
5% NaF fluoride varnish with a synthetic form of colophony (to reduce risk of allergy) every 3 to 4 months	The role of fluoride in remineralization of noncavitated lesions.	10 ml 0.12% Chlorhexidine rinse one minute daily for 1 week each month for short term (evaluate at 3 months recall until risk reduced).
Sealants	Reduction of bacterial infection through daily biofilm removal and antimicrobial therapy.	Recommend frequent sips of water during the day and xylitol gum or candy four times daily if mouth feels dry.
Referral to dermatologist for red lesions on neck	Food diary for analysis of sugar exposures.	
Referral to primary care physician to evaluate allergy symptoms	Use of chamois cloth to protect exposed skin while practicing violin	

## Progress Notes

The patient arrived for her appointment on time. A complete medical, social, and dental history was taken. Initial exam and FMS were performed. Three atypical callus-like red lesions on the neck were noted during the head and neck exam. Noncavitated white spot lesions were charted, and bacterial infection reduction methods were explained according to patient caries risk assessment. A food diary for analysis of sugar intake was reviewed and given to the patient. The patient was instructed to return in one week for dietary analysis and counseling. The patient was advised to see a dermatologist for a differential diagnosis and treatment of neck lesions and her primary care physician for symptoms of allergies. Three to four months recall recommended for high caries risk.

## Discussion: The Head and Neck Examination

Dental hygienists see patients for well-check visits more often than physicians and are at the frontline for recognizing early illness and for educating patients about their risk factors. The head and neck and intraoral examinations – often referred to as an oral cancer examination or oral cancer screening – are an important part of comprehensive dental hygiene care and can be completed in around five minutes. However, approximately half of practicing hygienists (51%) performs a head and neck exam routinely during dental visits (Forrest et al. 2001; Horowitz et al. 2002). The head and neck exam is emphasized during hygiene education as a standard of care to detect manifestations of systemic illness, early skin cancer, and lymphadenopathy. Demands on patient scheduling,

working time, knowledge, and perceived risk of cancer in the United States often prevent hygienists from performing the service (Forrest et al. 2001; Horowitz et al. 2002; Cotter et al. 2011). However, failure to include this exam routinely has profound consequences such as late-stage diagnosis, more extensive surgery and therapies such as radiation and chemotherapy, and a decreased quality of life and health.

Hygienists should perform the head and neck and intraoral assessments the same way at every visit to maintain efficiency and high levels of accuracy. The head and neck exam includes checking symmetry and profile of the face, the skin, eyes, lips, lymph nodes, salivary, and thyroid glands as well as a temporomandibular joint examination (see Figure 1.2.3). If possible, clinicians visually examine each area before performing a thorough palpation. Additionally, it is important to ask permission to do the exam and to tell patients exactly what is being done and why. For example, ask your patients if you may perform an extra- and intraoral examination to look for abnormalities that affect oral and general health. Tell patients that palpation will include the clavicle area.

If a problem is identified, ask the patient about its history (onset, duration, and possible causes). As in this case, when deviations from normal are detected, patients are referred to a physician for differential diagnosis and treatment. Finally, educating patients about known risk factors for cancer such as age, genetic predisposition, sun exposure, alcohol, tobacco, viruses such as HPV and HIV, chronic inflammation and inadequate nutrition and host immunity is essential to decreasing the rate of cancer (Sciubba 2001; Neild-Gehrig 2018).



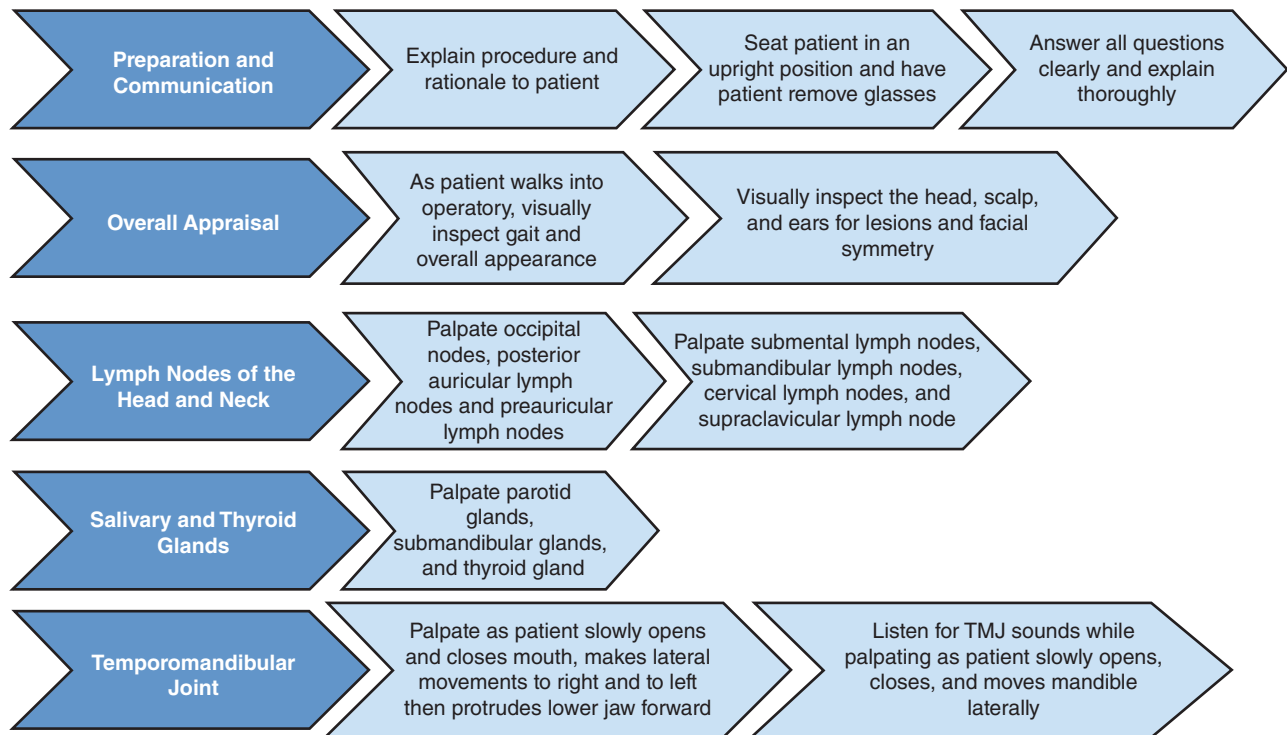


Figure 1.2.3: Steps in the head and neck examination.

### Take-Home Hints

- The American Cancer Society and the American Dental Association recommend oral cancer examinations as an essential element of routine dental examinations (Smith et al. 2013; Walsh et al. 2013).
- The Objectives of the Head and Neck and Intraoral Exam are:
  - To determine general wellness and ability to continue dental treatment.
  - To provide and/or to compare to a baseline of assessment information.
  - To determine need for additional diagnostic procedures and medical or other consultations.
  - To enable early diagnosis of pathology.
- Findings from the Head and Neck and Oral Examinations fall into one of three categories:
  - Normal – found in most individuals.
  - Atypical – a variant of normal found in some individuals but within normal limits.
  - Pathologic– indicative of infection, trauma, neoplasms, development errors causing functional issues, inadequate nutrition and immunity, and more.
- Include the following in your description of findings:
  - History* – Onset, duration, and possible causes.
  - Description* – Location and extent, size, surface texture, consistency, and color.
  - Morphology* – elevated, depressed, or flat.
- Oral cavity and oropharyngeal cancers are considered to be the sixth most common cancers worldwide (Warnakulasurlya 2009), there will be an estimated 51,540 new cases in the United States in 2016, and an estimated 10,030 people will die of this disease (SEER Cancer Statistics 2017).
- The most common malignancy of the head and neck, oral cavity squamous cell carcinoma (OC-SCC), is preceded often by white or red mucosal changes known as leukoplakia or erythroplakia. "Some lesions will show a combination of red and white features, termed *erythroleukoplakia*, *speckled leukoplakia*, or *speckled erythroplakia*" (Chi et al. 2015).
- Although oral cancer is associated with aging, studies indicate a rise in the disease in adults below the age of 40 and that squamous cell carcinoma in tongues of young adults has increased sharply (Schantz and Yu 2002; Chaturvedi et al. 2011).
- Alarming, cancers in younger people are more aggressive and associated with a poorer prognosis than those found in older adults (Warnakulasurlya 2009). A new study found that the human papillomavirus (HPV) may be causally linked to 70%

of oropharyngeal squamous cell carcinomas in white males in the United States, and found that by 2020 the number of oropharyngeal cancers in this population will surpass the annual number of cervical cancers (Chaturvedi et al. 2011).

9. Primary areas for the development of oral cancer in the (wet) oral tissues are:
  - Lateral borders of tongue (Figure 1.2.4)
  - Lips
  - Floor of the mouth
  - Soft tissue complex: includes “the posterior mouth such as the tonsils, tonsillar pillar and crypt, the base of the tongue, and the oropharynx” (SEER Cancer Statistics 2017).

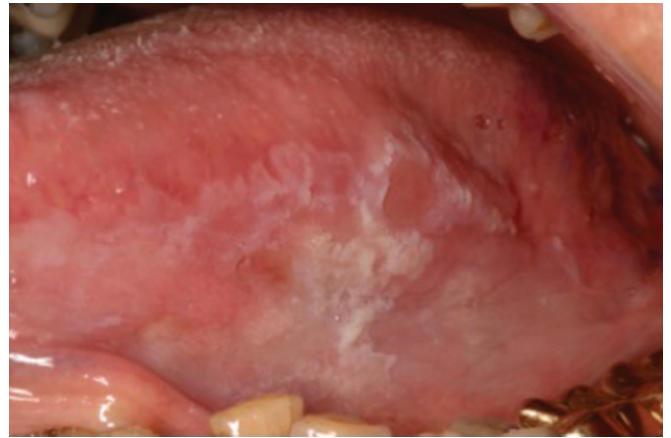


Figure 1.2.4: Lateral borders of the tongue.

