Fundamentals of

Periodontal Instrumentation & Advanced Root Instrumentation

Eighth Edition

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Rebecca Sroda
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Wolters Kluwer

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Fundamentals of Periodontal Instrumentation & Advanced Root Instrumentation

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Preface for Course Instructors

Fundamentals of Periodontal Instrumentation & Advanced Root Instrumentation, Eighth Edition is an instructional guide to periodontal instrumentation that takes students from the basic skills—patient positioning, intraoral finger rests, and basic instrumentation—all the way to advanced techniques—assessment of periodontal patients and instrumentation of the root branches of multirooted teeth, root concavities, and furcation areas. The foremost instructional goal of *Fundamentals* is to make it easy for students to learn and faculty to teach instrumentation. The eighth edition retains the features that have made it the market-leading textbook on periodontal instrumentation and adds new features and content organization designed to facilitate learning and teaching.

ONLINE INSTRUCTOR TEACHING RESOURCES

The online Faculty Resource section has a collection of instructional aids for use in teaching instrumentation. These resources are located online at thePoint website (http://thePoint.lww.com/GehrigFundamentals8e).

1. **PowerPoint Slides.** The PowerPoint slides were designed so as to be user-friendly for wide variety of software versions and equipment.
   - The PowerPoint presentations may be customized by saving the slides to your computer hard drive and using the formatting features of your slide presentation software.
   - Special effects, such as progressive disclosure, may be added to the slide presentations using the custom animation features of your slide presentation software. In addition, individual slides may be deleted and new instructor-created slides added to the presentations.
2. **Test Bank.** The test bank questions can be used for quizzes, combined to make up unit tests, or combined to create midterm and final examinations.
3. **Instructor Guide.** The instructor guide includes:
   - Suggestions for leading classroom discussions.
   - A list of phrases that facilitate the teaching of instrumentation.
   - Teaching tips for instruction, as well as, sources for periodontal typodonts.
   - Guidelines for introduction of alternate and advanced techniques.
4. **Module Evaluation Forms.** Evaluation forms for instructor grading are now located online in two formats.
   - Evaluations for Computerized Grading. These forms are designed to allow the instructor to enter grades and comments directly on a computer.
   - Evaluations for Paper Grading. These forms are designed to be printed out and used for "paper and pen" manual grading. Paper forms include evaluation forms for each module.

COn t En t ORGAn iZAt iOn

From an instructional viewpoint, it is important to note that *each major instrument classif cation is addressed in a stand-alone module*—sickle scalers, universal curets, and area-specific curets. Each stand-alone module provides complete step-by-step instruction in the use of an instrument classification. For example, the module on universal curets provides complete instruction on the use of universal curets. This chapter does not rely on the student having studied the previous module on sickle scalers before beginning the universal curet module. This stand-alone module structure means that it is not necessary to cover the instrument modules in any particular order or even to include all of the modules. If sickle scalers, for example, are not part of the school's instrument kit, this module does not need to be included in the course outline.

t EXt BOOK FEAt URES

1. **Module outlines.** Each chapter begins with a module outline that provides an overview of content and makes it easier to locate material within the module. The outline provides the reader with an organizational framework with which to approach new material.
2. **Learning objectives** assist students in recognizing and studying important concepts in each chapter.
3. **Step-by-step format.** The clear, step-by-step self-instructional format allows the learner to work independently—fostering student autonomy and decision-making skills. The learner is free to work at his or her own pace spending more time on a skill that he or she finds difficult and moving on when a skill comes easily. The self-instructional format relieves the instructor from the task of endlessly repeating basic information, and frees him or her to demonstrate instrumentation techniques, observe student practice, and facilitate the process of skill acquisition.
4. **Key terms** are listed at the start of each module. One of the most challenging tasks for any student is learning a whole new dental vocabulary and gaining the confidence to use new terms with accuracy and ease. The key terms list assists students in this task by identifying important terminology and facilitating the study and review of terminology in each instructional module.
5. **Study aids—**boxes, tables, and f ow charts—visually highlight and reinforce important content and permit quick reference during technique practice and at-home review.
6. **Critical thinking activities—**in the *Practical Focus* sections of the book—encourage students to apply concepts to clinical situations, facilitate classroom discussion, and promote the development of student problem-solving skills.
7. **Case-based patient experiences** allow students to apply instrumentation concepts to patient cases.
8. **The glossary of instrumentation terms** provides quick access to instrumentation terminology.
9. **Student self-evaluation checklists** guide practice, promote self-assessment skills, and provide benchmarks for faculty evaluation of skill attainment. Use of the student self-evaluation portion of the evaluation forms should be encouraged. The self-evaluation process helps students to develop the ability to assess their own level of competence rather than relying on instructor confirmation of skill attainment.

ONLINE CONTENT

In addition to the Student and Instructor Resources, the following resources are located online at thePoint website (**http://thePoint.lww.com/GehrigFundamentals8e**).

- 1B. Getting Ready for Instrumentation: Mathematical Principles & Anatomical Descriptors
- 20B. Instrumentation of Dental Implants
- 21B. Alternate Clock Positions
- 26B. Cosmetic Polishing Procedures
- 27B. Set-Up of Hu-Friedy/EMS Air Flow Polishing Devices

I appreciate the enthusiastic comments and suggestions from educators and students about previous editions of *Fundamentals,* and welcome continued input. Mastering the psychomotor skill of periodontal instrumentation is a very challenging process. It is my sincere hope that this textbook will help students to acquire the psychomotor skills that—combined with clinical experience—will lead to excellence in periodontal instrumentation.

Jill S. Gehrig, RDH, MA

Acknowledgments

It is gratifying to be members of a profession that includes so many individuals who strive for excellence in teaching. We are most grateful to all of the outstanding educators who shared their comments and suggestions for improving this edition. We thank all who generously gave their time, ideas, and resources, and gratefully acknowledge the special contributions of the following individuals:

- **Charles D. Whitehead** and **Holly R. Fischer**, MFA, the highly skilled medical illustrators, who created all the wonderful illustrations for the book.
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Jill S. Gehrig, Rebecca Sroda, and Darlene Saccuzzo

Contents

1

Ergonomics and Periodontal Instrumentation

Module Overview

This module introduces the principles of positioning for periodontal instrumentation. Correct positioning techniques help to (1) prevent clinician discomfort and injury, (2) permit a clear view of the tooth being worked on, (3) allow easy access to the teeth during instrumentation, and (4) facilitate ef cient treatment of the patient. **Prior to beginning this module, readers should review the online resource:** Getting Ready for Instrumentation: Mathematical Principles and Anatomical Descriptors.

Module Outline

Access the online module, Getting Ready for Instrumentation: Mathematical Principles and Anatomical Descriptors.
This module can be viewed at http://thepoint.lww.com/GehrigFundamentals8e

Key Terms

ergonomics
Musculoskeletal disorder
Posture
Neutral posture
Static posture
Force
Repetitive task
Supine position
Semi-supine position
Chin-up position
Chin-down position
Coaxial illumination sources
dental headlights
Magnification loupes
Working distance
Angle of declination
depth of field
Field of view
Blind zone

Learning Objectives

- define the term ergonomics and discuss how ergonomic principles are helpful in the practice of dental hygiene.
- define the term musculoskeletal disorder (MSd) and discuss the significance of MSds in the practice of dental hygiene.
- Name four ergonomic hazards for dental hygienists.
- develop an understanding and appreciation for ergonomic guidelines to minimize the exposure of dental hygienists to musculoskeletal stress.
- Identify musculoskeletal disorders commonly experienced by dental health professionals, their causes and prevention.
- discuss and demonstrate the elements of neutral seated posture for the clinician.
- demonstrate correct patient position relative to the clinician and positioning of dental equipment so that it enhances neutral clinician posture.
- State the reason why it is important that the top of the patient's head is even with top edge of the chair headrest. demonstrate how to correctly position a short individual and a child in the dental chair so that (1) the patient is comfortable and (2) the clinician has good vision and access to the oral cavity.
- In the preclinical or clinical setting, self-evaluate to identify the use of incorrect ergonomic principles and demonstrate how to correct the problem(s).

Section 1
Ergonomic Risk Factors Associated with Periodontal Instrumentation

WHAT IS ERGONOMICS AND WHY SHOULD HYGIENISTS CARE?

1. Ergonomics is an applied science concerned with the 'fit' between people and their technological tools and environments (1).
   - **A.** In application, ergonomics is a discipline focused on making products and tasks comfortable and efficient for the user.
     1. A primary ergonomic principle is that equipment—such as computer keyboards and workstations—should be designed to fit the user instead of forcing the user to fit the equipment.
     2. Ergonomics is the science of making things efficient. Efficiency is quite simply making something easier to do.
   - **B. Poor Ergonomic Working Conditions and Working Practices.** When the fit between an individual and his or her tools and working environment is less than optimal studies show that worker comfort, productivity, and workplace safety all suffer (1). For dental hygienists the work environment includes the dental office layout, dental equipment, and instruments.
2. **Musculoskeletal Stresses and the Dental Professional.** The dental literature indicates that both dentists and hygienists are exposed to ergonomic risk factors that often lead to discomfort, pain, and even disability.
   - **A.** A musculoskeletal disorder **(MSD)** is a condition where parts of the musculoskeletal system—muscles, tendons, nerves—are injured over time.
     1. MSDs occur when too much stress is exerted on a body part resulting in pain. When a body part is overused repeatedly the constant stress causes damage.
     2. Almost all occupations require workers to use their arms and hands. Therefore, most MSDs affect the hands, wrists, elbows, neck, and shoulders.
   - **B. Prevalence of Musculoskeletal Problems in Dental Professionals**
     1. Many studies have investigated the prevalence of MSDs among dental professionals. A systemic review on this topic found that the prevalence of MSDs ranged as high as 64% to 93% (2).
     2. Despite this high prevalence, there is a lack of evidence regarding the efficacy of preventive measure for MSDs for the dental hygiene profession (3). A complete understanding of the progression of MSDs in dental hygienists is still far from being realized, due to the lack of longitudinal studies and standardized research techniques (3–5).
   - **C. Causes of Musculoskeletal Pain in Dental Professionals**
     1. The literature indicates that the causes of MSDs among periodontists and dental hygienists include excessive use of small hand muscles, forceful repetitive motions while maintaining muscles in same position during application of force, tight grips, and a fixed work position (maintaining the body in one position for extended periods) (2–13).
     2. The result is injury to the muscles, nerves, and tendon sheaths of the back, shoulders, neck, arms, elbows, wrists, and hands that can cause loss of strength, impairment of motor control, tingling, numbness, or pain.

3. Given the high incidence of musculoskeletal pain, it is important for clinicians to understand the causes of MSDs and to take actions to prevent them.

D. Ergonomic Guidelines in Dentistry

1. It is important that dental hygiene students complete instructional modules on ergonomic principles during their education and training (3,5).
2. Research shows that among practicing hygienists, education on patient and clinician positioning can help reduce the risk of MSDs (4,14,15).
3. It is possible to define ergonomic guidelines to minimize exposure of dental healthcare providers to musculoskeletal stress.

ERGONOMIC HAZARDS FOR DENTAL HYGIENISTS

Four significant ergonomic hazards during periodontal instrumentation are (1) awkward clinician posture, static (fixed) working position, the force placed on a body part, and (4) repetitive movements. Figure 1-1 summarizes these hazards that can lead to musculoskeletal injury.

1. **Awkward Postures.** Posture is a term for the position of various parts of the body during an activity.
   - **A.** For most joints, ideal or neutral posture means that the joint is being used near the middle of its full range of motion.
   - **B.** The further a joint moves away from neutral posture, the more strain is placed on the muscles, tendons, and ligaments around the joint (37). For example, if an individual stands with his or her arms outstretched in front of the body, the elbow and shoulder joints are at their range of motion. If the individual pulls or lifts repeatedly in this outstretched position—versus held close to the body—there is a high risk of injury.
   - **C.** The literature confirms the presence of awkward postures specifically in the neck, shoulders, back, wrist, and hand for dental hygienists. Awkward postures often are adopted due to improper adjustment of the clinician's chair, improper patient position in relation to the clinician, and poor work techniques.
   - **D.** When dental hygienists use their bodies in awkward positions, the muscles must generate higher forces to accomplish a task than when muscles are used in a neutral position (38).
   - **E.** A common awkward posture in dental hygienists is wrist flexion, which results in stress to neurovascular structures and ligaments. Poor wrist positioning can diminish grip strength (39). Figure 1-2 shows the reduction in strength that occurs as the wrist deviates further away from its neutral posture (37).

