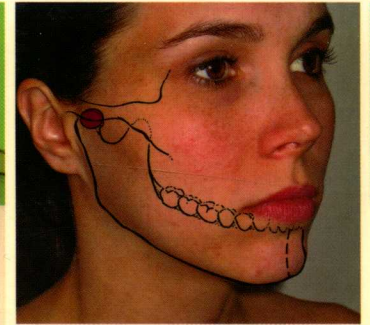


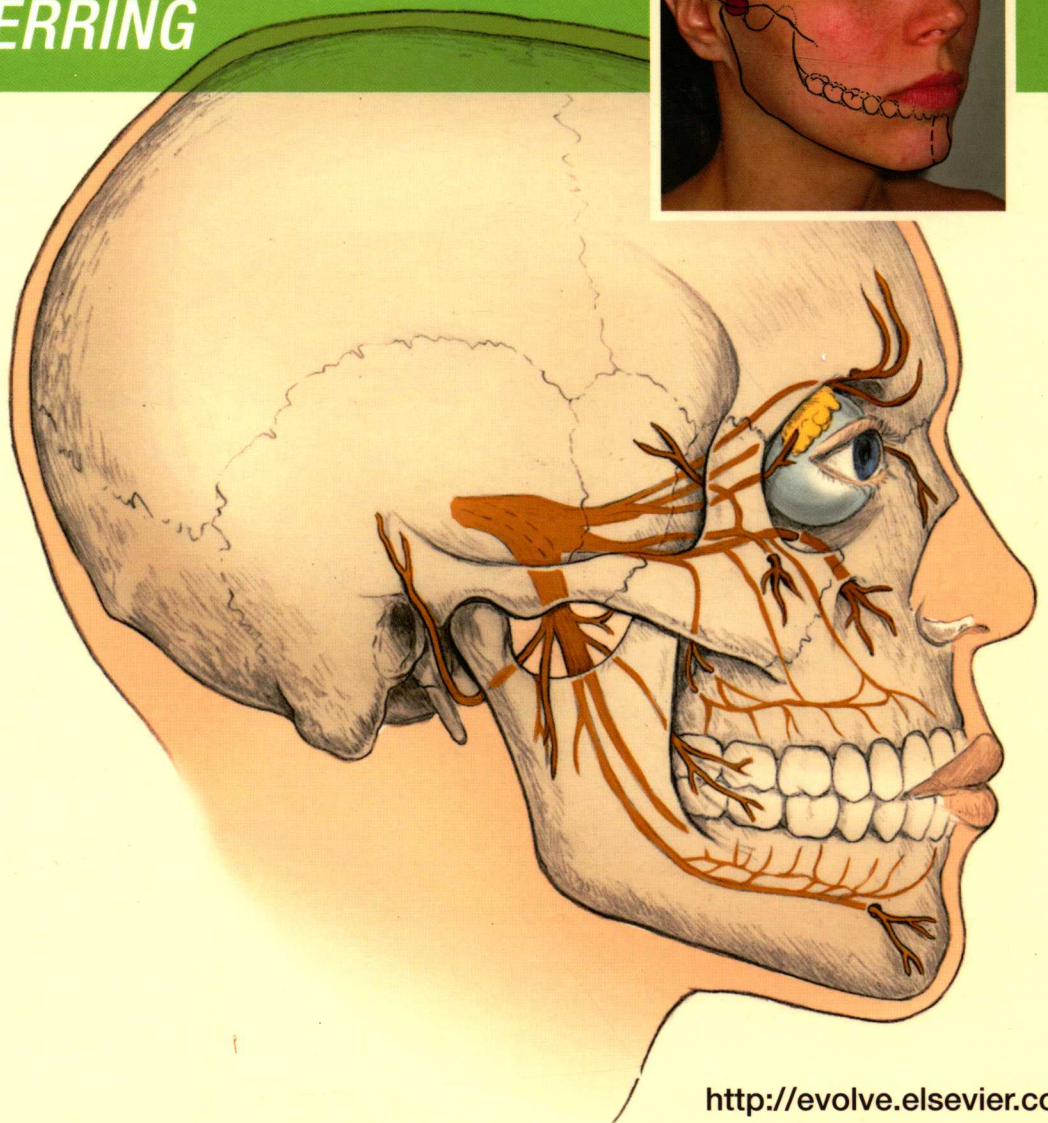
ILLUSTRATED ANATOMY OF THE HEAD AND NECK