## Self-Study Questions

### 1. True or False

Clinicians should alter the sequence of the Head and Neck and Intraoral exams to keep the process from becoming routine.

### 2. Approximately what percent of hygienists performs a Head and Neck Examination routinely?

- A. 100%
- B. 90%
- C. 75%
- D. 51%

### 3. True or False?

Hygienists should only screen older adults for head, neck, and oral cancers.

### 4. A finding of “Atypical” means a clinical condition or lesion is:

A. Found in most individuals.

B. Found in some individuals but within normal limits (variant of normal).

C. Indicative of infection, trauma, neoplasms, development errors causing functional issues, inadequate nutrition, and immunity, and more.

D. None of the above

### 5. Violinists stabilize their instrument with the large strap muscle that passes diagonally across the front and side of the neck beginning at the top of the sternum and ending behind the ear.

This muscle is the:

A. Trapezius

B. Mylohyoid

C. Anterior Belly of the Digastric

D. Sternocleidomastoid

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### Additional Resources

Strings Magazine. 2018. *How to Prevent or Even Cure a Violin Hickey*, [Online]. Available at: <http://stringsmagazine.com/how-to-prevent-or-even-cure-a-violin-hickey> (June 4, 2018).

## Answers to Self-Study Questions

1. Answer: False. The Head and Neck and Intraoral exams should be performed following the same sequence and in the same manner to ensure nothing is missed.
2. Answer: 51%. Studies indicate slightly more than half of practicing hygienists routinely performs a complete Head and Neck exam.

3. Answer: False. All patients should receive cancer screening as part of the standard of hygiene care.
4. B Answer: Atypical findings indicate the clinical condition or lesion is a variant of normal found in a portion of the population.
5. D Answer: Sternocleidomastoid.

# Case 3

## Radiographic Exam

### Introduction

Radiographic studies provide invaluable diagnostic information to the oral health-care provider. In this section we will discuss a case of an adolescent patient who has an atypical pattern of tooth eruption, prompting the utilization of a panoramic radiograph. This case highlights the importance of identifying disease beyond caries and periodontitis by utilizing dental radiography. We will discuss how to prescribe radiographic studies, review the different types of radiographic studies commonly used in dentistry, and suggest a brief methodology for radiographic interpretation.

In this case the patient was diagnosed with Gardener syndrome (GS). GS is an autosomal dominant genetic disorder resulting from a mutation on chromosome 5 (Cristafaro et al. 2013). The oral and maxillofacial manifestations include osteomas, odontomas, supernumerary teeth, impacted teeth, and epidermoid cysts (Neville et al. 2015). Several other findings exist outside the stomatognathic region, the most important of which are colonic polyps. Patients may develop up to 2500 of these polyps, which are premalignant. Nearly 100% of patients will develop colonic carcinoma if these polyps are not addressed surgically (Cristafaro et al. 2013). It is critical that oral health-care professionals recognize the findings of GS as the clinical signs in the head and neck may manifest prior to the development of premalignant colonic polyps (Neville et al. 2015).

### CASE STORY

A nine-year-old male presents to the dental clinic for an examination. This is his first visit to the dentist. Upon initial clinical examination it is noted that the patient is missing several teeth.

### PROBLEM-BASED LEARNING GOALS AND OBJECTIVES

- Discuss the rationale for taking radiographs
- Describe the common radiographic studies in dentistry
- List the steps in the suggested methodology for reading images
- Describe the features of GS
- List the oral and maxillofacial findings in patients with GS
- Understand the importance of timely referrals of patients with GS to the appropriate health-care provider

### Medical History

Denies.

### Medications

Denies.

### Review of Systems

All systems within normal limits.

### Social History

Denies.

### Dental History

None.

### Head and Neck Exam

#### Extraoral Exam

Bone-hard, subcutaneous, spherical nodule present at the right mandibular angle measuring approximately 1.0 × 1.0 cm.

No other grossly visible signs of pathology are identified in the head and neck or craniofacial region. The examination is negative for clinically detectable cervical lymphadenopathy.

### Intraoral Exam

#### Soft Tissue

All oral mucosal surfaces including upper and lower labial mucosae, gingiva, tongue, floor of mouth, bilateral buccal mucosae, bilateral maxillary and mandibular buccal vestibules, soft palate, hard palate and clinically visible oropharynx appeared healthy with no visible signs of atypical inflammation, infection, neoplasia, or other pathology.

#### Hard Tissue

Missing teeth C, H, #8 and #23.

#### Radiographic Examination

The clinical examination demonstrated missing teeth and an extraoral nodule of hard tissue consistency on the left mandibular angle. A panoramic image was prescribed in order to capture the areas of missing teeth and the angle of the mandible.

#### Radiographic Findings

- See Figures 1.3.1–1.3.5.
- Well-circumscribed radiopaque mass measuring approximately  $1.0 \times 1.0$  cm located on the right mandibular angle.

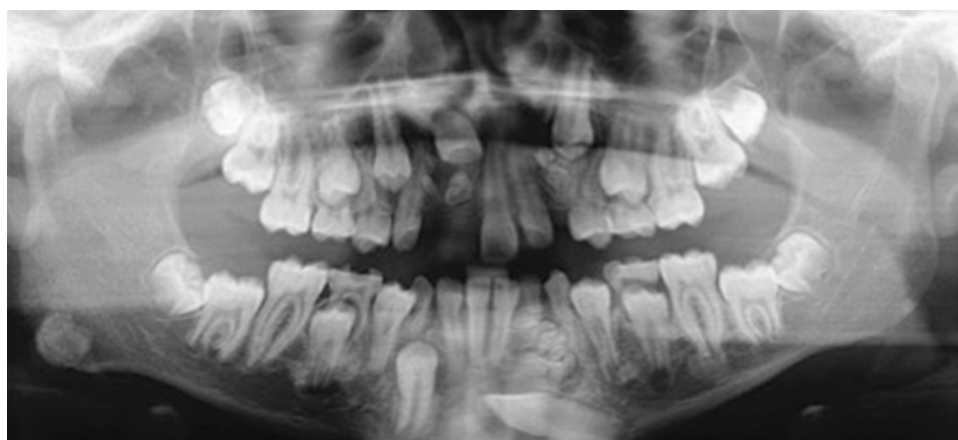


Figure 1.3.1: Panoramic radiograph demonstrating adolescent patient with a right mandibular osteoma, multiple odontomas, and impacted teeth.



Figure 1.3.2: Clinical image of an epidermoid cyst of the skin. An elevated nodule demonstrating a darker hue compared to the adjacent skin. The nodule was doughy in consistency upon palpation.



Figure 1.3.3: Clinical image of an epidermoid cyst of the skin. An elevated nodule demonstrating a darker hue compared to the adjacent skin. The nodule was doughy in consistency upon palpation.



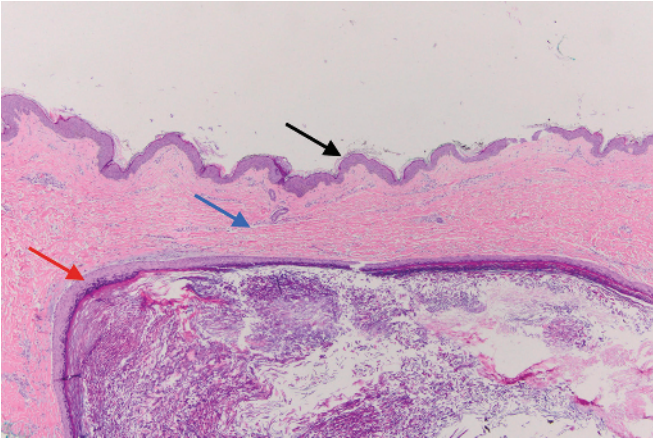


Figure 1.3.4: Low power histopathology corresponding to the epidermoid cyst of the skin seen in Figure 1.3.2 and Figure 1.3.3. The section shows an intact epidermis composed of orthokeratinized stratified squamous epithelium (black arrow), a dermis of dense fibrous connective tissue (blue arrow), a cystic structure showing orthokeratinized stratified squamous epithelium and a lumen with keratinaceous debris (red arrow).

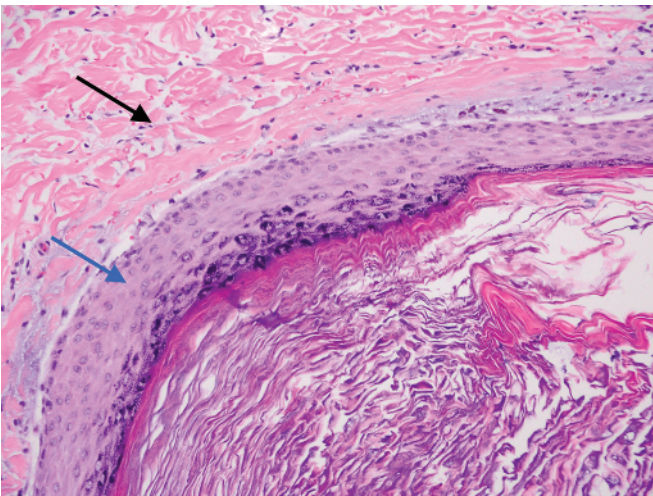


Figure 1.3.5: High power histopathology corresponding to the epidermoid cyst of the skin. The section shows the dermis comprising the cyst wall (black arrow) the cystic lining of orthokeratinized stratified squamous epithelium and a lumen with keratinaceous debris (blue arrow).

- Well-circumscribed radiopaque mass measuring approximately  $0.7 \times 0.5$  cm located at the apex of tooth #19.
- Coalesced radiopaque masses in the anterior maxilla (areas of teeth #8 and #11) and in the anterior mandible (area of tooth #22) measuring from  $1.1 \times 0.9$  cm to  $0.8 \times 0.9$  cm.
- Multiple impacted teeth (# 8 and #22).
- Cystic lesion surrounding crown of impacted #22.

- Missing tooth #23.
- Multiple retained primary teeth.