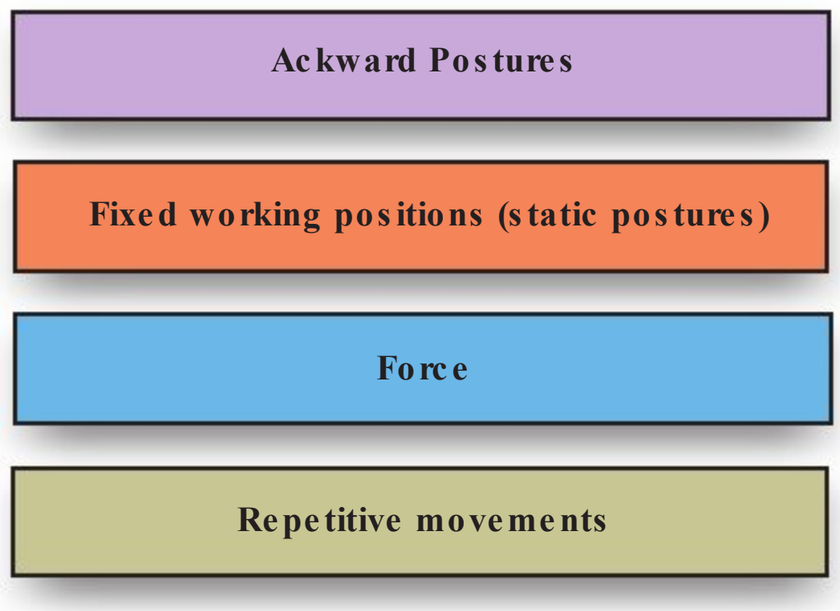


Figure 1-1. Ergonomic Hazards for Dental Hygienists. The dental hygienist has a high risk of musculoskeletal injury when awkward postures, static postures, and repetitive motions are combined with forceful movements (42–45).

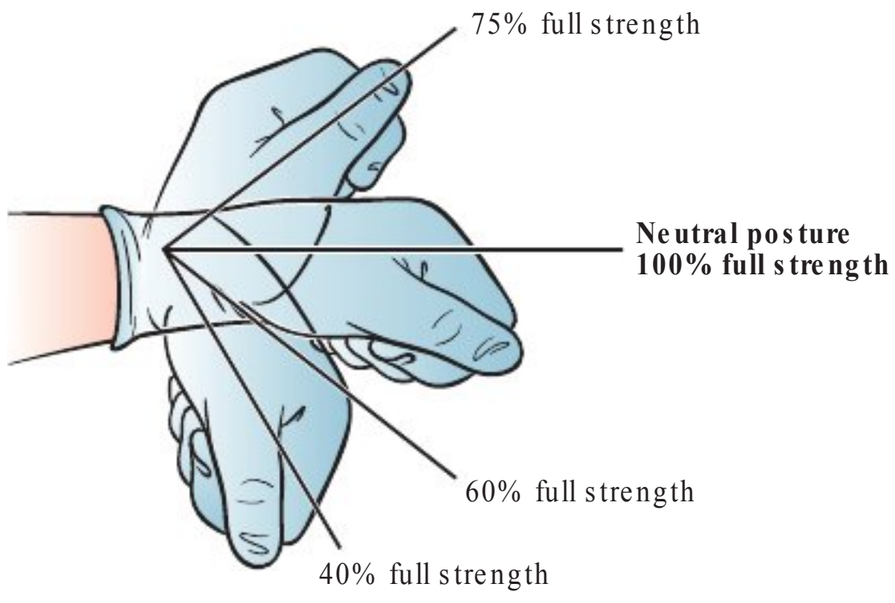


Figure 1-2. Effect of Poor Positioning on Wrist Strength. This illustration shows the reduction in strength that occurs as the wrist deviates away from its neutral position (37).

2. Static Postures

A. A static posture is defined as a fixed working position (maintaining the body in one position for an extended period of time) (1). The human body was not designed to maintain the same body position—prolonged static posture—hour after hour, day after day. In a static position, tensed muscles compress the blood vessels and reduce blood flow decreasing the oxygen and energy supply to the muscles. Waste products from the muscles accumulate causing muscle fatigue and eventually pain (1).

B. Dental clinicians have been observed statically holding postures that require greater than 50% of the body's musculature to contract (37).

C. Static gripping of instrument handles for durations exceeding 20 minutes is common during periodontal instrumentation (40).

3. Force

A. Force refers to the amount of effort created by the muscles, as well as, the amount of pressure placed on a body part.

B. Holding a small instrument for a prolonged period of time is an example of a gripping task requiring high force application. This task is commonly performed with a pinch grip where the fingers are on one side of the object and the thumb is on the other. This form of gripping is undesirable, as it requires a much greater force application than holding an object in the palm of the hand.

C. Researchers suggest that excessive use of a pinch grip is the greatest contributing risk factor in the development of MSDs among dental hygienists (40,41).

4. Repetitive Movements

A. Silverstein (42), in an article in the British Journal of Industrial Medicine, defined a repetitive task as a task that involves the same fundamental movement for more than 50% of the work cycle. Periodontal instrumentation would certainly be categorized as a repetitive task under this definition.

B. The human body was not designed to engage in fine hand movements hour after hour, day after day. The risk of developing an MSD increases when the same or similar parts of the body are used continuously, with few breaks or changes for rest (37).

C. Periodontal instrumentation requires excessive upper-body immobility while the tendons and muscles of the forearms, hands, and fingers overwork. Three critical components to consider with repetitive motions include:

1. Frequency: how many times an action is repeated; such as how many instruments are gripped by one hand throughout the day.
2. Duration: how long an action is performed; such as the length of time sitting in a static posture during the workday.
3. Recovery time: periods of rest that break a repetitive cycle, such as time spent doing muscle stretches between patients.

MUSCULOSKELETAL PROBLEMS COMMON IN DENTAL HYGIENISTS

MSDs commonly experienced by dental hygienists and periodontists are illustrated in Figures 1-3 to 1-10.

Figure 1-3. Thoracic Outlet Syndrome

1. Definition

A painful disorder of the fingers, hand, and/or wrist due to the compression of the brachial nerve plexus and vessels between the neck and shoulder

2. Causes

Tilting the head forward, hunching the shoulders forward, and continuously reaching overhead

3. Symptoms

Numbness, tingling, and/or pain in the fingers, hand, or wrist

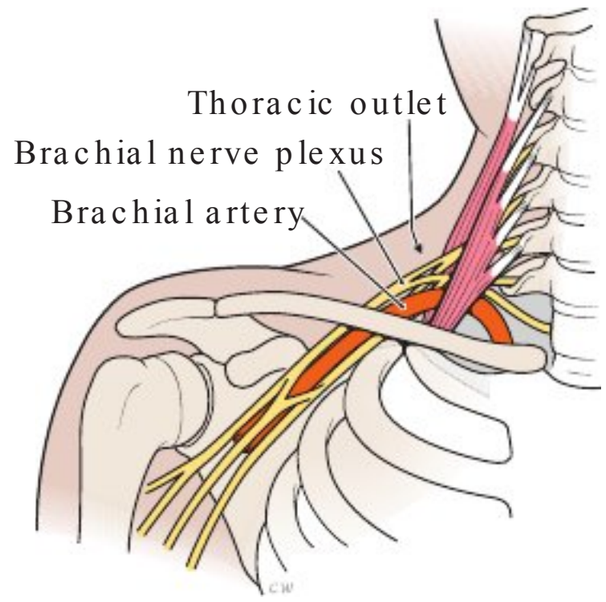


Figure 1-4. Rotator Cuf Tendinitis

1. Definition

A painful inflammation of the muscle tendons in the shoulder region

2. Causes

Holding the elbow above waist level and holding the upper arm away from the body

3 . Symptoms

Severe pain and impaired function of the shoulder joint

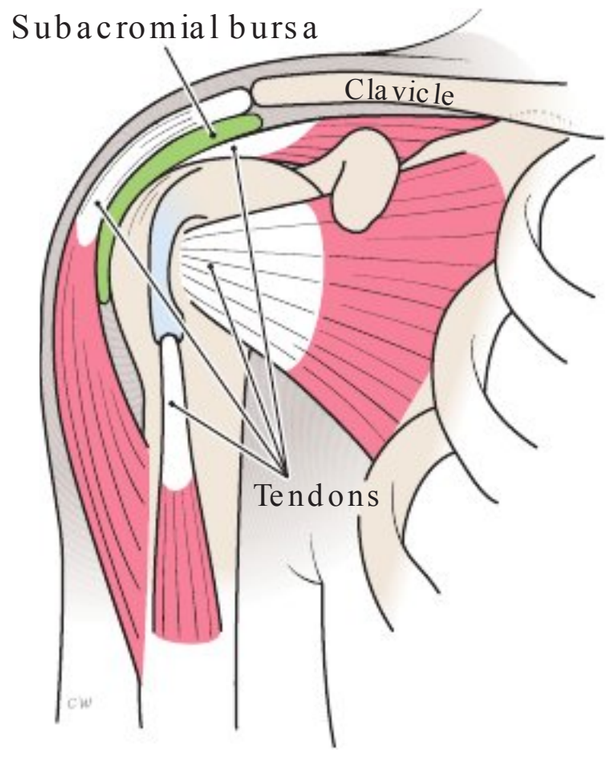


Figure 1-5. Pronator Syndrome

1. Definition

A painful disorder of the wrist and hand caused by compression of the median nerve between the two heads of the pronator teres muscle

2. Causes

Holding the lower arm away from the body

3. Symptoms

Similar to those of carpal tunnel syndrome

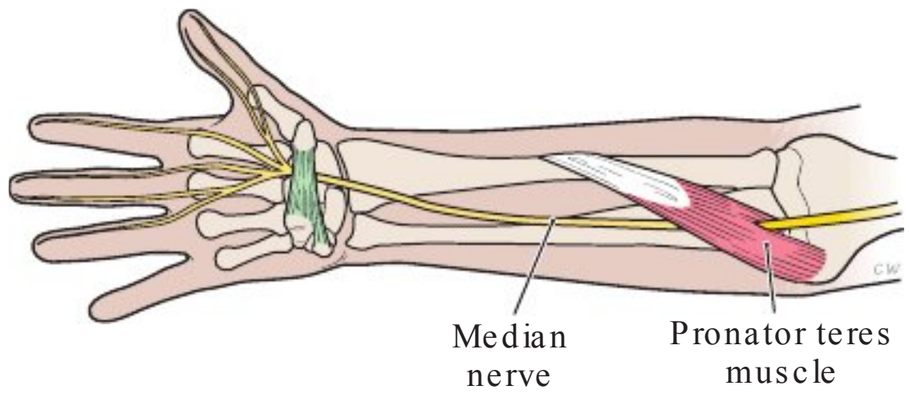


Figure 1-6. **Extensor Wad Strain**

1. Definition

A painful disorder of the fingers due to injury of the extensor muscles of the thumb and fingers

2. Causes

Extending the fingers independently of each other

3. Symptoms

Numbness, pain, and loss of strength in the fingers

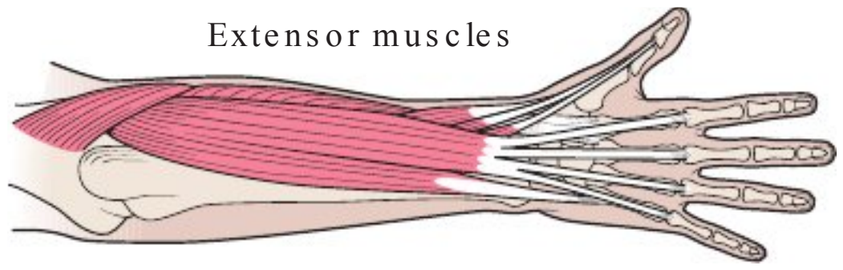


Figure 1-7. **Carpal Tunnel Syndrome (CTS)**

1. Definition

A painful disorder of the wrist and hand caused by compression of the median nerve within the carpal tunnel of the wrist

2. Causes

The nerve fibers of the median nerve originate in the spinal cord in the neck; therefore, poor posture can cause symptoms of CTS. Other causes include repeatedly bending the hand up, down, or from side-to-side at the wrist and continuously pinch-gripping an instrument without resting the muscles

3. Symptoms

Numbness, pain, tingling in the thumb, index, and middle fingers

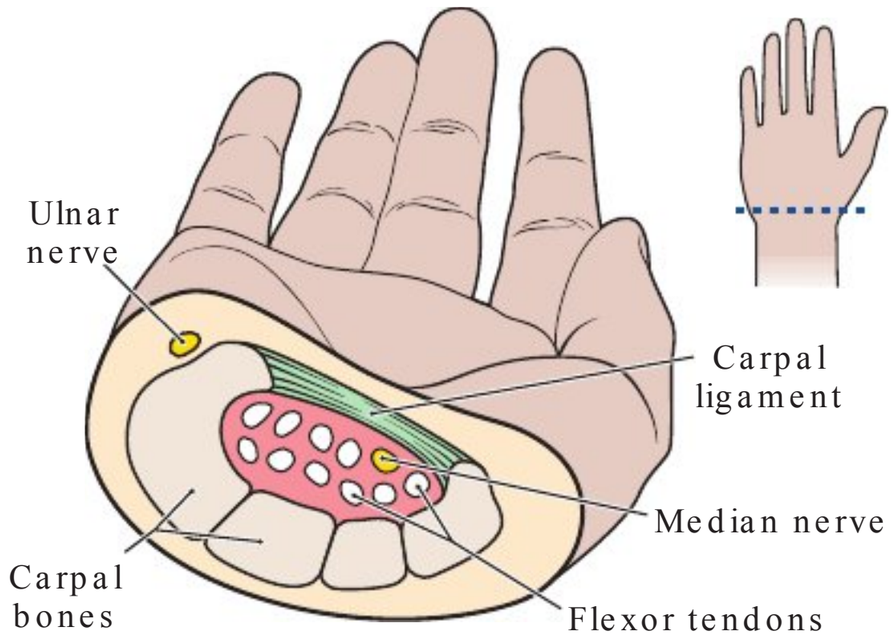


Figure 1-8. **Ulnar Nerve Entrapment**

1. Definition

A painful disorder of the lower arm and wrist caused by compression of the ulnar nerve of the arm as it passes through the wrist