*MARGARET J. FEHRENBACH
SUSAN W. HERRING*



4th

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ILLUSTRATED ANATOMY OF THE HEAD AND NECK

PREFACE

OVERVIEW

To meet the needs of today's dental professional, the fourth edition of *Illustrated Anatomy of the Head and Neck* offers more than basic information on head and neck anatomy. Clinical considerations are noted throughout the textbook, with special emphasis given to the complex anatomy of the temporomandibular joint and its associated disorders. A chapter on the anatomic basis of local anesthesia for pain control and one on the spread of infection related to the head and neck are also included.

FEATURES

To facilitate the learning process, chapters are divided into the various anatomic systems, ending in the considerations for the anatomic basis for local anesthesia, and the regional study of fasciae and spaces as well as the spread of infection. Each chapter begins with an outline, learning objectives, and a list of key terms with pronunciation guide; the pronunciation of each anatomic structure is included within each chapter when introduced. The anatomic terms follow those outlined in the internationally approved official body of anatomic nomenclature; older terms are included in many cases for completeness.

High-quality, full-color original illustrations and clinical photographs are included throughout the text to reinforce a three-dimensional understanding of anatomy. All chapter topics discussed in depth have been chosen for their relevance to the needs of the dental professional and to build on former topics.

Each chapter features two different types of highlighted terms. The terms appearing in bold and magenta are **key terms** and appear on the key terms list at the beginning of the chapter. The terms that appear in bold and black are **anatomic terms** that are important to the material being discussed in the chapter and are therefore emphasized. Both types of highlighted terms can be found in the glossary.

Tables summarizing important information appear throughout the text. Flow charts have been included to help with coordination of structures. Within each chapter are cross-references to other figures or chapters so the reader can review or investigate interrelated subjects. The content of this edition incorporates additional input from students and educators as well as the latest information from scientific studies and experts. Identification exercises and review questions are included for each chapter and are great tools for both classroom and self-study.

At the end of the book are two appendices. Appendix A is an updated bibliography that references published works relevant to head and neck anatomy. Appendix B provides a review of the procedures for performing extraoral and intraoral examinations. Following Appendix B is a glossary containing both key terms and anatomic terms that uses short, easy-to-remember definitions.

This textbook is coordinated with *Illustrated Dental Embryology, Histology, and Anatomy*, third edition, by Mary Bath-Balogh and Margaret J. Fehrenbach, and can be considered a companion textbook to complete the curriculum in oral biology. Many of the figures in this text also appear in the *Dental Anatomy Coloring Book*, edited by Margaret J. Fehrenbach.

NEW TO THIS EDITION

The important anatomy-related chapters on the temporomandibular joint, local anesthesia anatomy, and spread of infection have been significantly revised. **Twenty-eight full-color flashcards** are located in the back of the text. The cards are perforated for easy removal from the text and are an excellent study tool for students who want to test their knowledge of head and neck anatomy.

The **Evolve site** was an important new component to the last edition and now has been expanded. This site provides a variety of resources for both faculty and students. Included for faculty are an image collection, answers to the review questions found in the textbook, a 200-question test bank, and an updates section. For students, we have included supplemental study considerations, crossword puzzles, word searches, discussion questions for each chapter, and an updates section.

Completely new to this edition is **TEACH**, an exciting coordinated effort between a Lesson Plan Manual for all topics covered and the textbook. It features online PowerPoint programs with enrichment exercises and other related materials. The Elsevier sales representative will be able to help introduce this new digital format.

As authors, we have tried to make the text easy to understand and interesting to read. We hope that it challenges the reader to incorporate the information presented into clinical situations.

Margaret J. Fehrenbach, RDH, MS
Susan W. Herring, PhD

ACKNOWLEDGMENTS

We would like to thank Heidi Schlei, RDH, MS, Instructor, Dental Hygiene Program, Waukesha County Technical College, Pewaukee, Wisconsin, for her insights on this textbook. Thanks also to Pat Thomas, CMI, for her contributions to the first edition art program; her work has been truly beneficial to this textbook. Our families need to be thanked for their understanding of our devotion to the work.