### Radiographic Impressions

- The well-circumscribed radiopaque masses in the right and left mandible are consistent with osteomas.
- The coalesced radiopaque masses in the anterior maxilla and anterior mandible are consistent with compound odontomas.
- The combination of findings including multiple likely osteomas and odontomas as well as multiple impacted teeth, are highly suspicious for a diagnosis of GS.

### Differential Diagnosis

The combination of osteomas, odontomas, and impacted teeth place GS at the top of the differential diagnosis. It is possible that these findings could occur outside GS.

### Clinical Management

- Given the high degree of suspicion for GS, the patient's parent or guardian should be questioned regarding a family history of GS and findings related to this diagnosis.
- If a diagnosis has not been established, the patient should be referred to pediatric oncology for a thorough work-up to rule out a diagnosis of GS.

### Treatment Plan

Dental prophylaxis.

Referral to pediatric oncology for diagnostic work-up in consideration of findings consistent with GS.

### Discussion

Radiographic examination enables the oral health-care provider to acquire essential diagnostic information for patient care that cannot be obtained by other means. Several items must be considered in deciding which studies should be performed including acquiring the necessary diagnostic information as dictated by the clinical scenario and promoting patient safety by minimizing exposure to radiation.

The radiographic studies commonly used in dental practice include the bitewing, periapical, and panoramic radiographs. Cone beam computed tomography (CBCT) is also seeing increased utilization. Bitewing radiographs allow excellent visualization of structures above the cemento-enamel junction. One of the strengths of this study is diagnosis of dental caries in the posterior dentition. Periapical films enable visualization of the

crown and apex of the tooth, and of the bone surrounding the apex. This is helpful in identifying inflammatory disease (periapical granulomas and cysts) as well as evaluating bone levels in patients with periodontal disease. The periapical film is also useful in diagnosing caries of the anterior dentition. The panoramic study provides a large quantity of information regarding the teeth, and bone and soft tissues of the oral and maxillofacial region. While the resolution of a panoramic radiograph renders it less sensitive to detecting periodontal disease or caries, it allows for visualization of the general condition of the oral and maxillofacial region. A CBCT scan has many uses including treatment planning for resection of gnathic pathology, implant surgery planning, and detection of crown or root fractures.

The radiographic prescription is made based on the specific clinical scenario of each patient. An initial examination is completed when the patient arrives at the dental office to decide which, if any, radiographs may be needed.

The history of recent radiographic studies must also be taken into account. Once a decision is made as to which radiographs are necessary, the clinician must inquire as to whether recent radiographic studies were performed that would provide sufficient diagnostic information. If recent studies were done and provide the necessary information, no further radiographs would be required. Attention to this principle minimizes unnecessary radiation exposure. However, exceptions do exist. For instance, if a patient presents as an emergency and the office where recent radiographic studies were performed cannot be reached, new radiographs would be necessary to aid in addressing the emergency (White and Pharoah 2009).

It is critical to assess all anatomic structures that are present within a radiographic image. Developing a systematic repeatable approach to reading radiographic images is therefore imperative. Please see Table 1.3.1 for a suggested methodology.

A descriptive clinical note should be made following the reading of the radiographic study. The mnemonic LESION (**L**ocation, **E**dge, **S**hape, **I**nternal, **O**ther structures, **N**umber) is helpful in describing any abnormalities that are identified (Dr. G's Toothpix 2016).

- Location** – Where is it located?
- Edge** – What is the degree of definition? Is it well or poorly defined or circumscribed?
- Shape** – What is the shape?
- Internal** – What is the internal character? Radiolucent, radiopaque, mixed?

**Table 1.3.1:** Suggested methodology for reading radiographic images.

Step	Instruction
1	Assess image radiographic artifacts and quality; if anatomic structures are clearly visible move on to step 2; if anatomic structures are not clearly visible consider retaking image
2	Assess bone for normal patterns of trabeculation and any interruptions within the pattern moving from the left to the right side of the image
3	Count the teeth if present
4	Assess lamina dura, periodontal ligament area, and apex of each tooth
5	Assess alveolar bone levels surrounding each tooth that may be indicative of periodontal bone loss
6	Assess enamel and dentin for normal degrees of thickness and uniformity (e.g., absence of fracture)
7	Assess enamel and dentin for areas of radiolucency that may be indicative of dental caries
8	Assess pulp chamber and canal of each tooth for uniformity (e.g., absence of stones)
9	Write a detailed description of any abnormalities in the patient chart and depict on a diagram if available

**Other** – What other anatomic structures are involved?  
**Number** – Is it unilocular or multilocular? Are there several components?  
(Dr. G's Toothpix 2016)

In this patient's case there are several radiographic abnormalities identified. These findings lead to a strong clinical suspicion of GS. GS is a rare disease resulting from a mutation on chromosome 5. Patients with this diagnosis develop up to thousands of intestinal polyps. These polyps are initially benign, but have a malignant potential, carrying a high rate of transformation into adenocarcinoma (Neville et al. 2015). Nearly 100% of patients with GS will develop colonic adenocarcinoma by middle-age if left untreated (Kumar et al. 2007). Patients are treated with prophylactic surgical removal of their colon (colectomy) to prevent development of colonic adenocarcinoma (Neville et al. 2015).

GS includes several manifestations in the oral and maxillofacial region. Hard tissue findings comprise odontomas, supernumerary teeth, impacted teeth, and dental agenesis (Cristafaro et al. 2013; Neville et al. 2015). Soft tissue abnormalities include, but are not limited to epidermoid cysts of the skin (Neville et al. 2015). Figures 1.3.2 and 1.3.3 show the typical clinical appearance of an epidermoid cyst of the skin and Figures 1.3.4 and 1.3.5 demonstrate the associated histopathology. Patients with GS are also at high risk for developing thyroid carcinoma (Neville et al. 2015).



**Table 1.3.2:** Findings in patients with Gardner Syndrome.

Finding	Description
Osteoma	Benign tumor of bone; most commonly identified in the skull, paranasal sinuses, and mandible
Odontomas	Benign tumor of mesenchymal and epithelial odontogenic tissue
Supernumerary teeth	Number of teeth beyond the normal complement
Impacted teeth	Tooth remaining submerged in tissue beyond normal eruption sequence
Epidermoid cysts	Cutaneous cyst
Fibromatoses	Aggressive mesenchymal tumors arising in soft tissue
Thyroid carcinoma (female patients)	Malignant tumor of the thyroid
Ocular lesions	Pigmented lesions of the fundus
Colonic polyps	Premalignant fibro-epithelial neoplasms
Small intestine polyps (less common than colonic)	Premalignant fibro-epithelial neoplasms
Stomach polyps (less common than colonic)	Premalignant fibro-epithelial neoplasms

Source: (Adapted from Neville et al. (2015) and Kumar et al. (2007)).

Please see Table 1.3.2 for a list of conditions associated with GS.

Given the serious nature of GS, it is imperative that oral health professionals are aware of the disease, its manifestations in the head and neck region, and know the next steps in ensuring the patient is referred to the correct specialist. See Table 1.3.2 for findings in patients with GS.

### Take-Home Hints

1. Attention should be paid to acquiring necessary diagnostic radiographic information and minimizing patient radiation exposure.
2. Establish a systematic approach in reading radiographic studies that can be repeated.
3. Consider the LESION mnemonic in describing radiographic findings.
4. Oral and maxillofacial manifestations may be the first signs of GS and may lead to its diagnosis.
5. Consider GS in settings of multiple odontomas, impacted teeth, and osteomas.
6. Patients with GS are likely to have premalignant colonic polyps and possible gastrointestinal cancer.

## Self-Study Questions

1. A patient has a large carious lesion on the occlusal surface of tooth #19. To detect periapical inflammatory disease, which would be the most appropriate radiographic study?
  - A. Cone beam computed tomography scan
  - B. Bitewing radiograph
  - C. Periapical radiograph
  - D. Panoramic radiograph
  - E. Any of the above
2. L in the LESION mnemonic stands for:
  - A. Light energy
  - B. Lymphatic tissue
  - C. Location
  - D. Laparoscopy
  - E. Lesion
3. Which of the following cancers are most common in patients with Gardner syndrome?
  - A. Colonic adenocarcinoma
  - B. Thyroid carcinoma
  - C. Oral squamous cell carcinoma
  - D. A and B
  - E. None of the above
4. A combination of which of the following findings would raise the degree of suspicion for Gardner syndrome?
  - A. Odontomas
  - B. Osteomas
  - C. Bifid uvula
  - D. A and B
  - E. A and C
5. Which of the following are considered premalignant in patients with Gardner syndrome?
  - A. Odontomas
  - B. Osteomas
  - C. Epidermoid cysts
  - D. Intestinal polyps
  - E. Supernumerary teeth
6. The mutation in Gardner syndrome is found on chromosome:
  - A. 1
  - B. 5
  - C. 7
  - D. 13
  - E. 21

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## Answers to Self-Study Questions

- |      |      |
|------|------|
| 1. C | 4. D |
| 2. C | 5. D |
| 3. D | 6. B |

# Case 4

## Occlusal Examination

### CASE STORY

Miranda Hathaway is 11 years old. She is active in student government, basketball, softball, and field hockey. Miranda stated she is “being bullied and teased about her crooked teeth” and dreads going to school.

### LEARNING OBJECTIVES

- Identify the parts of a thorough occlusal examination
- Differentiate between primary and permanent dentition occlusion
- Distinguish abnormal from normal interarch and intraarch relationships in a patient case

### Medical History

Blood pressure: 115/70 mmHg; Pulse: 70 beats/min; Respiration: 12 breaths/min.

### Review of Systems

All systems were within normal limits.

### Social History

Miranda participates in school team sports five days per week. However, she reports being unhappy that members of her sixth-grade class tease her about the gaps between her teeth and her prominent incisors. The bullying impacts attendance and her ability to concentrate in class.

### Dental History

The patient has an established dental home and has received comprehensive dental hygiene care under parental supervision.

### Head and Neck Examination

#### Extraoral Exam

The temporomandibular joints and surrounding extraoral structures were within normal limits. A facial profile photograph shows a retrognathic or convex skeletal profile (Figure 1.4.1).