2. Causes

Bending the hand up, down, or from side-to-side at the wrist and holding the little finger a full span away from the hand

3. Symptoms

Numbness, tingling, and/or loss of strength in the lower arm or wrist

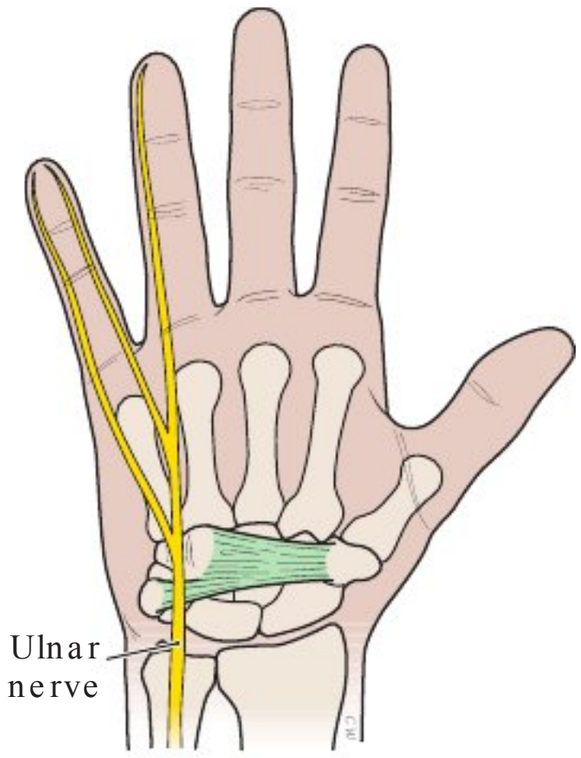


Figure 1-9. **Tenosynovitis**

1. Definition

A painful inflammation of the tendons on the side of the wrist and at the base of the thumb

2. Causes

Hand twisting, forceful gripping, bending the hand back or to the side

3. Symptoms

Pain on the side of the wrist and the base of the thumb; sometimes movement of the wrist yields a crackling noise

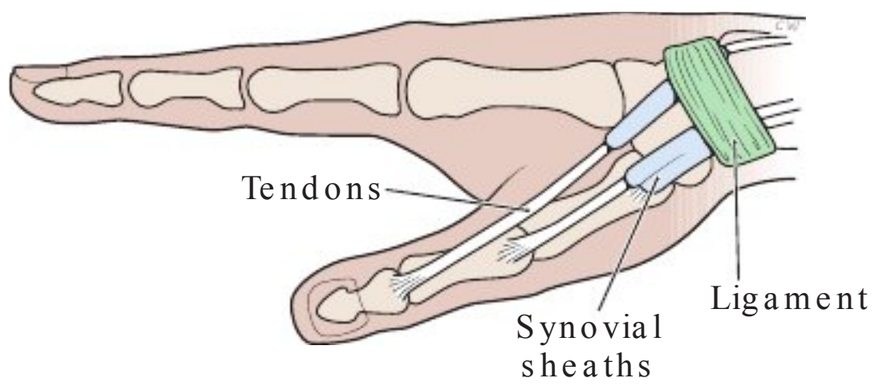


Figure 1-10. **Tendinitis**

1. Definition

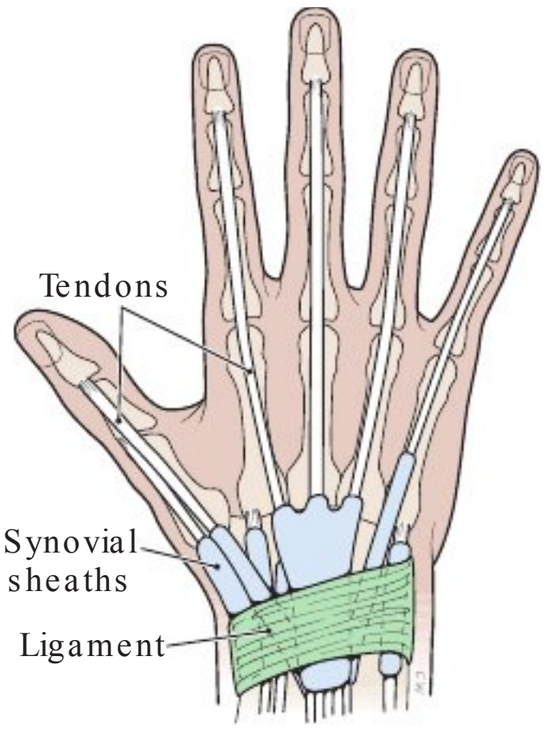
A painful inflammation of the tendons of the wrist resulting from strain

2. Causes

Repeatedly extending the hand up or down at the wrist

3. Symptoms

Pain in the wrist, especially on the outer edges of the hand, rather than through the center of the wrist



Section 2
Foundational Skills for Periodontal Instrumentation

Periodontal instrumentation is a complex psychomotor skill that involves the precise execution of many individual component skills. Swinging a golf club is an everyday example of a complex psychomotor skill that involves many component skills, for example, proper stance, grip on the club handle, position of the golfer's head, and movement to swing the golf club.

1. **Foundational Building Blocks of Periodontal Instrumentation.** Many building blocks—individual skill components—are involved in periodontal instrumentation. These building blocks are discussed below and illustrated in Figure 1-11.
   - A. **Building Block 1: Position.** The building block of "positioning" entails the proper use of equipment, as well as, positioning the patient and clinician.
   - B. **Building Block 2: Instrument Grasp.** This building block involves the way in which the clinician holds a periodontal instrument.
   - C. **Building Block 3: Mirror Use.** A dental mirror allows a clinician to view tooth surfaces or other oral structures that are obscured from direct viewing.
   - D. **Building Block 4: Finger Rests.** This building block entails the manner in which the clinician stabilizes his or her hand in the oral cavity during periodontal instrumentation.
   - E. **Building Block 5: Stroke Production.** This building block refers to the manner in which the working-end of a periodontal instrument is moved against the tooth surface. Stroke production is a complex skill that involves several smaller component skills—activation, adaptation, and angulation—that are discussed later in this book.

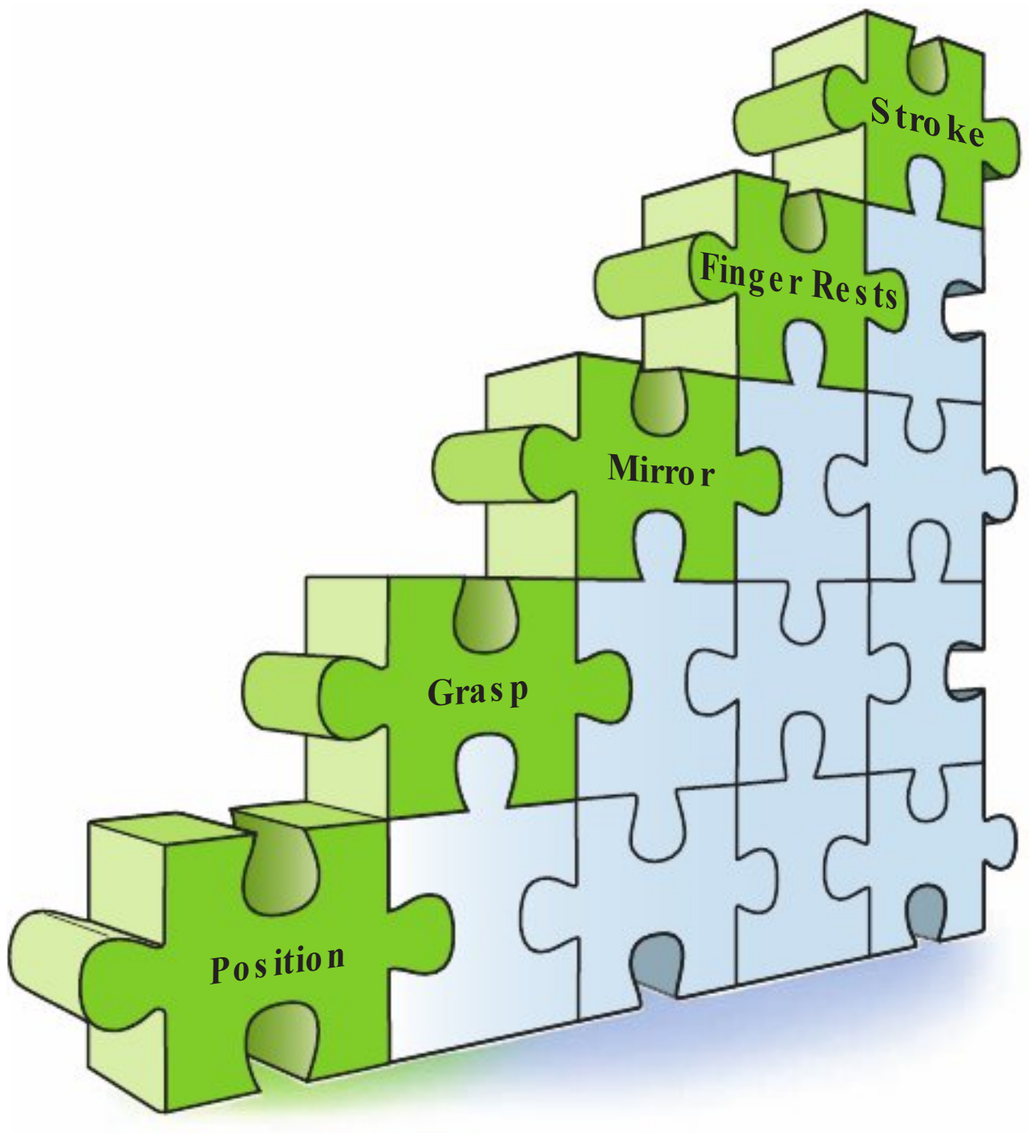


Figure 1-11. Building Blocks for Periodontal Instrumentation. Successful periodontal instrumentation requires the mastery the individual skill components of position, grasp, mirror use, fnger rests, and stroke production.

2. Signif cance of the Building Blocks for Periodontal Instrumentation

A. Precise Performance.

1. Precise, accurate performance of the building blocks is essential if periodontal instrumentation is to be effective, efficient, safe for the patient, and comfortable for the clinician.
2. Research on psychomotor skill acquisition indicates that a high level of mastery in the performance of skill building blocks is essential to successful mastery of periodontal instrumentation.
   - **a.** The building block skills are the foundation that "supports" successful periodontal instrumentation.
   - **b.** These skills should be mastered one-by-one.
   - **c.** Each skill should be overlearned until it can be performed easily and without hesitation. It is impossible to devote too much time to the practice of these building block skills.
   - **d.** If the building block skills are mastered, then the use of any periodontal instrument will be relatively easy to learn. The building block skills are the same no matter which periodontal instrument is used.

B. Faulty Performance. Incorrect performance of even one of the building blocks means that at the very least periodontal instrumentation will be inefficient. Most likely faulty performance results in ineffective calculus removal, unnecessary discomfort for the patient, and musculoskeletal stress to the clinician.

3. Sequencing of Building Block Skills

A. The modules (chapters) in this book are sequenced to allow beginning clinicians to practice the building blocks to periodontal instrumentation one-by-one.

B. Each building block should be practiced until it is easy to perform from memory before attempting the next building block in the skill sequence.

BUILDING BLOCK SKILLS. The puzzle piece shown here appears throughout the book to alert clinicians to the individual skill components of periodontal instrumentation.

Section 3
Ergonomic Dos and Don'ts for Seated Posture

NEUTRAL POSITION FOR THE CLINICIAN

1. **Ergonomic Do's and Don'ts**
   - **A. Ergonomic Don'ts**
     1. When a dental hygienist alters his or her body position or equipment in a manner that is uncomfortable or painful just to "get the job done," musculoskeletal stress is the result.
     2. A mindset that it is acceptable to assume an uncomfortable position "just for 15 minutes while performing periodontal instrumentation on these two teeth" is destined to lead to MSDs.
     3. Pain and injury results when the body's natural spinal curves are not maintained in a seated position.
   - **B. Ergonomic Do's**
     1. For a healthy and productive career, first, the dental hygienist assumes a neutral, balanced body position and then alters the patient's chair and dental equipment to complete periodontal instrumentation.
     2. Good posture requires the seated dental hygienist to use a neutral spine position that maintains the natural curves of the spine (Fig. 1-12).
2. **Neutral Body Position**
   - **A. Spine Basics: The Curves of a Healthy Back**
     1. The spine is made up of three segments: the cervical, thoracic, and lumbar sections.
     2. The spine has three natural curves that form an S-shape (46). When the three natural curves are properly aligned, the ears, shoulders, and hips are in a straight line.
        - **a.** When viewed from the side, the cervical and lumbar segments have a slight inward curve (lordosis).
        - **b.** When viewed from the side, the thoracic segment of the spine has a gentle outward curve (kyphosis).
   - **B. Neutral Body Position for the Clinician.** Figures 1-13 to 1-19 illustrate the characteristics of neutral body position for the clinician.