Finally, we would like to thank Editors John Dolan, Kristin Hebbard, and Joslyn Dumas, and the staff of Elsevier for making this new edition possible.

Margaret J. Fehrenbach, RDH, MS
Susan W. Herring, PhD

Introduction to Head and Neck Anatomy

CHAPTER OUTLINE

Clinical Applications
Anatomic Nomenclature
Normal Anatomic Variation

LEARNING OBJECTIVES

1. Define and pronounce the **key terms** and **anatomic terms** in this chapter.
2. Discuss the clinical applications of head and neck anatomy by dental professionals.
3. Discuss normal anatomic variation and how it applies to head and neck structures.
4. Correctly complete the review questions and activities for this chapter.
5. Apply the correct anatomic nomenclature during dental clinical procedures.

KEY TERMS

Anatomic Nomenclature (an-ah-tom-ik no-men-kla-cher) System of names of anatomic structures.

Anatomic Position Position in which the body is erect, with arms at the sides, palms and toes directed forward, and eyes looking forward.

Anterior Front of an area of the body.

Apex (ay-peks) Pointed end of a conical structure.

Contralateral (kon-trah-lat-er-il) Structure on the opposite side of the body.

Deep Structure located inwards, away from the body surface.

Distal (dis-tl) Area that is farther away from the median plane of the body.

Dorsal (dor-sal) Back of an area of the body.

External Outer side of the wall of a hollow structure.

Frontal Plane Plane created by an imaginary line that divides the body at

any level into anterior and posterior parts.

Frontal Section Section of the body through any frontal plane.

Horizontal Plane Plane created by an imaginary line that divides the body at any level into superior and inferior parts.

Inferior Area that faces away from the head and toward the feet of the body.

Internal Inner side of the wall of a hollow structure.

Ipsilateral (ip-see-lat-er-il) Structure on the same side of the body.

Lateral Area that is farther away from the median plane of the body or structure.

Medial (me-dee-il) Area that is closer to the median plane of the body or structure.

Median (me-dee-an) Structure at the median plane.

Median Plane Plane created by an imaginary line that divides the body into right and left halves.

Midsagittal Section (mid-saj-i-tl) Section of the body through the median plane.

Posterior Back of an area of the body.

Proximal (prok-si-mil) Area closer to the median plane of the body.

Sagittal Plane (saj-i-tl) Any plane of the body created by an imaginary plane parallel with the median plane.

Superficial Structure located towards the surface of the body.

Superior Area that faces toward the head of the body, away from the feet.

Transverse Section (trans-vers) Section of the body through any horizontal plane.

Ventral (ven-tral) Front of an area of the body.

CLINICAL APPLICATIONS

The dental professional must have a thorough understanding of head and neck anatomy when performing patient examination procedures, both extraoral and intraoral (Figure 1-1). This will help determine whether any abnormalities or lesions exist and possibly indicate their cause and amount of involvement. This will also provide a basis for the description of the lesion and its location for record-keeping purposes.

When taking radiographs, the dental professional uses surface landmarks for easy film placement and consistency. In addition to these landmarks, an understanding of anatomy is important in the mounting and analysis of the films.

A patient may also present with features of a temporomandibular joint disorder. A dental professional must understand the normal anatomy of the joint to understand the various disorders associated with it.

The administration of local anesthesia is also based on landmarks of the head and neck. Knowledge of anatomy helps the dental professional plan for use of a local anesthetic to reduce pain during various dental procedures. This knowledge also allows for correct placement of the syringe and its anesthetic agent, potentially avoiding complications.

During examination of the patient, the dental professional may note the presence of dental infection. It is important to know the source of the infection as well as the areas to which it could spread by way of certain anatomic features of the head and neck. This background in anatomy will help the dental professional understand the spread of dental infection.

To initially consider patient care through anatomic study, this text takes mainly a systemic approach to the study of head and neck anatomy after its two initial background chapters, **Chapters 1 and 2**, and through most of its chapters, **Chapters 3-10**, an approach that takes a look at each system separately (e.g., skeletal, muscular). Another way to study anatomy for patient care integration is the regional approach, which is taken up later within **Chapter 11**, since it focuses on the faciae and fascial spaces of the head and neck. Both approaches, when used in the order presented in this text, are complementary and effective ways to study head and neck anatomy and prepare for patient care considerations.