#### Intraoral Exam

There were no biofilm accumulations or calculus deposits. The patient’s gingiva was pink with normal pigmentation for her ethnicity. The maxillary anterior interdental papillae were blunted due to lack of proximal



Figure 1.4.1: Patient profile image.

CASE 4 OCCLUSAL EXAMINATION

contacts. The gingiva exhibited normal contour and the amount of textural stippling and consistency expected in a patient in phase four of arch development (time in which the permanent canines emerge). The intraoral photographs show delayed eruption of maxillary first and second premolars (see Figures 1.4.2 and 1.4.3).



Figure 1.4.2: Patient intraoral palate.



Figure 1.4.3: Patient intraoral floor of mouth.



Figure 1.4.4: Malocclusion right.

Occlusion

Class II Division I malocclusion with a severe overbite and excessive overjet (9mm) (see Figures 1.4.4–1.4.6). No occlusal habits or other parafunctional occlusal habits noted.

Radiographic Examination

Delayed eruption of maxillary first and second premolars (see Figures 1.4.7 and 1.4.8).

Dental Hygiene Diagnosis

Problems	Related to Risks and Etiology
Class II Division I malocclusion	Permanent molar and anterior teeth relationships: <ul style="list-style-type: none"><li>• mesiobuccal groove of the mandibular first molar is distal to the mesiobuccal cusp of the maxillary first molar by more than the width of a premolar</li><li>• maxillary anterior teeth protrude facially with a severe overbite related to hereditary skeletal (mandibular) jaw discrepancy</li></ul>
Negative oral health-related Quality-of-Life (OHRQoL)	Teasing and bullying about malocclusion
Increased risk of sports-related mouth injury	Patient age and participation in sporting activities

Planned Interventions

Planned Interventions (to arrest or control disease and regenerate, restore or maintain health)		
Clinical	Education/ Counseling	Oral Hygiene Instruction
Initial exam, intraoral photographs, alginate impressions, study models radiographs, and adult prophylaxis	Features of malocclusion and the importance of orthodontic intervention to OHRQoL.	OTC fluoride-containing toothpaste twice daily, after breakfast and at bedtime.
Fabrication of mouth guard	Proper use of a mouth guard during contact sports	Oral hygiene, flossing, and brushing.
Referral to an orthodontic/ orthopedic specialist	activities and risks of not wearing or altering protective equipment (Ranalli 2002).	Wear mouth guard during sports activities
Referral to primary care physician and school officials to implement appropriate services and support for bullying		
Six-month recall		



**Progress Notes**

Miranda arrived for her appointment 15 minutes late. I reminded Miranda and her mother of the office policy regarding missed and late appointments. A complete

medical, social, and dental history was taken. Head and neck and dental exams including occlusal assessment were performed. Panoramic and lateral cephalogram radiographs, and alginate impressions were taken.



Figure 1.4.5: Malocclusion left.



Figure 1.4.6: Malocclusion facial.



Figure 1.4.8: Relative mandibular retrognathia.

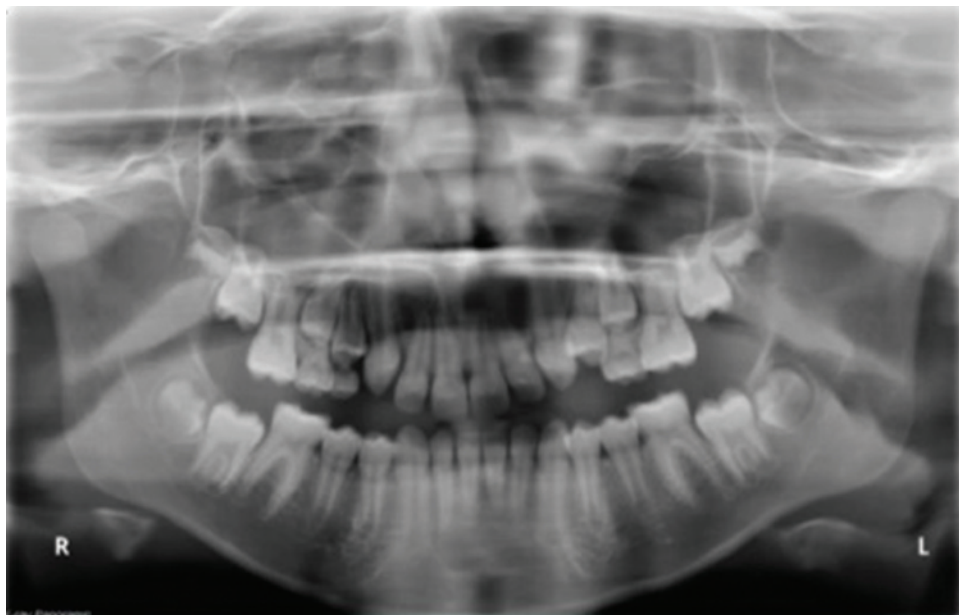


Figure 1.4.7: Radiographic image.

Study models were made for fabrication of a mouth guard. The patient had a mild to moderate gag response to the alginate impressions and was managed well by using a distraction technique: the patient was given a small puzzle to complete (For information on managing patients who gag during dental treatment, see Figures 1.4.9A and B). Oral hygiene instructions were given regarding protective factors to maintain current caries status. Correct use of mouth guard was explained to the patient. The patient was referred to an orthodontist for malocclusion and advised to speak to her guidance counselor for in-school bullying. The hygienist will make follow-up calls to Miranda's parents and her school guidance counselor regarding bullying. Six-month recall recommended.

## Discussion

The occlusal examination is critical to the assessment of the patient's dentition and facial symmetry. It includes:

- Classification of occlusion,
- Identification of any teeth malrelationships,
- Examination of the temporomandibular joints, muscles of mastication and range of movements (ROM),
- Record of parafunctional habits such as bruxism and clenching.

Diagnostic records such as intraoral photographs, study casts, and panoramic radiographs and cephalograms assist in the evaluation of the patient's condition and provide a baseline growth record and database for changes during treatment. Disease development such as caries, noncaries cervical lesions (abfractions), periodontal disease and temporomandibular joint disorder (TMD) are related to occlusal disharmony. When teeth are malaligned they lose their ability to self-cleanse; also, parafunctional habit patterns (movements that are not within the normal range) may appear. Malocclusion has physical and psychological ramifications and interferes with children's Oral Health-Related Quality-of-Life (OHRQoL) regarding school attendance, performance, and psychosocial wellbeing (Jokovic et al. 2002; da Rosa et al. 2016). OHRQoL is a construct based on the World Health Organization's definition of health and is used to measure people's oral health status. OHRQoL looks at physical, mental, and social wellbeing as a determinant of oral health and not just the absence of oral disease and related ailments.

Ideal occlusion, although rare, is used as a standard for determining the need for orthodontic treatment in patients. In centric occlusion or maximum intercuspation (MI), each tooth has a particular relationship with teeth

in the same arch (intraarch) and opposing arches (interarch). Centric relation (CR), the relationship of the mandible to the maxilla, should coincide with MI (when teeth are entirely interposed). When the MI and CR differ occlusal disharmony is the result. (For a list of risk factors for malocclusion, see Figure 1.4.10.)

Analysis of the permanent occlusion uses the first molars and canines to classify or confirm occlusion while the primary occlusal assessment is performed using the second molars. Analysis of the primary dentition is important because it determines the arch space required to provide room for the secondary teeth. Additionally, the identification of a distal terminal plane relationship between the primary maxillary and mandibular second molars predicts permanent molar relationships and provides valuable information for early orthodontic intervention (For an illustration of flush, mesial, and distal steps, see Figure 1.4.11).

All patients should have an orthodontic evaluation to determine the health of the masticatory system and to provide early therapy to manage the developing dentition and occlusion. The American Association of Orthodontists (AAO) recommends that an evaluation by an orthodontist should be performed no later than age seven because the first molars establish posterior occlusion and the incisors alert clinicians to crowding and poor anterior overlap relationships (American Association of Orthodontists mylifemysmile.org 2013).

Malocclusion can have an adverse effect on self-esteem, self-concept, happiness, and social development; also, it increases the risk of teasing (Seehra et al. 2011; da Rosa et al. 2016). Bullying among schoolchildren has a global prevalence rate of 5–58% and is as high as 47% in 11–12-year-old children (Al-Omari et al. 2014). The most commonly reported targets by bullies are dentofacial features; for example, children with spaces between teeth, malformed and discolored teeth, and prominent maxillary anteriors are likely to be victims of bullying (Al-Bitar et al. 2013). If a child admits to being bullied, clinicians should inform parents of the possible consequences that include psychological distress, anxiety, and depression. Also, parents should be asked to contact the school and teachers regarding the situation. The US Department of Health and Human Services website, Stopbullying.gov (U.S. Department of Health and Human Service, n.d.) provides parents, teachers, communities, and students with tools that support victims of unwanted aggressive behavior. Noting occlusal problems early, identifying possible victims of bullying, and referring patients for treatment have physical and psychosocial benefits for children with poor dentofacial features (Al-Omari et al. 2014).

(A)

**Why some patients gag**

Patients commonly gag during dental treatment, particularly during the taking of alginate impressions. It is interesting to note that Randall et al. found a correlation between gagging frequency and higher levels of fear related to dental care (Randall 2014).

Gagging is an involuntary defensive reaction to protect the oropharynx and upper respiratory tract from foreign objects. Some non-pharmacological and pharmacological interventions are used to manage the gag reflex (such as behavioral therapies/distraction techniques, acupuncture, local and general anesthetics, herbal remedies, and sedatives), and research has examined their effectiveness.

**Effectiveness of Interventions to Manage Dental Gagging**

A 2015 systematic review found weak evidence regarding the effectiveness of interventions to manage dental care related gagging and that more studies are needed (Prashanti, 2015). A recent web-based cross-sectional survey found that behavioral modification techniques such as patient distraction, relaxation, and sensory flooding are considered the most reliable methods for prevention of the gag response in 68.5% of patients (Roy 2016). This data supports previous findings that distraction techniques may temporarily divert the patient's attention and allow clinicians to perform minor dental procedures while distracting the patient from a potentially distressing situation (Krol 1963; Kovats 1971; Hoad-Reddick 1986).