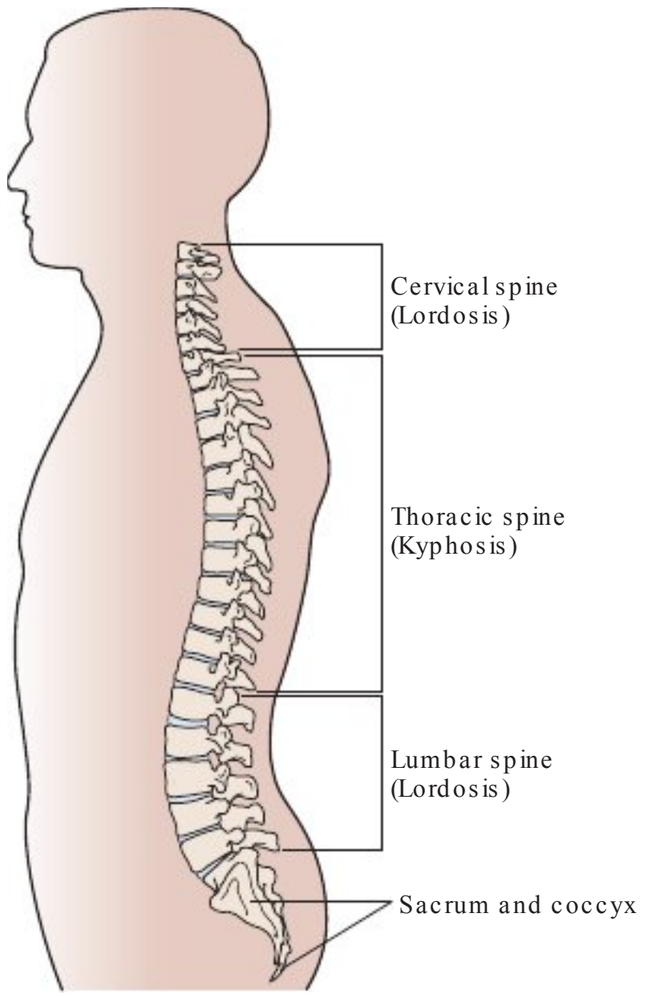


Figure 1-12. Three Curves of a Healthy Back. The spine has three natural curves: cervical, thoracic, and lumbar curves. The cervical and lumbar segments have a gentle inward curve. The thoracic segment has a slight outward curve.

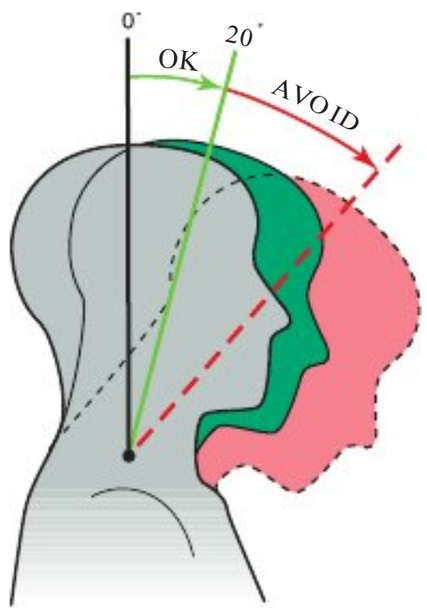


Figure 1-13. **Neutral Neck Position**

Goal:

- Head tilt of 0 to 20 degrees
- The line from eyes to the treatment area should be as near to vertical as possible

Avoid:

- Head tipped too far forward
- Head tilted to one side

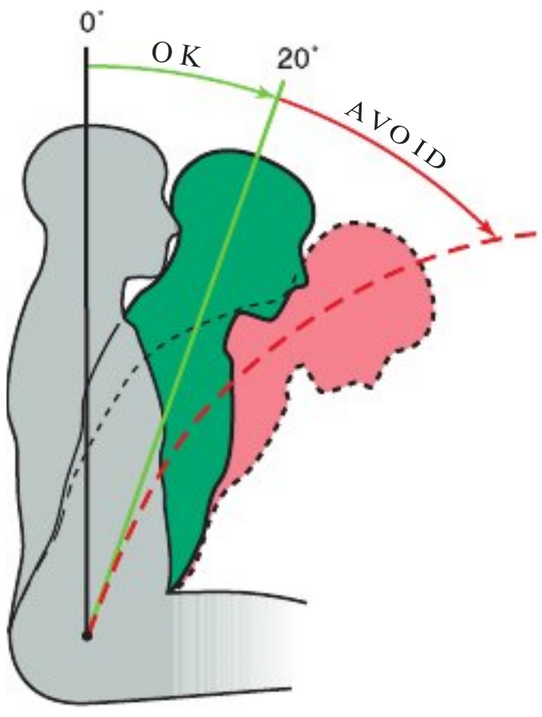


Figure 1-14. **Neutral Back Position**

Goal:

- Lean forward slightly from the hips (hinge at hips)
- Trunk flexion of 0 to 20 degrees

Avoid:

- Over flexion of the spine (curved back)

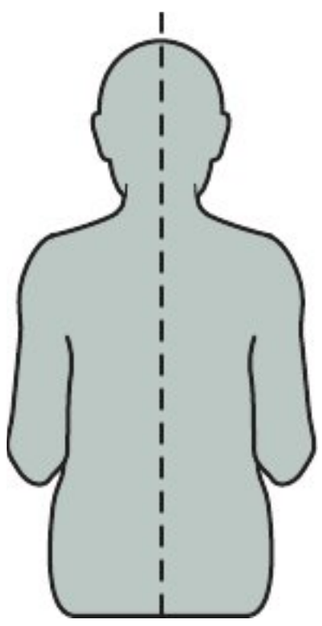


Figure 1-15. **Neutral Torso Position**

Goal:

- Torso in line with long axis of the body

Avoid:

- Leaning torso to one side
- Twisting the torso

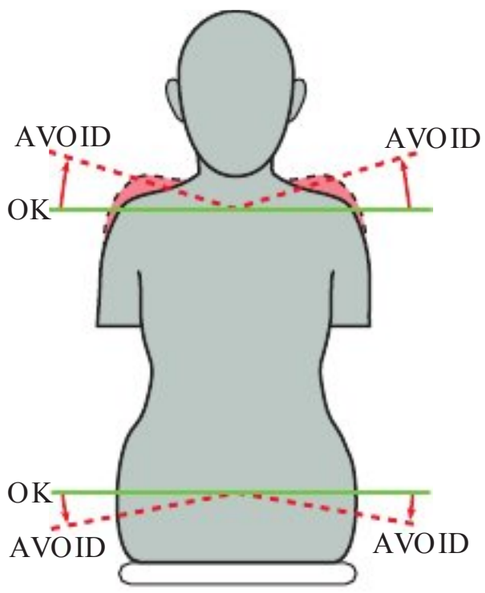


Figure 1-16. **Neutral Shoulder Position**

Goal:

- Shoulders in horizontal line
- Weight evenly balanced when seated

Avoid:

- Shoulders lifted up toward ears
- Shoulders hunched forward
- Sitting with weight on one hip

Figure 1-17. Neutral Upper Arm Position

Goal:

- Upper arms hang parallel to the long axis of torso
- Elbows at waist level held slightly away from body

Avoid:

- Greater than 20 degrees of elbow abduction away from the body
- Elbows held above waist level

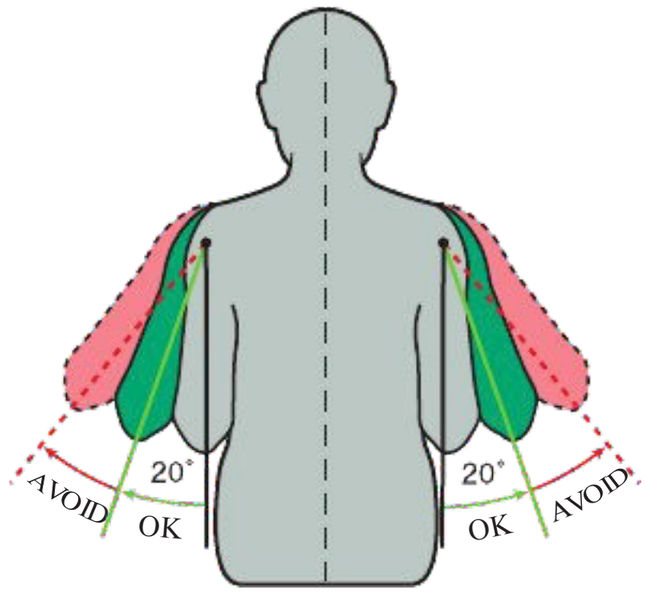


Figure 1-18. Neutral Forearm Position

Goal:

- Held parallel to the floor
- Raised or lowered, if necessary, by pivoting at the elbow joint

Avoid:

- Angle between forearm and upper arm of less than 60 degrees

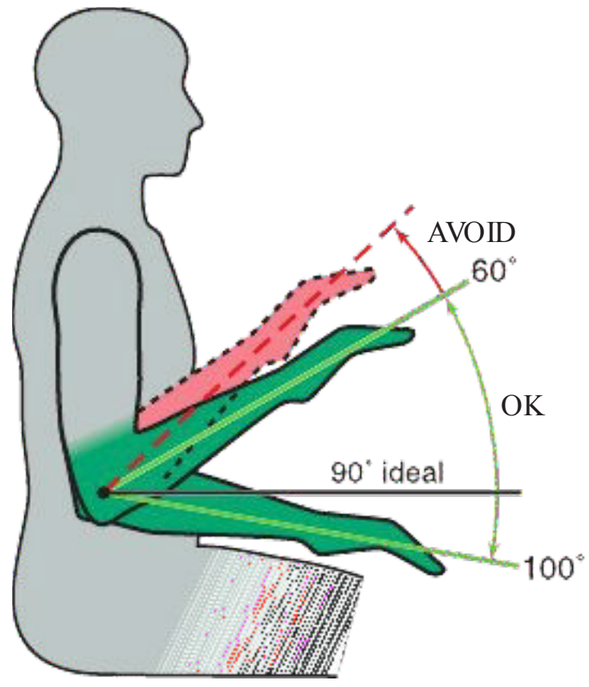


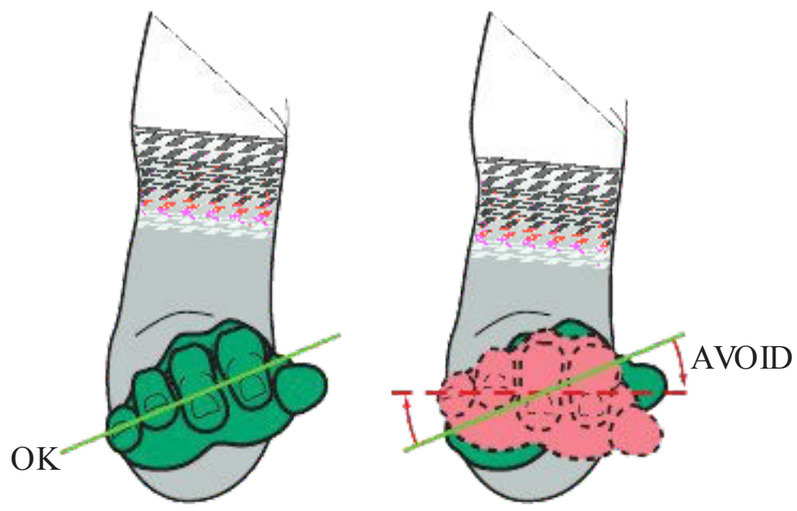
Figure 1-19. Neutral Hand Position

Goal:

- Little finger-side of palm is slightly lower than thumb-side of palm
- Wrist aligned with forearm

Avoid:

- Thumb-side of palm rotated down so that palm is parallel to floor
- Hand and wrist bent up or down



Section 4

Application of Ergonomic Principles: Seated Posture

Ergonomic principles can reduce the risk of developing an MSD by reducing muscle forces during periodontal instrumentation. Attention to the principles for neutral seated clinician posture can minimize the amount of physical stress that occurs during instrumentation.

SKILL BUILDING
Neutral Seated Posture for the Clinician

Directions: Practice the neutral clinician posture by following the steps 1 to 9 as illustrated in Figures 1-20 to 1-28.

The ideal seated position for the clinician is called the **neutral seated position**. Adjust the clinician stool first. A common mistake clinicians make is positioning the patient first and then adjusting the clinician stool to accommodate the patient.

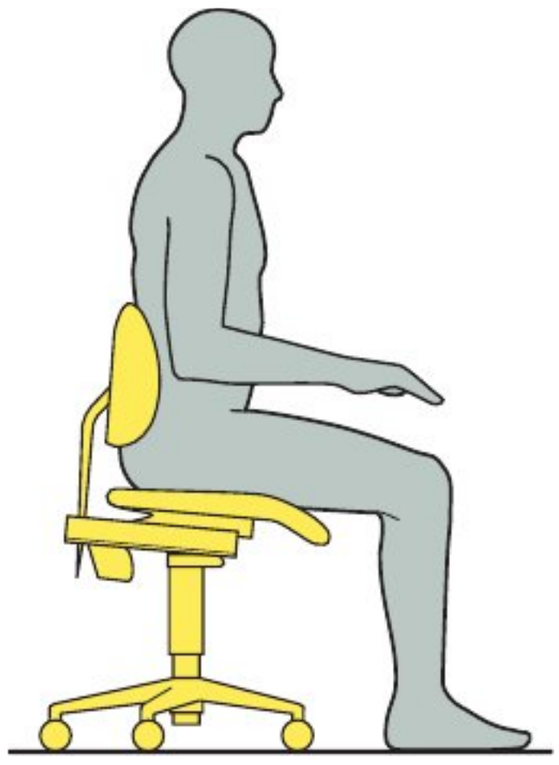


Figure 1-20. Step 1.
- Position the buttocks all the way back in the chair. Distribute the body's weight evenly on both hips.

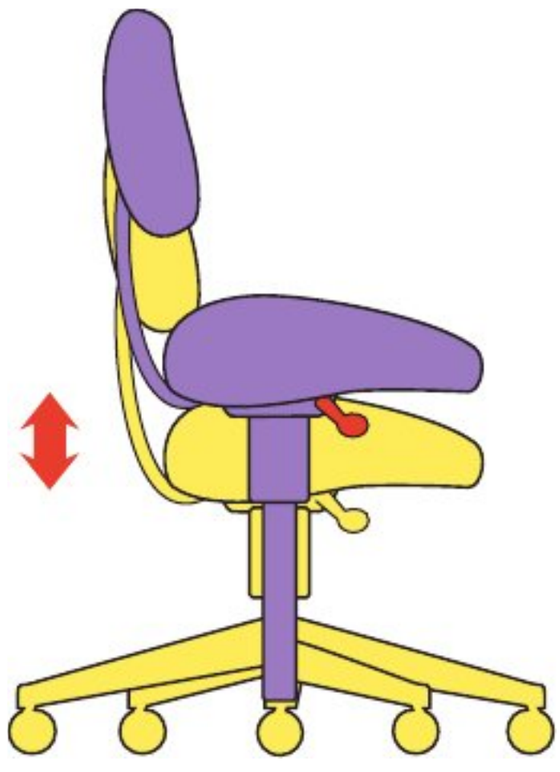


Figure 1-21. Step 2.
- Adjust seat height so the feet rest flat on the floor. Establish a "wide base of support" with feet on floor at least shoulder-width apart and in front of the hips (19).
- Legs should not dangle or be crossed at the knees or ankles. Dangling legs or crossing them puts pressure on the back of the thighs and restricts blood flow.

Figure 1-22. Step 3.

- Adjust the seat tilt so that the back is about an inch higher than the front (hips slightly higher than the knees) (16,17,19,20,22–24).
- The seat tilt helps to maintain the natural lower curve of the spine and relaxes the bend of the knees. The seat tilt should only be about 5 degrees; overtilting it can cause too much low back curve.
- **Note:** Chairs without a tilt feature can be retrofitted with an ergonomic wedge-shaped cushion.

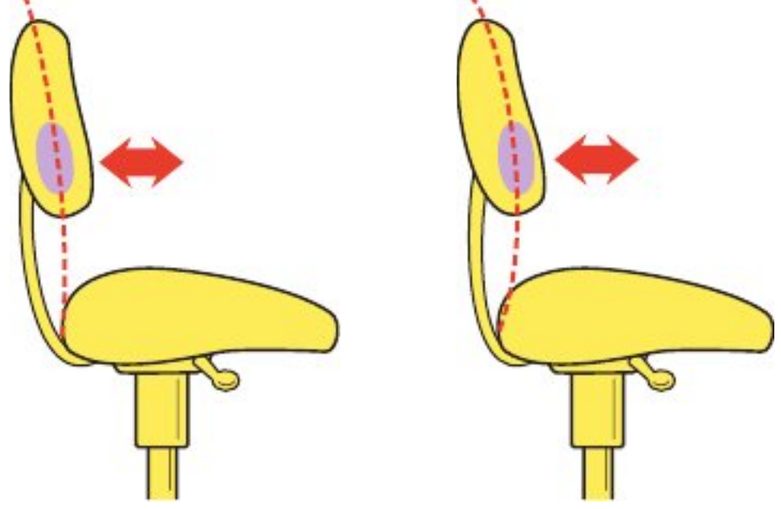


Figure 1-23. Step 4.

- With buttocks seated all the way back in the chair, adjust the lumbar depth by moving the backrest closer or farther from the seat pan until the backrest nestles against the lower back.
- The unsupported lower back tends to straighten rather than maintain a healthy curve (21,24).

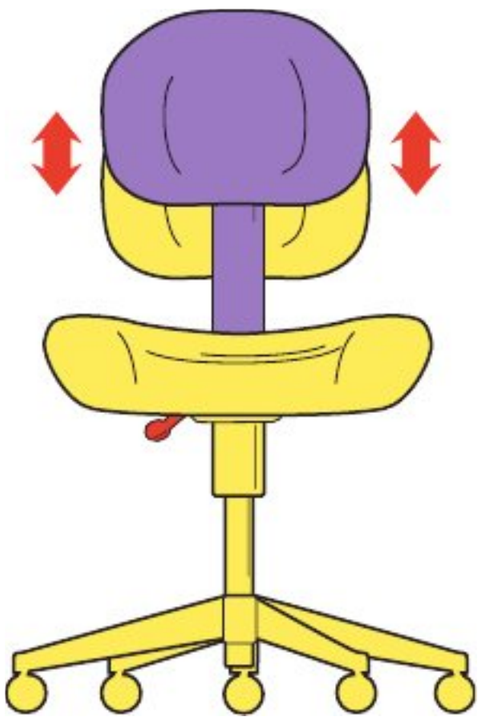


Figure 1-24. Step 5. Adjust the lumbar height by moving the backrest up or down until it nestles in the natural lumbar curve of the lower back. This helps to support the natural curve of the spine (21).

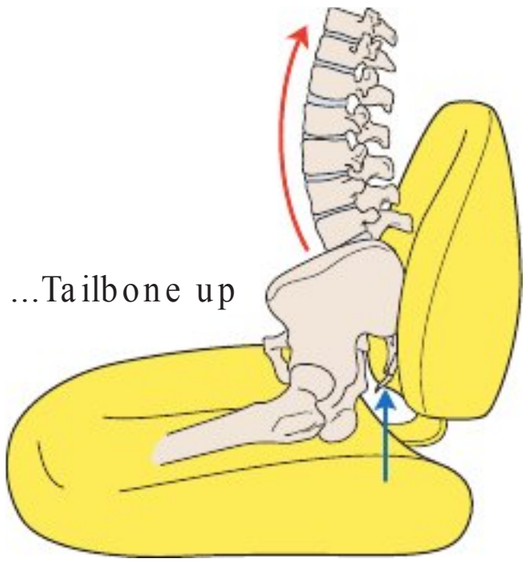


Figure 1-25. Step 6.

- Raise the tailbone up to establish correct spinal curves. All three normal back curves should be present while sitting.
- Studies of the seated body show that the position of the pelvis determines the shape of the spine (23).

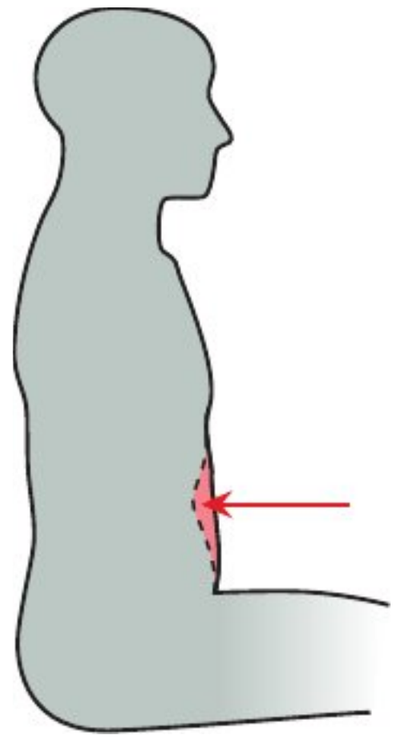


Figure 1-26. **Step 7.**
- Stabilize the low back curve by pulling the stomach muscles toward the spine (25).

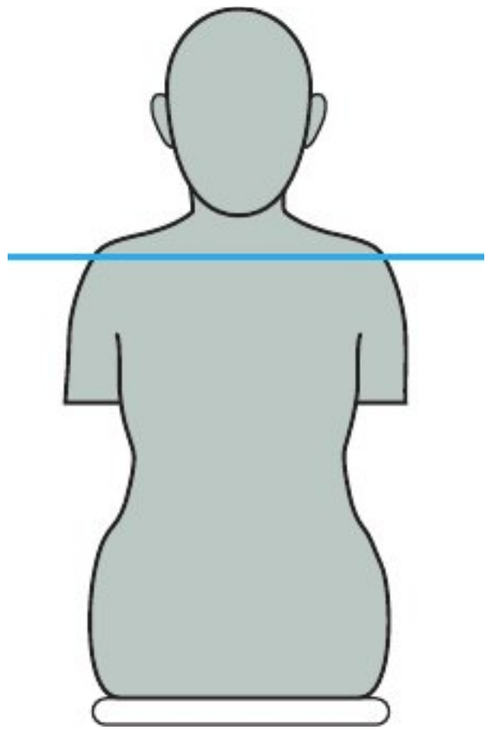


Figure 1-27. **Step 8.**
- Relax your shoulders so that they are down and back (16).
- If your stool has armrests, adjust the height of each arm so the arms are supported. This helps take the weight off the shoulders.

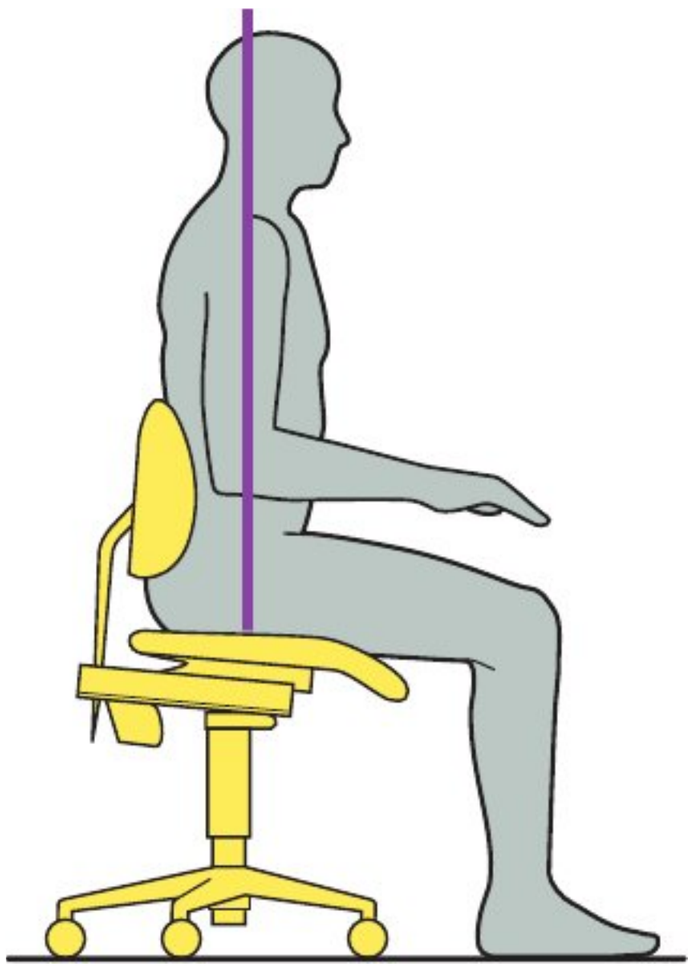


Figure 1-28. **Step 9.**
- Position the upper arms parallel to the long axis of the torso with elbows held near the body.
- Maintain a trunk position such that an imaginary straight line can be drawn connecting from the ear, shoulder, and hips (19).

SKILL BUILDING
The Masking Tape Trick

An easy way to monitor back position while practicing instrumentation in a preclinical setting is to use the "masking tape trick." While sitting with your back in a neutral position, have a friend apply a strip of masking tape down the center of your back, along your spinal column. Figure 1-29 shows how the masking tape will appear when a clinician is seated in neutral position. If a clinician bends forward, out of neutral position, the masking tape breaks as shown in Figure 1-30.

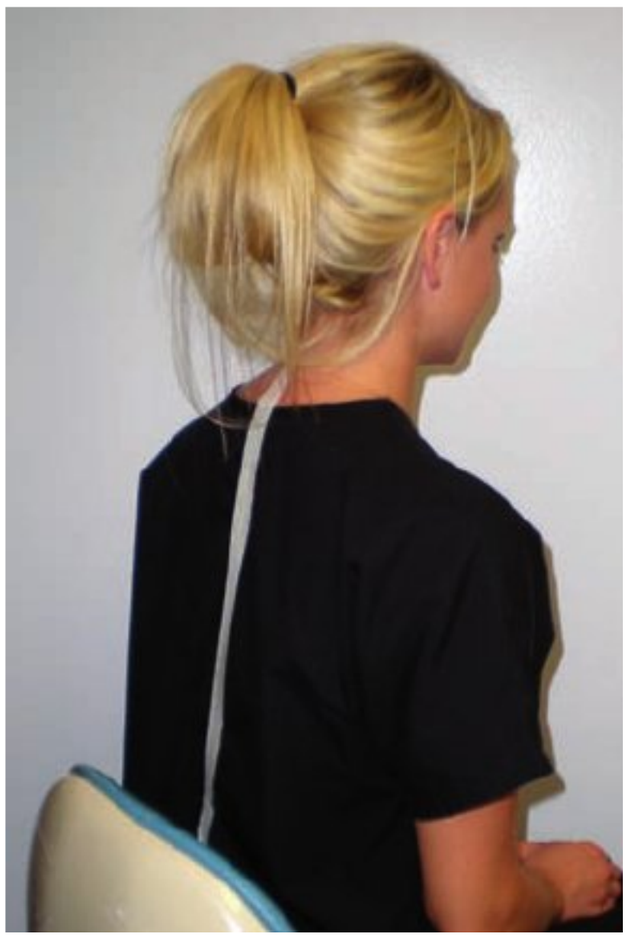


Figure 1-29. Correct Position—Neutral Back Position. Maintain a neutral back position while practicing positioning or periodontal instrumentation and the strip of masking tape remains intact and straight. (Photo courtesy of dr. Richard Foster, Guilford Technical Community College, Jamestown, NC.)