**Things to do**

- Sit patients upright
- When taking impressions, insert the maxillary tray from posterior to anterior to direct the flow of impression material forward
- Have patients tilt their head forward
- Have patients breathe deeply through their nose
- Encourage drooling into the bib or a napkin
- Distract patients with an activity such as puzzling, (mentally) reciting the Pledge of Allegiance or conjugating the verb "to love" in Latin, talking to patients, and having your patients raise each foot until the impression material sets.
- *I find that assembling a transformer toy (Figure 1.4.9b) works with all ages, including seniors.*

(B)



Figure 1.4.9: (A) Managing patients who gag during dental treatment. (B) Transformer puzzle toy.



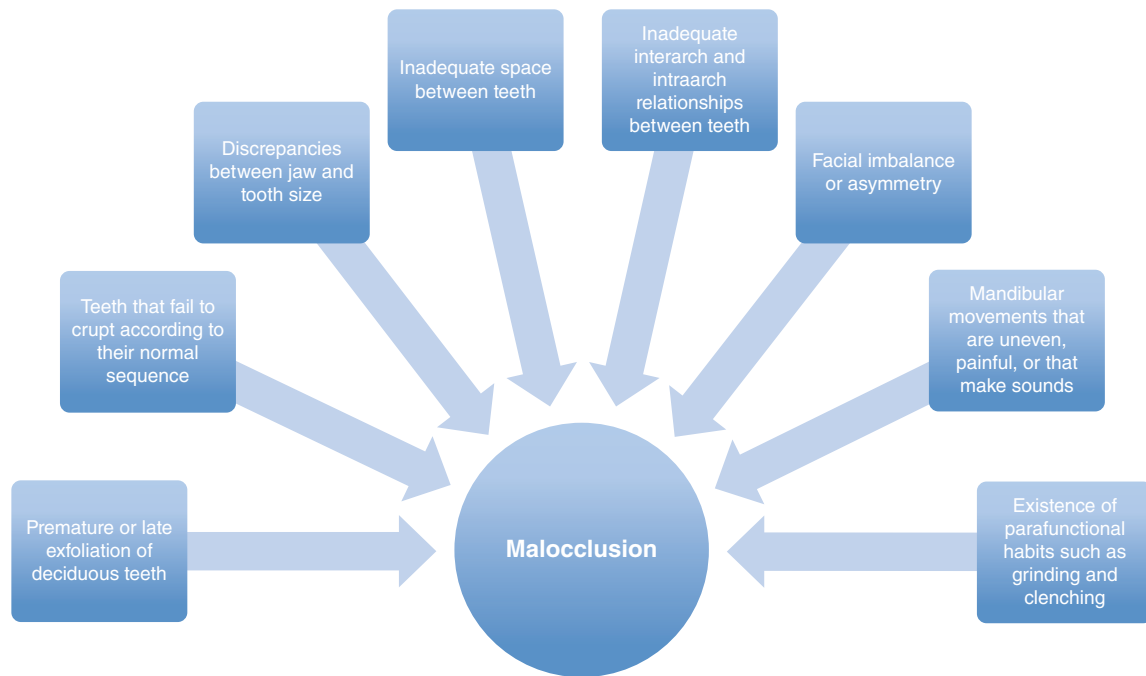


Figure 1.4.10: Risk factors for malocclusion.

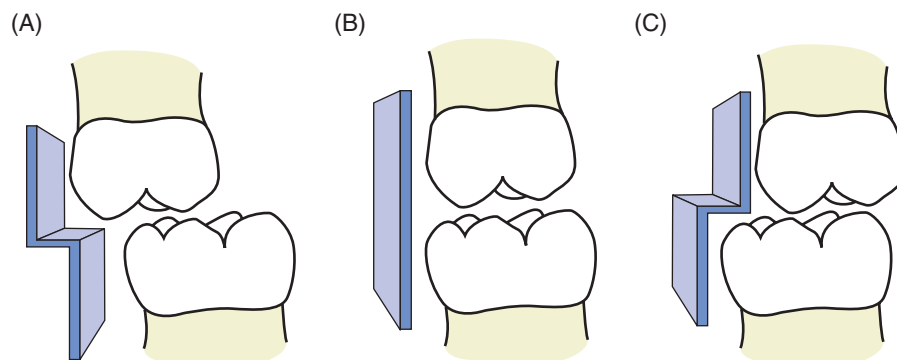


Figure 1.4.11: Distal terminal plane in determining primary occlusion. (A) mesial and (B) flush steps predict class I, (C) distal step predicts class II, extreme mesial step predicts class III.

### Take-Home Hints

- As seen in this case, the age group that is most vulnerable to sports-related injuries is children between the ages of 7 and 11 (Tesini and Soporowski 2000).
- According Lyznicki et al. (2004) the clinician's role in bullying involves identifying the children at risk, counseling families, screening for psychiatric comorbidities, and providing preventive surgeries.
- The dental arches go through five phases of development as the bony structures mature to accommodate the permanent teeth:
  - Phase one* is characterized by the eruption of the permanent first molars;
  - Phase two* is marked by the eruption of the permanent anterior teeth;
  - Phase three* consists of the eruption of the premolars anterior to the permanent molars;
  - Phase four* occurs when the permanent canines erupt; and finally,
  - Phase five* occurs when the third molars erupt (Fehrenbach and Popowics 2016).
- Flush and mesial steps in primary occlusal findings predict Class I and distal steps predict Class II in the permanent dentition. An excessive mesial step predicts Class III malocclusion (Figure 1.4.11).
- Hygienists can reduce student bullying and its effects by collaborating with the patient's parents, school officials, and primary care physician on implementing appropriate responsive services and support.

## Self-Study Questions

**1. In which phase of arch development do the permanent canines erupt between lateral incisors and first premolars?**

**2. The following are risk factors for malocclusion EXCEPT one. Which is the EXCEPTION?**

- A. Premature or late exfoliation of deciduous teeth**
- B. Teeth that erupt according to their normal sequence**
- C. Discrepancies between jaw and tooth size**
- D. Mandibular movements that are uneven, painful or that make sounds**

**E. Existence of parafunctional habits such as grinding and clenching**

**3. Which step relationship predicts Class II malocclusion in the permanent dentition?**

**4. The use of which radiographs enable monitoring of tooth eruption sequence and arch development?**

**5. What are benefits of early identification of malocclusion in children?**

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## Additional Resources

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## Answers to Self-Study Questions

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1. Phase four.
2. B: Teeth that erupt according to their normal sequence.
3. Distal step predicts Class II in the permanent dentition.
4. Panoramic radiographs of the mixed dentition monitor proper growth and development of the jaws and teeth by establishing dental age and identifying eruption problems and dental anomalies/pathologies.
5. The benefits of early identification of malocclusion in children are physical and psychosocial including an increased Oral Health-Related Quality of Life (OHRQoL).

# Case 5

## Gingival Examination

### Introduction

The gingival exam is an aspect of the head and neck regional examination, which is a critical component of oral health care. This section will describe the gingival structures, their normal clinical appearances, disease processes that may involve the gingiva, the components of a gingival exam, and present a patient with a disease involving the gingiva.

The patient in this case has lichen planus (LP). LP is an immune-mediated disorder that can manifest in the oral cavity. Patients may be asymptomatic, have mild to moderate discomfort, or complain of intense pain. This disease has a predilection for middle-aged females, but can be seen in any segment of the population. The clinical findings in the oral cavity may include white striations, white plaques, erythematous erosions, and ulcerations anywhere on the oral soft tissues, with the buccal mucosa and the gingiva being among the most common sites (Neville et al. 2015). The diagnosis is established by combining clinical findings with histopathological examination of biopsied tissue. It is important for the oral health-care practitioner to be familiar with LP as it can clinically mimic several other oral diseases, but requires specific management. Cases of malignant transformation to oral squamous cell carcinoma are documented in the scientific literature, further necessitating knowledge of this disease entity (Cheng et al. 2016).

### CASE STORY

A 32-year-old male presents to a periodontist following referral for periodontal therapy to manage moderate-to-severe chronic periodontitis. The periodontist observes atypical features (see Figures 1.5.1–1.5.3) on the gingiva of the patient.



Figure 1.5.1: Clinical image of the patient from the anterior showing multiple erosions and white striated plaques of the gingiva and accumulation of plaque and calculus.



Figure 1.5.2: Clinical image of the patient from the right side showing multiple erosions and white striated plaques of the gingiva and accumulation of plaque and calculus.

The periodontist referred the patient to an oral and maxillofacial pathologist (OMP) for evaluation of the gingival findings prior to initiating periodontal therapy. The patient presents to the OMP



Figure 1.5.3: Clinical image of the patient from the left side showing multiple erosions and white striated plaques of the gingiva and accumulation of plaque and calculus.

requesting clearance for periodontal therapy and also mentions recent onset of sensitivity to spicy and sour foods.

#### PROBLEM-BASED LEARNING GOALS AND OBJECTIVES

- Describe the normal appearance of the gingiva
- List the diseases that can involve the gingiva
- Describe the components of a gingival exam
- Describe lichen planus
- Understand the importance of timely referrals for patients with LP to the appropriate provider

#### Medical History

Celiac disease, managed by a gluten-free diet.

#### Medications

Denies.

#### Review of Systems

All systems within normal limits.

#### Social History

Ten cigarettes per day for 10 years (five-pack/year smoking history).

#### Dental History

Regular restorative dental work.  
Moderate-to-severe chronic periodontitis.  
Poor oral hygiene.

#### Regional Head and Neck Exam

##### Extraoral Exam

No palpable nodules, asymmetry, or other grossly visible signs of pathology are identified in the head and neck or craniofacial region. The examination is negative for clinically detectable cervical lymphadenopathy.