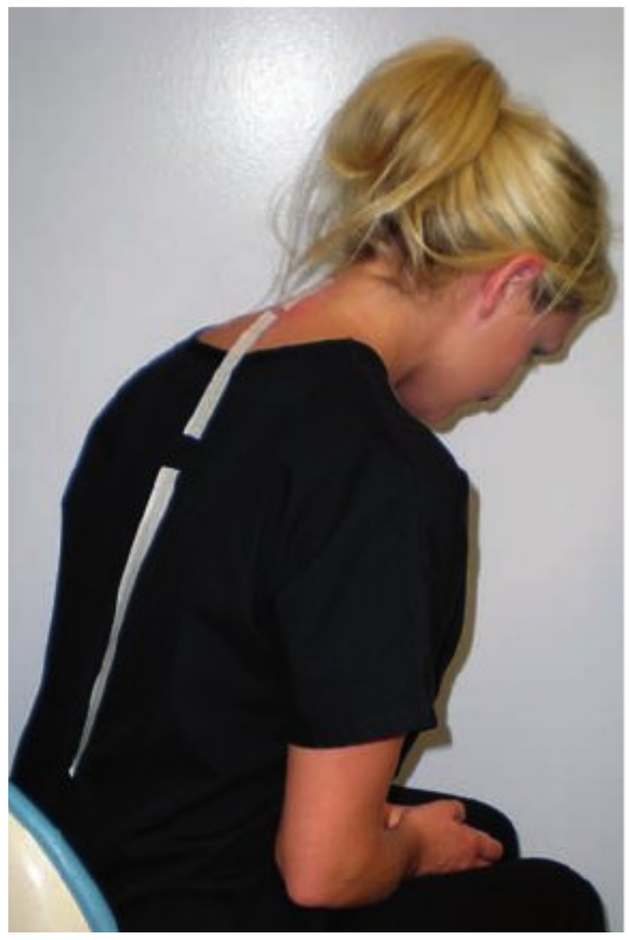


Figure 1-30. Incorrect Position—Rounded Back Position. The masking tape strip will tear if you bend over, rounding your back while practicing positioning or periodontal instrumentation. Torn masking tape will alert you to problems with your seated position. (Photo courtesy of dr. Richard Foster, Guilford Technical Community College, Jamestown, NC.)

IMPORTANT ELEMENTS OF THE SEATED POSITION

Figures 1-31 and 1-32 depict important elements of the seated clinician position.

Figure 1-31. Correct Feet Position. The feet should be positioned to create a "wide base of support" for the seated clinician. That is, the feet should be flat on the floor about a shoulder's width apart for ideal balance while seated.

Figure 1-32. Incorrect Feet Position for Seated Clinician
A. Narrow Base of Support. A narrow base of support with the feet together or tucked under the chair interferes with the clinician's balance and can limit his or her range of motion during instrumentation.
B. Crossed Legs. Crossing the legs at the knees or ankles restricts blood flow to the legs and feet. In addition, this position places more weight on one side of the hip and interferes with the clinician's balance during periodontal instrumentation. (Photos courtesy of dr. Richard Foster, Guilford Technical Community College, Jamestown, NC.)

Section 5
Application of Ergonomic Principles: Positioning the Patient

SUPINE AND SEMI-SUPINE PATIENT POSITION

The recommended patient position for dental treatment is with the patient lying on his or her back. For maxillary treatment areas, the back of the dental chair is nearly parallel to the floor in a supine position (Table 1-1, Fig. 1-33). For mandibular treatment areas, the back of the dental chair is slightly upright in a semi-supine position (Table 1-2, Fig. 1-34).

TABLE 1-1. POSITION FOR MAXILLARY TREATMENT AREAS

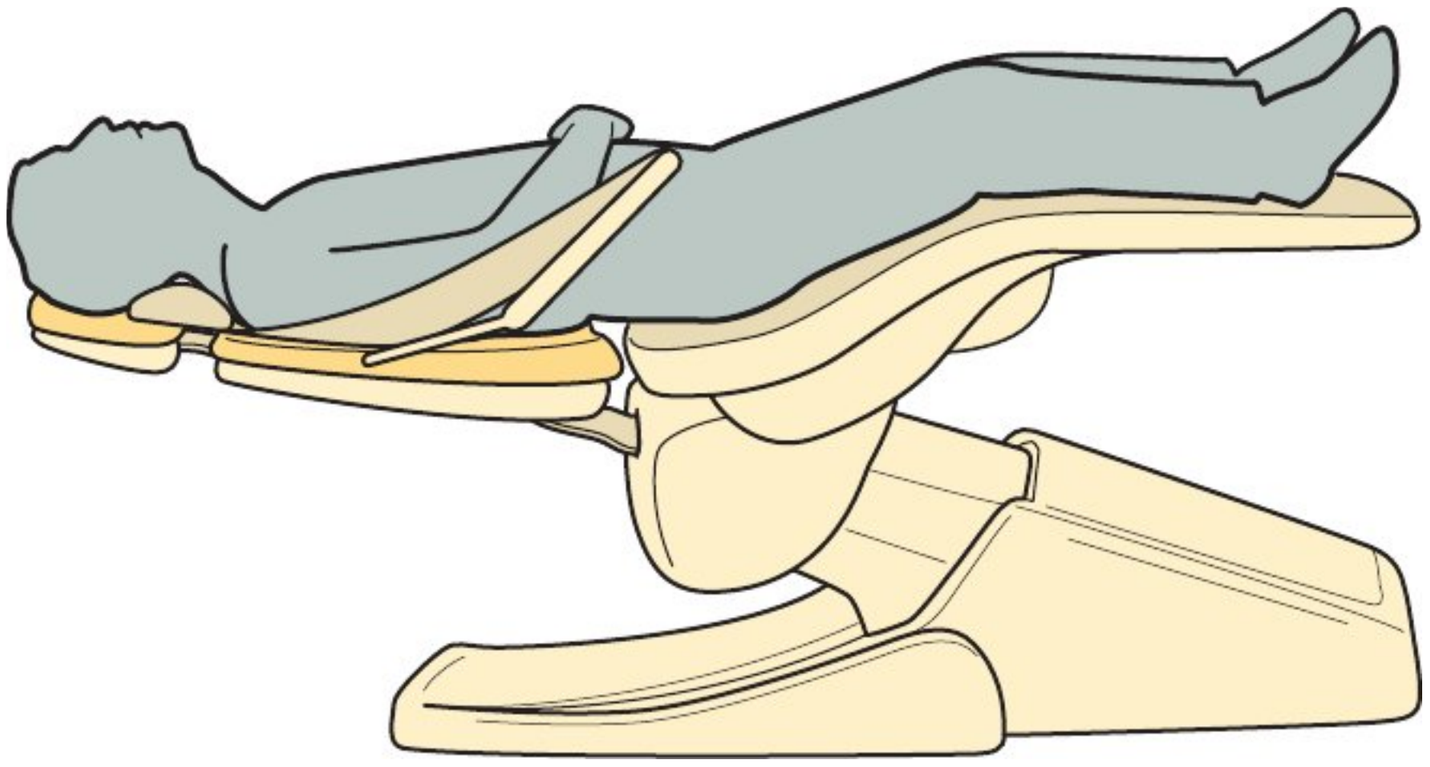


Figure 1-33. Patient Position for the Maxillary Arch.

Body	The patient's **feet should be even with or slightly higher than the tip of his or her nose**.
Chair Back	The chair back should be nearly **parallel to the floor** for maxillary treatment areas.
Head	The **top of the patient's head should be even with the upper edge of the headrest**. If necessary, ask the patient to slide up in the chair to assume this position.
Headrest	Adjust the headrest so that the patient's head is in a **chin-up position**, with the patient's nose and chin level. Patient head position is discussed in more detail later in this chapter.

TABLE 1-2. POSITION FOR MANDIBULAR TREATMENT AREAS

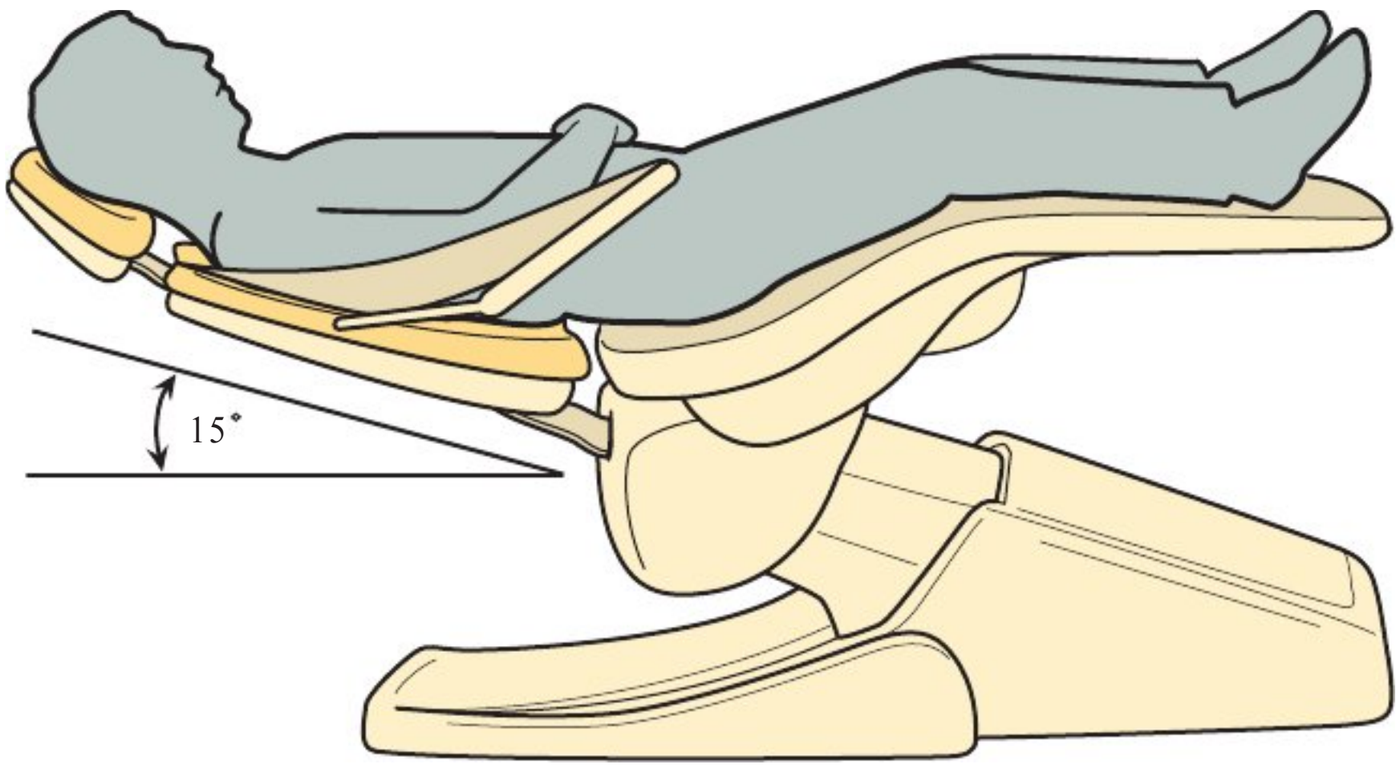


Figure 1-34. Patient Position for the Mandibular Arch.

Body	The patient's **feet should be even with or slightly higher than the tip of his or her nose**.
Chair Back	The chair back should be **slightly raised above the parallel position** at a 15- to 20-degree angle to the floor (24)
Head	The **top of the patient's head should be even with the upper edge of the head-rest**. If necessary, ask the patient to slide up in the chair to assume this position.
Headrest	Raise the headrest slightly so that the patient's head is in a **chin-down position**, with the patient's chin lower than the nose. Patient head position is discussed in greater detail later in this chapter.

PATIENT HEAD POSITION

The patient's head position is an important factor in determining whether the clinician can see and access the teeth in a treatment area.

- Unfortunately, a clinician may ignore this important aspect of patient positioning, contorting his or her body into an uncomfortable position instead of asking the patient to change head positions. Working in this manner not only causes stress on the musculoskeletal system, but also makes it difficult to see the treatment area.
- Remember that the patient is only in the chair for a limited period of time while the clinician spends hours at chairside day after day. The patient should be asked to adjust his or her head position to provide the clinician with the best view of the treatment area.
- The patient's head should be positioned at the upper edge of the headrest. This position permits maximal visibility and access to the oral cavity. Figure 1-35A and B depicts correct patient head position for an adult and a young child. Incorrect head position is shown in Figure 1-36.

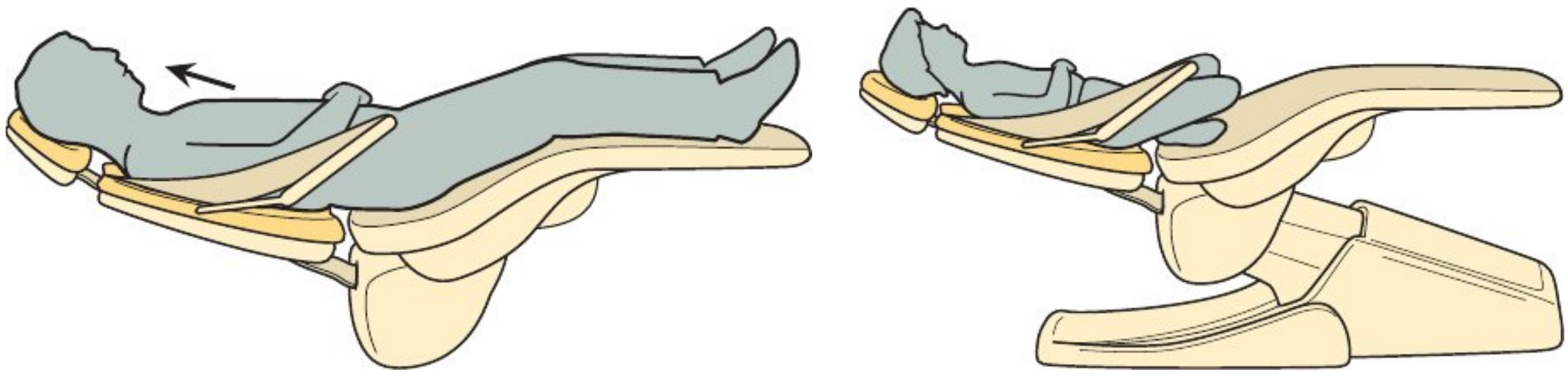


Figure 1-35. Correct Position.
A. Adult Patient. once the patient chair is in a supine or semi-supine position, ask the patient to slide up until his or her head is even with the top edge of the headrest.
B. Young Child. Asking a young child to bend the knees and cross the legs may be helpful in keeping him or her from sliding down in the chair.

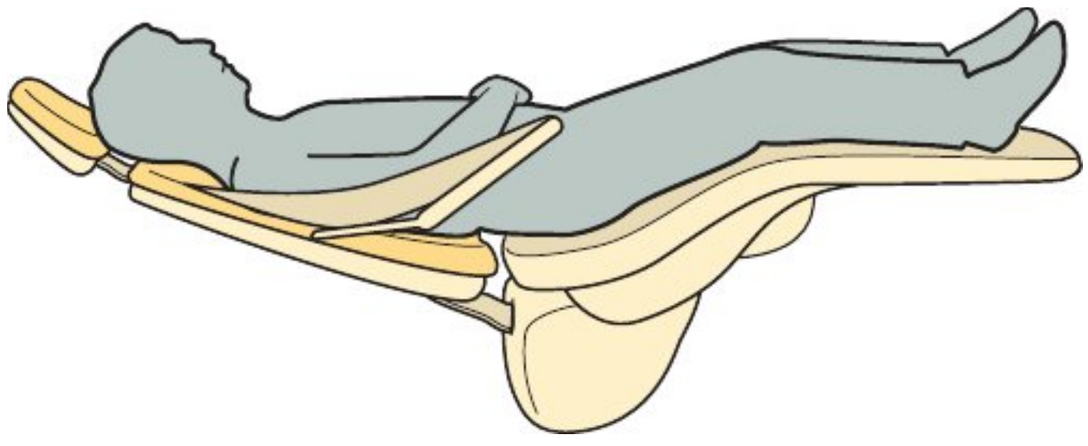


Figure 1-36. Incorrect Position. The patient may slide down in the chair when the patient chair is reclined. If patient's head is not even with the upper edge of the headrest, access and visibility of the oral cavity is restricted.

PATIENT HEAD ADJUSTMENT FOR OPTIMAL VISIBILITY

Once the patient is comfortably lying in a reclined position, the next objective is to ask the patient to adjust his of her head position to attain an optimal view of the treatment area. The patient can (1) tilt the head up or down, (2) rotate the head toward or away from the clinician, and (3) bend the head to the side (Figs. 1-37 to 1-40). Articulating (adjustable) headrests facilitate adjustment of the patient's head. Cervical rolls can be used with nonarticulating headrests to maintain patient head position.

Figure 1-37. Patient Head Tilt for Maxillary Arch.
- Angle the headrest up into the back of the patient's head (occipital area) so that the nose and chin are approximately level (48).
- The upper arch needs to be angled backward past the vertical plane.
- This patient head position is known as the chin-up position.

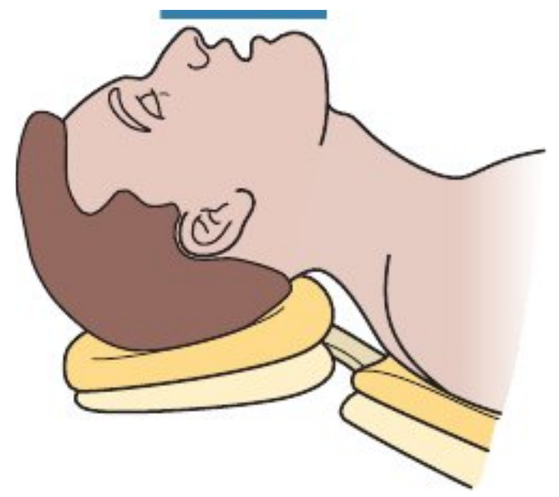


Figure 1-38. Patient Head Tilt for Mandibular Arch.
- Angle the headrest forward and down, so that the chin is lower than nose level (48).
- The occlusal or incisal surfaces of the treatment area should approximately parallel to the floor.
- This patient head position is known as the chin-down position.

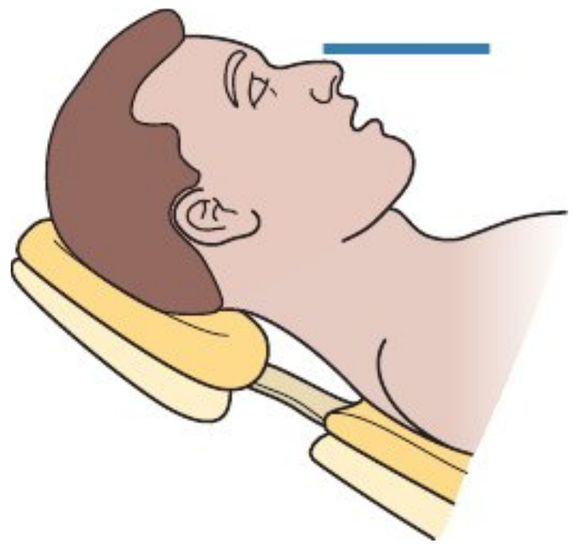


Figure 1-39. Patient Head Rotation for Both Arches.
- Ask the patient to rotate his or her head for easy access to the treatment area.
- Positions include turning toward the clinician, looking straight ahead, and turning slightly away from the clinician.

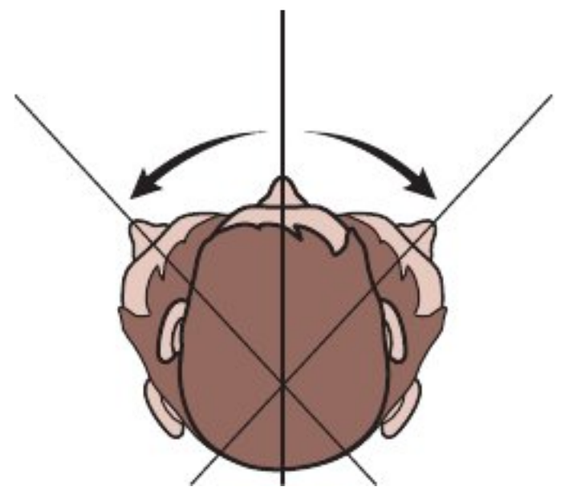


Figure 1-40. Bending the Head to the Side.
- If the patient chair has a flat, nonarticulated headrest, it is helpful to ask the patient to side-bend the head toward the clinician and then turn his or her head for the treatment area.
- This technique can position the oral cavity 2 to 3 in closer to the clinician and enhance viewing of the treatment area.

Section 6
Application of Ergonomic Principles: Adjusting the Overhead Light and Instrument Tray

POSITIONING THE OVERHEAD DENTAL LIGHT

Ideally, the overhead dental light is positioned so that the light beam is parallel to the clinician's line of sight (22,24,49).

- For mandibular treatment areas, the overhead dental light is positioned so that the light beam is approximately perpendicular to the floor (Fig. 1-41).
- For maxillary treatment areas, it usually is not possible to direct the light beam identically to the clinician's line of sight. For maxillary areas, it often is necessary to move the dental light above the patient's neck and angle the light beam into the mouth (Fig. 1-42). It is significant to note that dental hygienists whose overhead dental lights are positioned farther away from their sight lines (toward the patient's waist) are more likely to experience lower back pain (22,24,49).
- It is necessary to make tiny adjustments to the light throughout periodontal instrumentation—seldom is the light positioned for an arch and left in the identical position until moving to the opposite arch. As the clinician works around a dental arch and as the patient looks toward or away from the clinician, the dental light requires minor adjustments.

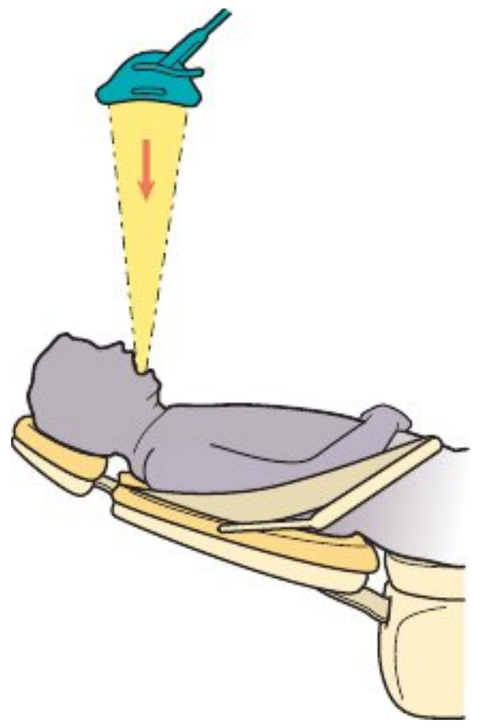


Figure 1-41. Light Position for Mandibular Arch.

- For the mandibular treatment areas, the overhead dental unit light is positioned directly over the oral cavity.
- Position the light at **arm's length within** comfortable reach. Avoid positioning the light close to the patient's head.
- The patient is in a chin-down head position.
- The light beam is directed approximately perpendicular to the floor.

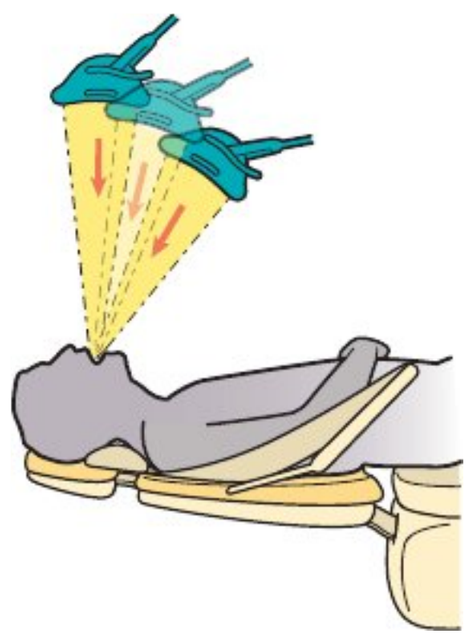


Figure 1-42. Light Position for Maxillary Arch.

- The maxillary treatment areas, the position of the overhead dental unit light ranges from being directly over the oral cavity to a position over the patient's neck.
- Position the light **at arm's length** within comfortable reach.
- Ideally, the light beam always would be perpendicular to the floor, but this is not always possible using an overhead dental light. This is why a coaxial illumination source is ideal. Coaxial illumination is discussed later in this chapter.
- The patient is in a chin-up position.
- The direction of the light beam ranges from perpendicular to the floor to a 60- to 90-degree angle to the floor.

POSITIONING THE INSTRUMENT TRAY

The instrument tray should be positioned within easy reach of the clinician's dominant hand as shown in Figure 1-43. Incorrect positioning of the instrument tray as depicted in Figure 1-44 places unnecessary stress on the clinician.