##### Intraoral Exam

##### Soft Tissue

Multiple erosions on the bilateral facial and buccal aspects of the maxillary and mandibular gingiva ranging from  $0.1 \times 0.1$  cm to  $0.3 \times 0.3$  cm (see Figures 1.5.1–1.5.3).

Multiple white striated plaques on the bilateral facial and buccal aspects of the maxillary and mandibular gingiva ranging from  $0.1 \times 0.1$  cm to  $0.5 \times 1.5$  cm (see Figures 1.5.1–1.5.3).

All other oral mucosal surfaces appear healthy with no visible signs of inflammation, infection, neoplasia, or other pathology.

##### Hard Tissue

Multiple occlusal restorations.

Moderate plaque and calculus accumulation.

#### Examination Findings and Problem List

- Multiple erosions of the gingiva.
- Multiple white striated plaques on the gingiva.
- Sensitivity to spicy and acidic foods.
- Tobacco use.
- Poor oral hygiene.

#### Differential Diagnosis

Based on the clinical examination, patient symptoms and history, the following entities were considered as possible diagnoses:

- LP
- Epithelial dysplasia
- Squamous cell carcinoma

The color and surface texture support any of the three entities mentioned. The long history of tobacco use places the patient at an elevated risk for epithelial dysplasia and squamous cell carcinoma. The generalized involvement (bilaterality, maxillary, and mandibular locations of lesions) favored a diagnosis of oral LP.

Arrival at a definitive diagnosis required a tissue biopsy to be performed.



## Treatment

Written and oral consent were obtained to biopsy the patient's gingiva. A biopsy of the gingiva adjacent to tooth #14 was performed under local anesthetic. Hemostasis was achieved within five minutes by applying local pressure with wet gauze. The specimen was submitted to an oral and maxillofacial pathology service for histopathological review.

## Histopathological Description

The histopathological section (see Figure 1.5.4) showed a stratified squamous epithelial layer exhibiting hyperparakeratosis, saw-toothing of the rete ridges, lymphocytic infiltration, and degeneration of the basal layer. The underlying connective tissue demonstrated a band-like infiltrate of lymphocytic cells in the lamina propria. These features are characteristic of LP.

## Definitive Diagnosis

Lichen planus.

## Clinical Management

The patient was contacted and the diagnosis was disclosed and explained. A prescription was written for a 30-g tube 0.05% fluocinonide gel (topical corticosteroid) to be applied to the affected areas three times per day. Smoking cessation counseling was provided. A follow-up appointment was made to evaluate therapy and observe disease activity at four weeks.

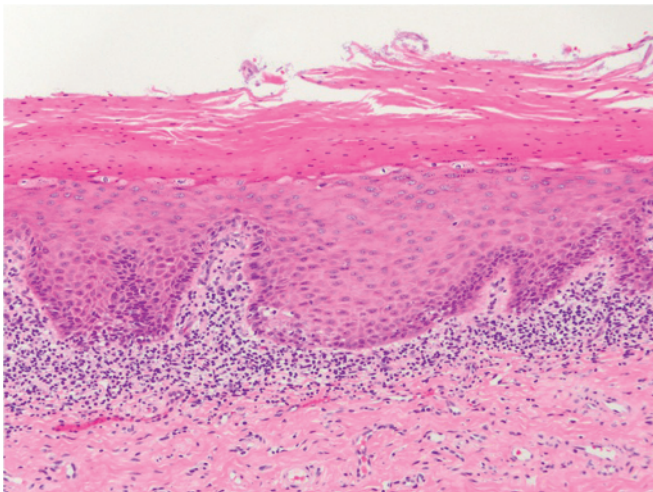


Figure 1.5.4: Histopathology of biopsied specimen demonstrating hyperparakeratosis, lymphocytic infiltration of the epithelium, degeneration of the basal layer, saw-toothing of the rete ridges and a band-like infiltrate of lymphocytes.

## Discussion

The gingiva is defined as the portion of the oral mucosa that covers the alveolar bone and the cervical aspects of the teeth. It is divided into three distinct anatomic regions: the marginal gingiva, the attached gingiva, and the interdental gingiva. The marginal gingiva is the terminal end of soft tissue at the tooth and forms a collar around it. The terminating position of the marginal gingiva is at the cemento-enamel junction of the tooth in health. The gingival sulcus is the shallow space between the tooth and the marginal gingiva. The attached gingiva extends from the marginal gingiva to the mucogingival junction and is tightly bound to the underlying alveolar bone. The interdental gingiva is comprised of the mucosa occupying the embrasure space between adjacent teeth (Newman et al. 2012).

Healthy gingiva is of a firm consistency upon palpation. The surface texture of the attached gingiva bears multiple small depressions. This characteristic is termed stippling and is similar to the peel of an orange. Stippling is best viewed by drying the gingiva (Newman et al. 2012). A "salmon-pink color" has often been included in the classical description of a healthy gingiva. In actuality the color of the gingiva in health can vary significantly from individual to individual. This variation depends on several factors. For instance, patients with darker skin often have a darker hue to their gingiva, or may have areas of scattered hyperpigmentation, known as physiologic or racial pigmentation (Neville et al. 2015).

The list of diseases that may involve the gingiva is extensive. The general categories include reactive, inflammatory and immune-mediated, infectious, nutritional and metabolic, and neoplastic (benign and malignant). Please see Table 1.5.1 for examples of these categories of disorders.

Many gingival diseases include a degree of inflammation. Inflammation of the gingiva is termed gingivitis. It is characterized by bright erythema (redness), swelling and loss of stippling. The swelling may be edematous or fibrotic. Inflamed gingival tissues may bleed with minimal provocation (e.g., palpation, brushing). Hence, in disease the clinical appearance of the gingival tissues change from those associated with health. Forms of gingivitis include plaque-related, necrotizing ulcerative gingivitis, medication-influenced, allergic, specific infection related, and dermatosis-related gingivitis. There are also several systemic factors that are associated with gingivitis, including hormonal changes, stress, poor nutrition, and substance abuse (Neville et al. 2015).

Examination of the gingiva should be performed in a systematic, thorough, and repeatable manner. Attention

**Table 1.5.1:** Examples of disease processes involving the gingiva.

Category	Disease	Etiology	Clinical Features	Clinical Management
Reactive	Frictional hyperkeratosis	Repetitive mechanical habit	Homogenous white patch	<ul style="list-style-type: none"> <li>Determine origin</li> <li>Clinical observation</li> <li>Determine origin</li> <li>Clinical observation</li> </ul>
	Hematoma	Trauma and subsequent extravasation of blood under mucosa	Dark red to purple, fluctuant nodule	
Inflammatory and Immune-Mediated	Plaque –induced gingivitis	<ul style="list-style-type: none"> <li>Local reaction to presence of bacteria in intimate association with the tissues</li> <li>Process influenced by several factors including, but not limited to hormonal levels, medications and local factors such as crowding of the dentition.</li> </ul>	Erythematous, swollen tissue with absence of stippling	<ul style="list-style-type: none"> <li>Oral hygiene instruction</li> <li>Plaque removal</li> <li>Addressing of local mechanical factors (e.g. orthodontics for dental crowding)</li> </ul>
	Pyogenic Granuloma	Local reaction to accumulation of plaque and calculus	Pedunculated or sessile, nodule; color may be that of mucosa or more erythematous with or without ulceration	<ul style="list-style-type: none"> <li>Excisional biopsy</li> </ul>
	Peripheral Ossifying Fibroma	Local reaction to accumulation of plaque and calculus	Pedunculated or sessile, nodule; color may be that of mucosa or more erythematous with or without ulceration	<ul style="list-style-type: none"> <li>Excisional biopsy</li> </ul>
	Peripheral Giant Cell Granuloma	Local reaction to accumulation of plaque and calculus	Pedunculated or sessile, nodule; color may be that of mucosa or more erythematous with or without ulceration and occasionally exhibit a purple hue	<ul style="list-style-type: none"> <li>Excisional biopsy</li> </ul>
	Fibroma	Trauma	Pedunculated or sessile, nodule; color may be that of mucosa, paler or more erythematous with or without ulceration	
Lichen Planus		<ul style="list-style-type: none"> <li>Unknown</li> <li>Primarily mediated by T lymphocytes</li> </ul>	White striations, erythema, erosions and ulcerations	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis</li> <li>Multiple therapies are available, topical cortical steroids being the most common</li> </ul>
	Mucous Membrane Pemphigoid	Autoantibodies directed at components of the basement membrane-epithelial junction	Erythema, erosions and ulcerations with occasional identification of bullae	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis (often direct immunofluorescence studies are required)</li> <li>Multiple therapies are available, cortical steroids are often utilized</li> </ul>



Infectious	Primary Herpetic Gingivostomatitis	Infection by herpes simplex virus	Erythema, edema, absence of stippling, purulence from the gingival sulcus and occasional vesicle formation (frequently accompanied by malaise, fever and lymphadenopathy)	<ul style="list-style-type: none"> <li>Establish diagnosis (e.g., mucosal smear, serum titers, etc...)</li> <li>Antiviral medications and supportive care including hydration, rest and analgesics</li> </ul>
Nutritional	Ascorbic Gingivitis (Scurvy)	Vitamin C deficiency	Swelling, ulceration and hemorrhage	<ul style="list-style-type: none"> <li>Establish diagnosis</li> <li>Administration of Vitamin C and nutritional counseling</li> </ul>
Neoplastic- Benign	Peripheral odontogenic tumors (e.g., peripheral ameloblastoma, peripheral odontoma, peripheral odontogenic fibroma)	Genetic mutations in some cases and unknown etiology in others	Mucosa-colored, smooth surfaced nodule	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis</li> <li>Complete excision</li> </ul>
Neoplastic- Premalignant	Epithelial Dysplasia	Genetic mutations in epithelial cells	Leukoplakia, erythroleukoplakia, erythroplakia	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis</li> <li>Complete excision in most cases</li> </ul>
Neoplastic- Malignant	Squamous Cell Carcinoma	Genetic mutations in epithelial cells	Leukoplakia, erythroleukoplakia, erythroplakia, ulcerations and ulcerative masses	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis</li> <li>Referral to head and neck oncology</li> </ul>
	Lymphoma	Genetic mutations in lymphocytic cells	Mucosa-colored or erythematous broad based mass, often compressible	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis</li> <li>Referral to head and neck oncology</li> </ul>
	Leukemia	Genetic mutations in white blood cells	Generalized enlargement or broad based mass with compressible consistency and a range of color from that of mucosa to erythematous to dark green; may bleed with minimal provocation	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis</li> <li>Referral to head and neck oncology</li> </ul>
	Melanoma	Genetic mutations in melanocytic cells	Darkly pigmented nodule or mass that may exhibit ulceration	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis</li> <li>Referral to head and neck oncology</li> </ul>
	Metastatic Tumor	Genetic mutations in primary tumor	Often an ulcerative mass; great variety of appearance that may fit description of any of the above	<ul style="list-style-type: none"> <li>Biopsy to establish diagnosis</li> <li>Referral to head and neck oncology</li> </ul>

must be paid to any changes in color, surface architecture, size, position of the gingiva on the teeth, or any other abnormality. Please see Table 1.5.2 for a suggested stepwise methodology in performing a gingival exam.

Reviewing Figures 1.5.1–1.5.3 and applying the steps of the gingival exam in Table 1.5.2 to the patient in this case, one can rapidly identify features in this patient not associated with gingival health. These would include the atypical white striations, deeply erythematous areas of erosion, and an absence of stippling. Furthermore, application of moderate pressure through digital palpation would induce bleeding. Once these features are noted, the clinician would formulate a differential diagnosis and recommend biopsy. As noted above, the definitive diagnosis was LP based on the clinical and histopathological data.

Oral LP has an estimated worldwide prevalence of 2.2% (Cheng et al. 2016) with a 3:2 female-to-male ratio with most cases occurring in middle-aged patients. The disease is considered to be an immune disorder with damage to the tissues primarily mediated by T lymphocytes (Kurago 2016).

The disease can take many forms in the oral cavity including white striations, white plaques, erythematous erosions, and ulcerations. Any surface of the oral mucosa may be involved in the disease process. Common locations include the buccal mucosa, gingiva, lateral tongue, palate, and labial mucosa and vermillion (Neville et al. 2015). Patients occasionally present with oral and cutaneous lesions. While LP may be completely asymptomatic, common symptoms include mild sensitivity to spicy or acidic foods. Certain patients may even report intense pain with minimal tissue manipulation.

Several diseases may have a similar clinical appearance to oral LP. Diseases that mimic oral LP include plaque-induced gingivitis, lupus, epithelial dysplasia, mucous membrane pemphigoid, and pemphigus vulgaris (Cheng et al. 2016). A definitive diagnosis is made based on histopathological review of biopsied material.

Oral LP is an immune-mediated disorder, therefore plaque control and attention to oral hygiene alone is not sufficient to manage the disease process. Several treatments are available, the most common of which

**Table 1.5.2:** Suggested stepwise methodology for performing a gingival exam.

Step	Instruction
1	Retract the right buccal mucosa to allow visualization of the facial aspect of the upper right quadrant (URQ)
2	Beginning from the distal aspect of the most distal tooth, run the tip of your second digit along the surface of the gingiva applying moderate pressure
3	Dry the gingiva of the facial aspect of the upper right quadrant (URQ) with an air syringe or cotton tip applicator
4	Beginning from the distal aspect of the most distal tooth visualize the facial gingival surface; follow the above steps for the facial aspect of the upper left quadrant (ULQ)
5	Complete the above steps for the palatal surface of the ULQ and URQ, using indirect vision with a dental mirror as necessary; complete the above steps for the mandibular arch, retracting the tongue as necessary
6	Write a detailed description of any abnormalities in the patient chart and depict on a diagram if available

include cortical steroid derivatives. While medications can help to manage the disease, and some patients experience spontaneous resolution, there is no known cure for oral LP.

There are several documented cases in the scientific literature of oral LP transforming to oral squamous cell carcinoma. Therefore it is imperative that oral health-care providers become familiar with the clinical findings of this disease in order to make appropriate referrals to ensure adequate patient management and follow-up.

**Take-Home Hints**

- 1. Develop a systematic approach to examining the gingiva.
- 2. The list of diseases that can involve the gingiva is extensive and ranges from minimally symptomatic to life threatening.
- 3. LP has several clinical manifestations and may appear similar to other oral diseases.
- 4. Patients with LP must receive timely referrals to ensure appropriate clinical management of disease and long-term follow-up.

## Self-Study Questions

1. Healthy gingiva has a firm texture upon palpation and demonstrates stippling. Healthy gingiva is always characterized by a salmon-pink color.
  - A. Both statements are true
  - B. Both statements are false
  - C. The first statement is true and the second statement is false
  - D. The first statement is false and the second statement is true
2. Which of the following are recommended practices when examining the gingiva?
  - A. Retraction of soft tissues (e.g. buccal mucosa and tongue) to allow visualization
  - B. Air-drying the tissues prior to visual examination
  - C. Utilizing a mirror for indirect vision as necessary
  - D. Noting all abnormalities in the patient chart
  - E. All the above
3. Which of the following are locations in the oral cavity where lichen planus may occur?
  - A. Buccal mucosa
  - B. Lateral tongue
  - C. Labial mucosa
  - D. Palate
  - E. All of the above
4. What type of cancer occurs in cases where oral lichen planus transforms into a malignancy?
  - A. Basal cell carcinoma
  - B. Oral squamous cell carcinoma
  - C. Adenoidcystic carcinoma
  - D. Mucoepidermoid carcinoma
  - E. Osteosarcoma
5. Which cells are most likely responsible for the damage to the mucosa in oral lichen planus?
  - A. Osteocytes
  - B. T lymphocytes
  - C. Neutrophils
  - D. Eosinophils
  - E. Langerhans cells
6. Oral lichen planus most often occurs in middle-aged adults. This statement is:
  - A. True
  - B. False
7. Clinical findings in oral LP may include:
  - A. White plaques
  - B. White reticulations
  - C. Erosions
  - D. Ulcerations
  - E. All of the above

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## Answers to Self-Study Questions

- |      |      |
|------|------|
| 1. C | 5. B |
| 2. E | 6. A |
| 3. E | 7. E |
| 4. B |      |

# Case 6

## Periodontal Exam

### Introduction

The periodontium comprises the gingiva, periodontal ligament, alveolar bone, and the cementum. It provides support to the teeth, keeping them anchored in the maxilla and mandible. While the stability of the teeth is directly affected by the health of the periodontium, it may be involved with several other diseases processes. There are at least two types of relationships the periodontium may have with other diseases: diseases that directly involve the periodontium and those diseases that are indirectly impacted by its relative state of health or disease. Examples of the former include the patient presented in this case, and other infectious and neoplastic diseases. An example of the latter is diabetes mellitus (DM). The periodontal exam is therefore a critical aspect of oral health care as it functions to assess the health of the periodontal structures that are related not only to the health of the teeth in isolation, but to overall health.

In this section we will review the basic structures of the periodontium, discuss the components of the periodontal exam and review a case of a patient with Langerhans cell histiocytosis (LCH). LCH is characterized by a proliferation of histiocyte-like cells that infiltrate and destroy various tissues of the body including the hard and soft tissues of the oral and maxillofacial region (Badalian-Very et al. 2011; Neville et al. 2015). Disease may be solitary or multifocal involving several anatomic sites. LCH occurs in a wide range of patients, but has a predilection for the pediatric population (Neville et al. 2015). The diagnosis of LCH is confirmed by histopathological review of biopsied tissue. Treatment of this disease ranges from simple curettage to radiation and chemotherapy. The prognosis depends on the extent of involvement and the specific tissues affected by disease (Badalian-Very et al. 2011; Neville et al. 2015).

### CASE STORY

A 42-year-old male presents to the dental clinic for evaluation of vague pain and loose teeth. Teeth #17, #18, and #19 were extracted at a different dental office two weeks prior due to severe mobility.

### PROBLEM-BASED LEARNING GOALS AND OBJECTIVES

- List the components of the periodontium
- Describe the importance of the periodontium in terms of oral and overall health
- List the components of the periodontal exam
- Describe chronic and aggressive periodontitis and their variants
- Be able to describe the clinical aspects of LCH
- Understand the importance of timely referrals of patients with LCH to the appropriate healthcare provider

### Medical History

Hypertension.

### Medications

Hydrochlorothiazide 25 mg.

### Review of Systems

All systems within normal limits.

- Vital Signs
  - Blood pressure: 126/88 mmHg
  - Respiration: 16 breaths/min
  - Pulse: 80 beats/min

**Social History**

Denies.

**Dental History**

Regular dental recall.

Restorative treatment.

Maxillary third molars (#1 and #16) extracted 22 years prior.

Extraction of teeth #17, #18, and #19 two weeks prior due to severe mobility.

**Head and Neck Examination****Extraoral Exam**

No palpable nodules, asymmetry, or other grossly visible signs of pathology are identified in the head and neck or craniofacial region. The examination is negative for clinically detectable cervical lymphadenopathy.

**Intraoral Exam****Soft Tissue**

Gingival tissues of teeth #s 2–6, 20, and #s 29–32 demonstrate marked erythema and enlargement.

Extraction sockets of teeth #s 17–19 demonstrate marked erythema and redundant soft tissue.

Generalized gingival recession.

All other oral mucosal surfaces appear healthy with no visible signs of inflammation, infection, neoplasia, or other pathology.

**Hard Tissue**

See Figure 1.6.1 panoramic radiograph and Figure 1.6.2 Periodontal Chart.

Minimal plaque and calculus accumulation.

**Radiographic Findings and Problem List**

- Well-circumscribed radiolucency in the left posterior mandible extending from the ascending ramus to tooth #20 and involving the inferior alveolar nerve canal.
- Well-circumscribed radiolucency in the right posterior mandible extending from the apices of tooth #32 to the interproximal bone between teeth #28 and #29.