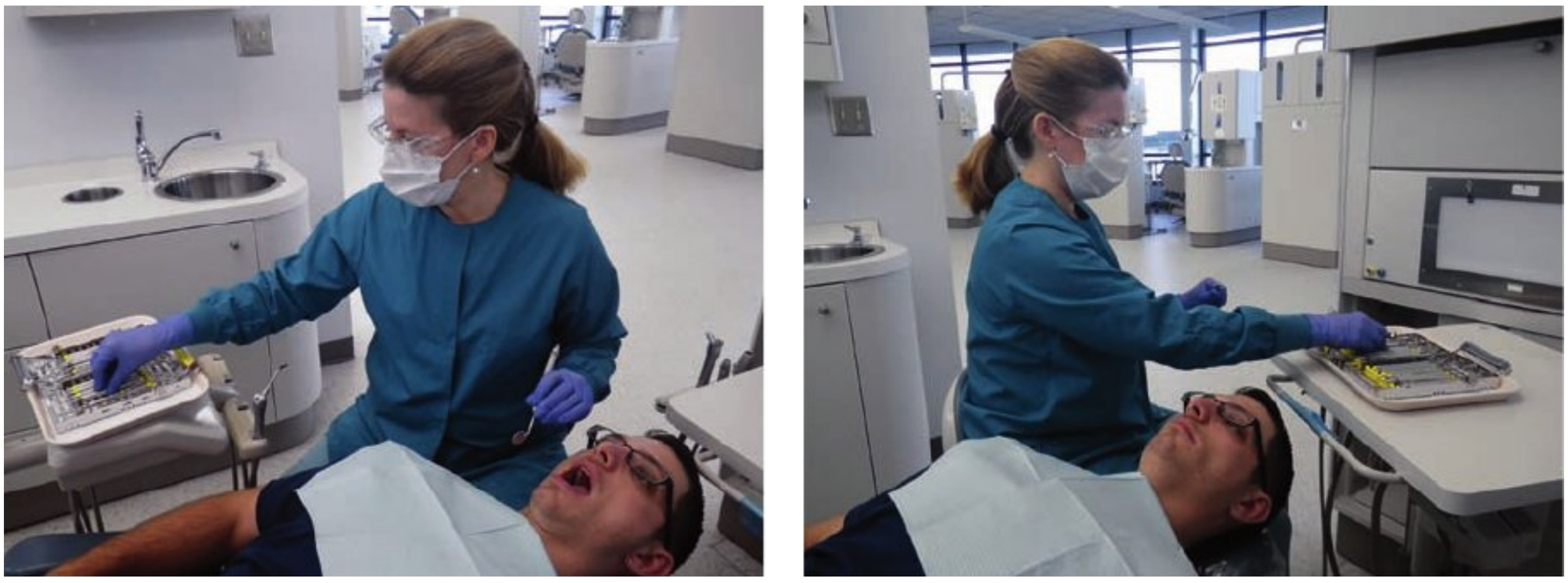
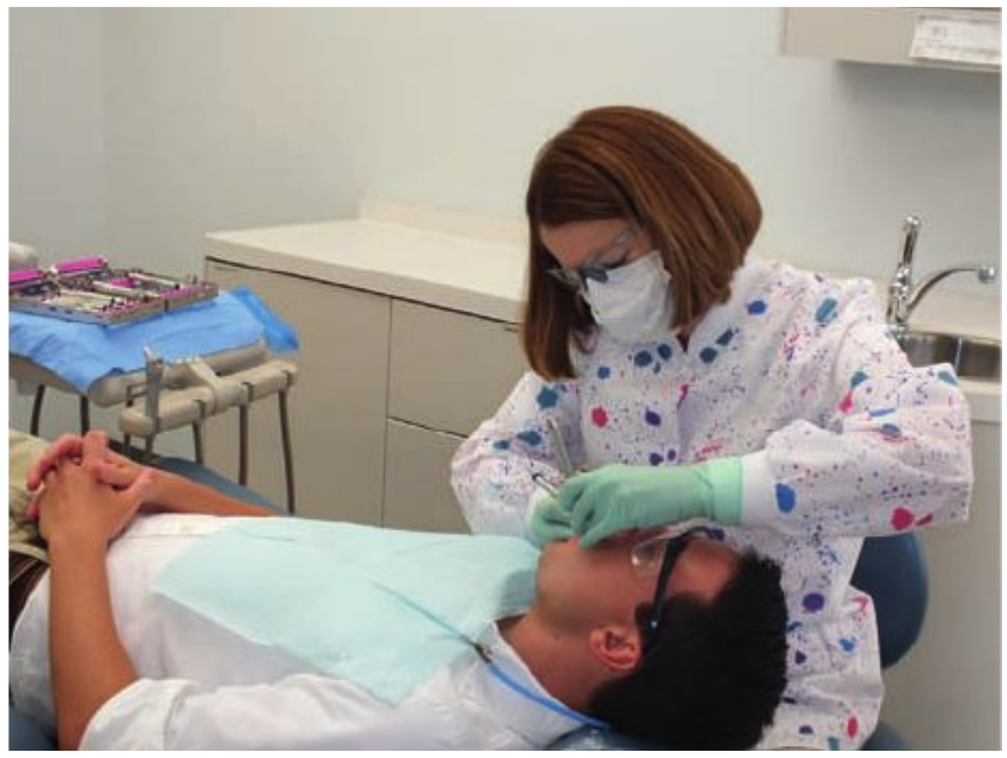


Figure 1-43. Correct Positioning of the Instrument Tray.
A. Front/Side Delivery. Instrument tray positioned correctly for front or side delivery within easy reach of the clinician's dominant hand.
B. Rear Delivery. Instrument tray positioned correctly for rear delivery within easy reach of the clinician's dominant hand.

Figure 1-44. Incorrect Positioning of Instrument Tray. A combination of positioning errors is demonstrated in this photo.

- The patient's oral cavity is positioned too high at midsternum level, instead of at the clinician's waist-level.
- The bracket table is positioned too far from the clinician. She would have to stretch to reach the instrument.



Section 7
Application of Ergonomic Principles: Adjusting the Patient to Facilitate Clinician Posture

A major component in avoiding fatigue and injury is proper positioning of the patient and dental equipment in relation to the seated clinician.

- While working, the clinician must be able to gain access to the patient's mouth and the dental unit without bending, stretching, or holding his or her elbows above waist level.
- The neutral seated position is established first, and then everything else—the patient chair, the patient's head, the dental unit light, and other dental equipment are adjusted to *f*acilitate maintenance o*f* the neutral seated position.
- Box 1-1 (Fig. 1-45) provides an overview of the relationship of the patient chair to the seated clinician while Figures 1-46 and 1-47 demonstrate correct and incorrect positioning.

Box 1-1 Overview: Patient Chair Position Relative to the Seated Clinician

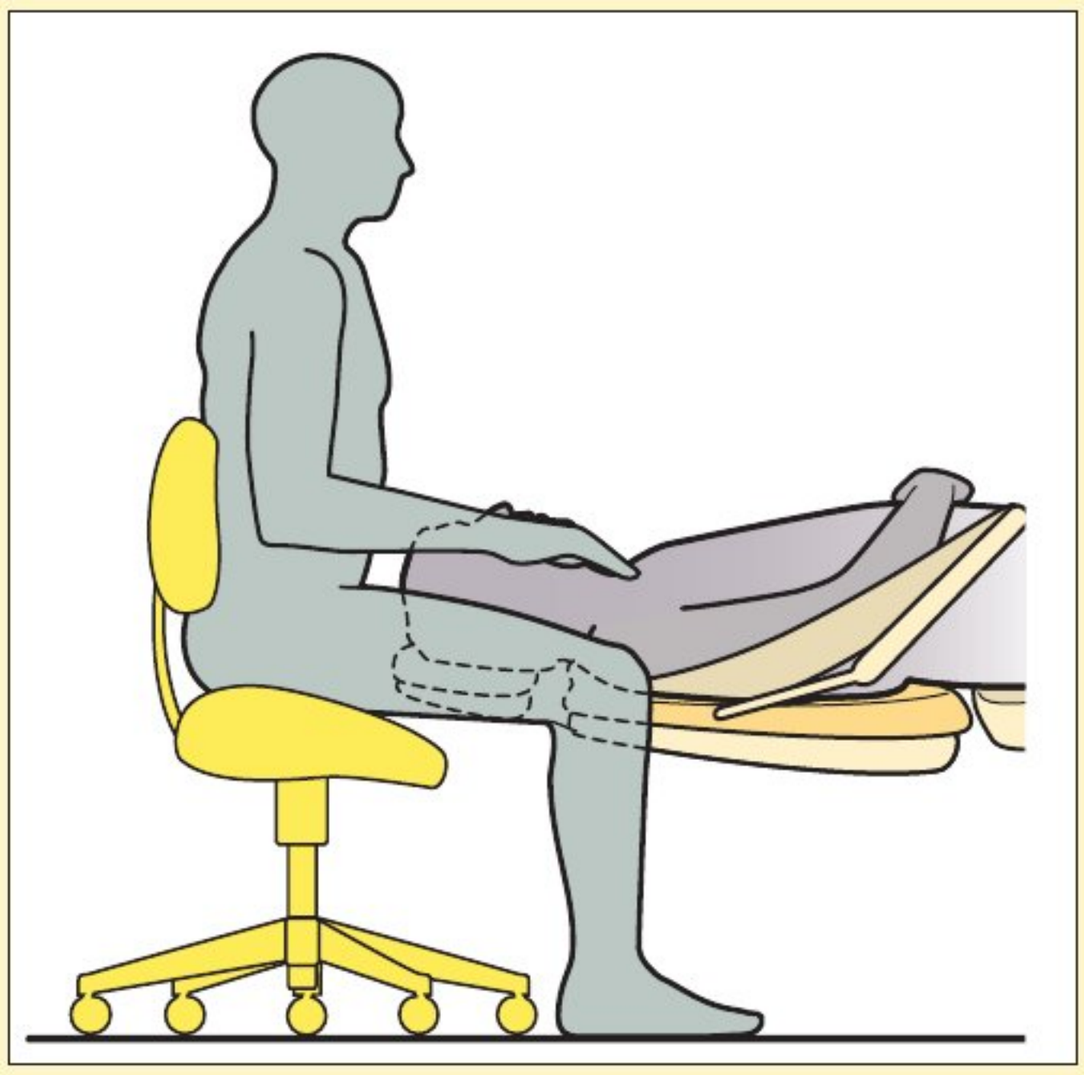


Figure 1-45

- Clinician assumes a neutral seated position.
- The clinician establishes a "wide base of support" with feet on floor at least shoulder-width apart and in front of the hips.
- The patient chair is lowered until the tip of the patient's nose is below the clinician's waist.
- The clinician should position his or her stool close to the patient to enhance vision of the treatment area and to minimize forward bending.
- Whenever possible, the clinician should straddle the headrest to facilitate neutral position.

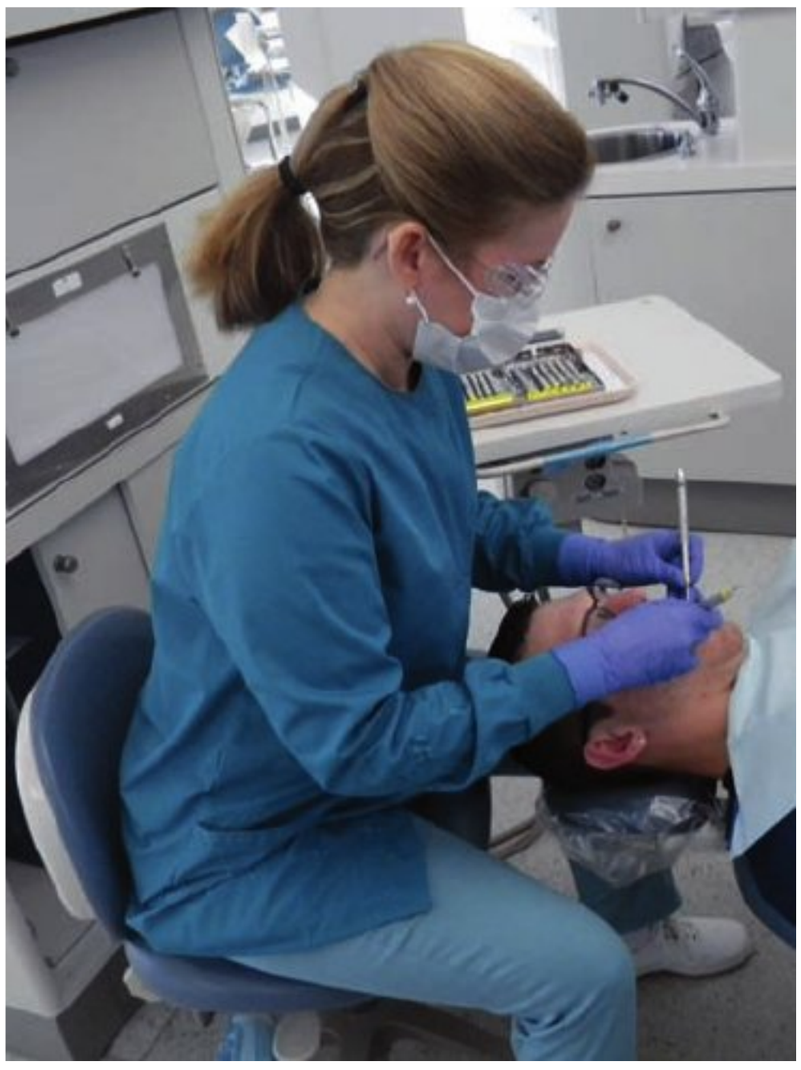


Figure 1-46. Correct Positioning. Here the patient chair and patient's head are positioned at the correct height in relation to the clinician. Note that the clinician holds her upper arms parallel to her torso, her arms are not raised, and her shoulders are relaxed.

Figure 1-47. Incorrect Positioning—Patient Too High.

A. Note how this clinician must hold her elbows up in a stressful position in order to reach the mouth because she has positioned the patient's chair too high. This error is often due to the misconception that the clinician sees better if the patient is closer to the clinician's eyes. Actually, the reverse is true; the clinician has improved vision of the mouth when the patient is in a lower position.

B. In this example, the patient is positioned too high for the clinician. As a result, the clinician's chair is raised so the clinician can reach the mouth. The high chair position causes her to rest her feet on the rungs of the chair because she cannot touch the floor with the soles of her shoes.