**Clinical Impressions**

1. Multiple, large bony defects of this type can often be identified in certain populations including adults with advanced chronic severe periodontitis, young adults with a history of aggressive periodontitis, and patients with syndromes predisposing them to rapid periodontal bone such as Down or Papillon-Lefevre syndrome. This pattern of bone loss, in a patient of this age and health status is uncommon. Furthermore, the loss of attachment pattern and the patient age of do not fit well for either variant of aggressive periodontitis or chronic periodontitis. The differential diagnosis would include both infectious and neoplastic processes. The initial examination should focus on identifying any source of pulpal necrosis of the involved teeth that could be responsible for the defect, such as a fractured tooth or gross carious lesion. Once a pulpal etiology has been ruled out, the remaining entities on the differential diagnosis may include aggressive periodontitis, a benign neoplastic process such as ameloblastoma, and a malignant neoplastic process such as lymphoma. A biopsy is appropriate to arrive at a definitive diagnosis in this clinical scenario.



Figure 1.6.1: Panoramic radiograph demonstrating multiple large, unilocular radiolucencies. *Source:* White et al. (2009).



## CASE 6 PERIODONTAL EXAM

[illegible]

Figure 1.6.2: Periodontal charting.

## Treatment Plan

- Referral to oral and maxillofacial surgery for an incisional biopsy of the tissue involved with the radiolucencies.

## Discussion

The gingiva, periodontal ligament, cementum, and alveolar bone are the four components that comprise the periodontium. These components work together providing structural support to the dentition. Assessment of periodontal health depends on the periodontal exam. This exam includes four parts: the medical history, the dental history, radiographic exam, and clinical exam (Newman et al. 2012). The medical history may reveal critical information related to periodontal health. For instance, DM has been strongly correlated with periodontal health in the scientific literature (Chapple et al. 2013). Identification of a history of DM is likely to impact the periodontal status of the patient. The dental history is important for determining the patient's past and ongoing treatment, current oral hygiene regimen, and general attitude toward oral health (Newman et al. 2012). Following the medical and dental history, a radiographic exam is usually required. For details concerning the radiographic exam, please see Case 3 of this chapter, Radiographic Examination.

With the medical and dental history obtained and radiographic studies completed, the clinical examination of the periodontium can commence. This exam consists of several steps. As emphasized thus far in the text, deciding on a systematic, repeatable method for performing this task is foundational. Critical elements of any methodology should contain at least the following steps: assessment of mobility, sensitivity to percussion, plaque, and calculus accumulation, a gingival examination, inspection of all dental restorations, assessment of periodontal pocketing and furcation involvement, and detailed notation of all findings. Please see Table 1.6.1 for a suggested methodology.

Periodontal attachment loss is most commonly related to chronic periodontitis. The American Academy of Periodontology (AAP) classifies slight to moderate loss of periodontal support as periodontal pockets up to 6 mm and clinical attachment loss of up to 4 mm. Advanced loss of periodontal support is classified as pocketing greater 6 mm and clinical attachment loss greater than 4 mm (American Academy of Periodontology 2000a). While loss of periodontal

**Table 1.6.1:** Periodontal examination: a suggested methodology.

Step Number	Procedure	Additional Information
1	Study the mobility of each tooth placing a fingertip on the lingual/palatal surface and the blunt end of an explorer on the buccal/facial surface	Mobility Grading: <ul style="list-style-type: none"> <li>• Normal</li> <li>• Grade I: Slight</li> <li>• Grade II: Moderate</li> <li>• Grade III: Severe with displacement in the horizontal and vertical planes</li> </ul>
2	Sensitivity to percussion	Test any teeth reported to be symptomatic by the patient for sensitivity to percussion by gentle tapping with the blunt end of a dental explorer
3	Inspection of existing dental restorations	Identification of defective dental restorations that may negatively impact the health of the periodontium (e.g., restorations with overhanging margins, over-contoured crowns)
4	Assessment of plaque and calculus	Utilization of one of several indices
5	Gingival exam	Please see Chapter 1 Case 5: Gingival Exam for a detailed description of this component of the periodontal exam.
6	Assessment of periodontal pocketing	Probing of all surfaces of the teeth with notation of fluids expressed including blood and purulence; areas of pocketing may be indicated by areas of bone loss seen on radiographs
7	Assessment of furcation involvement on posterior teeth	A Nabers probe is used to assess furcation involvement of posterior teeth that demonstrate pocketing on probing; classification is based on one of several grading systems
8	Charting of all the above findings	Charting is typically entered simultaneously by an assistant as the clinician performs the exam

Source: Adapted from *Carranzas Clinical Periodontology*, 11th Edition and "Parameter on Comprehensive Periodontal Examination," American Academy of Periodontology.



support is most often mediated by chronic periodontitis, aggressive periodontitis (AP), although less common, can result in similar clinical outcomes. AP progresses more rapidly than the chronic variant and generally occurs in patients who are healthy and have a level of plaque and calculus that do not seem to correspond to the level of attachment loss. Two variants of AP exist; a localized variant, commonly occurring around adolescence, and a generalized variant with a predilection for those under 30 years of age. Localized AP typically affects the permanent incisors and first molars; generalized AP involves three permanent teeth besides the incisors and first molars (American Academy of Periodontology 2000b).

A cursory review of the panoramic radiograph and periodontal charting of the patient in this case may appear as some form of severe periodontitis. However, a closer study of this patient reveals a pattern that does not correspond to either chronic or aggressive periodontitis. The severe loss of attachment is isolated to the posterior lower right and left quadrants. The loss of attachment would be more generalized to fit a diagnosis of generalized AP or chronic periodontitis. A diagnosis of localized AP is questionable as the central incisors are not involved and the patient is outside the age group where this disease is typically identified. It is critical to consider other disease processes when a clinical pattern does not fit into the diagnostic parameters of the common variants of periodontitis. These considerations should prompt the clinician to refer the patient to an oral and maxillofacial surgeon for an incisional biopsy. The definitive diagnosis in this case was LCH.

LCH is characterized by a destructive proliferation of histiocyte-like cells (Badalian-Very et al. 2011; Neville et al. 2015). The first designation given to this disease was "histiocytosis X." The term used more commonly today, LCH, points to the phenotypic characteristics shared by the disease and the Langerhans cells of epidermal and mucosal surfaces. In the past it was believed that disease cells originated from the Langerhans cells. Recent research indicates that this may not be the case with the most likely origin of the cells being a myeloid-derived precursor (Badalian-Very et al. 2011).

The presentation of this disease may take several forms. The disease may be solitary, or multifocal involving various anatomic sites including skin, mucosa, bone, lymph nodes, soft tissue, and organs. In the past

the terms Hand-Schuller-Christian disease and Letterer-Siwe disease were used to describe chronic and acute disseminated LCH, respectively. These eponyms have largely been set aside and replaced with a description of the focus of disease and sites of involvement (Neville et al. 2015; Badalian-Very et al. 2011).

LCH is diagnosed in patients over a wide age range. However, over 50% of cases are diagnosed in those younger than 15 years. The disease demonstrates an equal distribution between the sexes (Neville et al. 2015).

LCH is capable of destroying hard tissue and results in radiolucent lesions on radiography. Destruction of tooth-supporting bone can produce a similar radiographic pattern to that seen in severe periodontitis (Neville et al. 2015). It is important to keep LCH on one's differential diagnosis in cases of atypical periodontal bone loss, particularly in pediatric patients. Lesions involving bone may present with symptoms of tenderness or dull pain (Neville et al. 2015). When lesions are diagnosed in the oral soft tissues they often present initially as an ulcerative mass (Neville et al. 2015).

Diagnosis of LCH is based on histopathological review of biopsied specimens coupled with immunohistochemical evaluation (Neville et al. 2015). Treatment depends upon the extent of disease involvement. Mainstays of therapy have included curettage, local steroid injection and radiation for isolated, single focus disease (Neville et al. 2015; Badalian-Very et al. 2011). Disseminated disease is often treated by a combination of systemic steroids and chemotherapeutics (Neville et al. 2015; Badalian-Very et al. 2011). The discovery of the *BRAF*<sup>V600E</sup> mutation in 38–69% of LCH cases has opened the possibility of molecular-targeted therapy (Badalian-Very et al. 2011; Haroche et al. 2013). The prognosis varies from patient to patient and depends upon several factors including age at the time of diagnosis, the degree of dissemination as well as the specific organs involved in the disease process (Neville et al. 2015). Some cases of LCH have exhibited spontaneous resolution, while others will lead to the patient's demise.

It is critical that oral health-care providers become familiar with the presenting signs of LCH as the oral and maxillofacial region is not an uncommon site of involvement. Identification of the disease and a timely referral is likely to have a positive impact on the patient's long-term prognosis.

**Take-Home Hints**

1. The variants of periodontitis follow demographic and clinical parameters.
2. It is critical to consider other disease processes when a clinical pattern does not fit into

diagnostic parameters of the common variants of periodontitis.

3. LCH and other neoplastic processes can mimic periodontitis clinically and radiographically.

**Self-Study Questions**

**1. Which of the following are components of the periodontium?**

- A. Gingiva
- B. Alveolar bone
- C. Periodontal ligament
- D. Cementum
- E. All of the above

**2. In which age group is localized aggressive periodontitis typically identified?**

- A. Elderly adults
- B. Middle-aged adults
- C. Adolescents
- D. Children
- E. None of the above

**3. What is the most likely radiographic presentation of LCH?**

- A. Radiolucency
- B. Radiopacity

**C. Mixed radiolucency-radiopacity**

**D. A and B**

**E. All of the above**

**4. Which of the following therapeutic modalities may be utilized in the treatment of LCH?**

- A. Curettage
- B. Local steroid injection
- C. Radiation
- D. Chemotherapy
- E. All of the above

**5. The radiographic presentation of LCH may appear similar to severe periodontitis. The preceding statement is:**

- A. True
- B. False

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## Answers to Self-Study Questions

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1. E

2. C

3. A

4. E

5. A