To reinforce the material already presented and make it readily useful for clinicians, the final chapter, **Chapter 12**, emphasizes this important clinical approach to head and neck anatomy during the consideration of the spread of infection. **Chapter 9** also has an expanded clinical emphasis, covering the anatomy of local anesthesia. In addition, all the other chapters include important clinical ramifications when appropriate, such as related pathology.

ANATOMIC NOMENCLATURE

Before beginning the study of head and neck anatomy, the dental professional may need to review **anatomic nomenclature**, which is the system of names for anatomic structures. This review will allow for easy application of these terms to the head and neck area when examining a patient, for use in the patient's record, or during other clinical procedures.

The nomenclature of anatomy is based on the body being in **anatomic position** (Figure 1-2). In anatomic position, the body is standing erect. The arms are at the sides with the palms and toes directed forward and the eyes looking forward. This position is assumed even when the body may be supine (on the back) or prone (on the front) or even with respect to the patient's head and neck when sitting in a dental chair.

When studying the body in anatomic position, certain terms are used to refer to areas in relationship to other areas (Figure 1-3). The front of an area in relationship to the entire body is its **anterior** part. The back of an area is its **posterior** part. The **ventral** part is directed toward the anterior and is the opposite of the **dorsal** part (the posterior) when considering the entire body.

Other terms can be used to refer to areas in relationship to other areas of the body. An area that faces toward the head and away from the feet is its **superior** part. An area that faces away from the head and toward the feet is its **inferior** part. As an example, the face is on the anterior side of the head, and the hair is superior and posterior to the face. The **apex** or tip is the pointed end of a conical structure such as the tongue apex or tip.

The body in anatomic position can be divided by planes or flat surfaces (Figure 1-4). The **median plane** or **midsagittal plane** is created by an imaginary line dividing the body into equal right and left halves. On the surface of the body, these halves are generally symmetric, yet the same symmetry does not apply to all internal structures.

Other planes can be created by different imaginary lines. A **sagittal plane** is any plane created by an imaginary plane parallel to the median plane. A **frontal plane** or **coronal plane** is created by an imaginary line dividing the body at any level into anterior and posterior parts. A **horizontal plane** is created by an imaginary line dividing the body at any level into superior and inferior parts and is always perpendicular to the median plane.

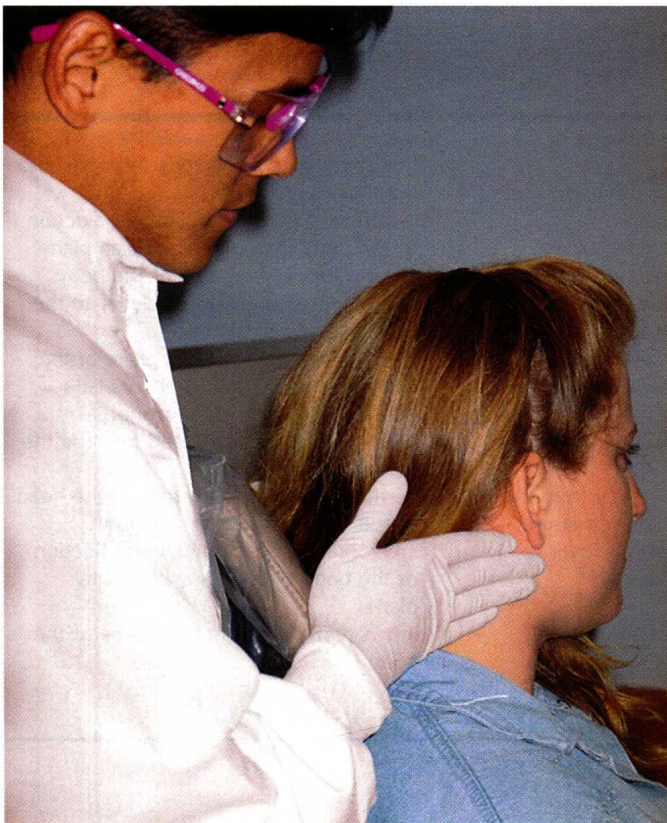


FIGURE 1-1 Extraoral examination of the patient (as well as intraoral examination) is based on an understanding of head and neck anatomy.

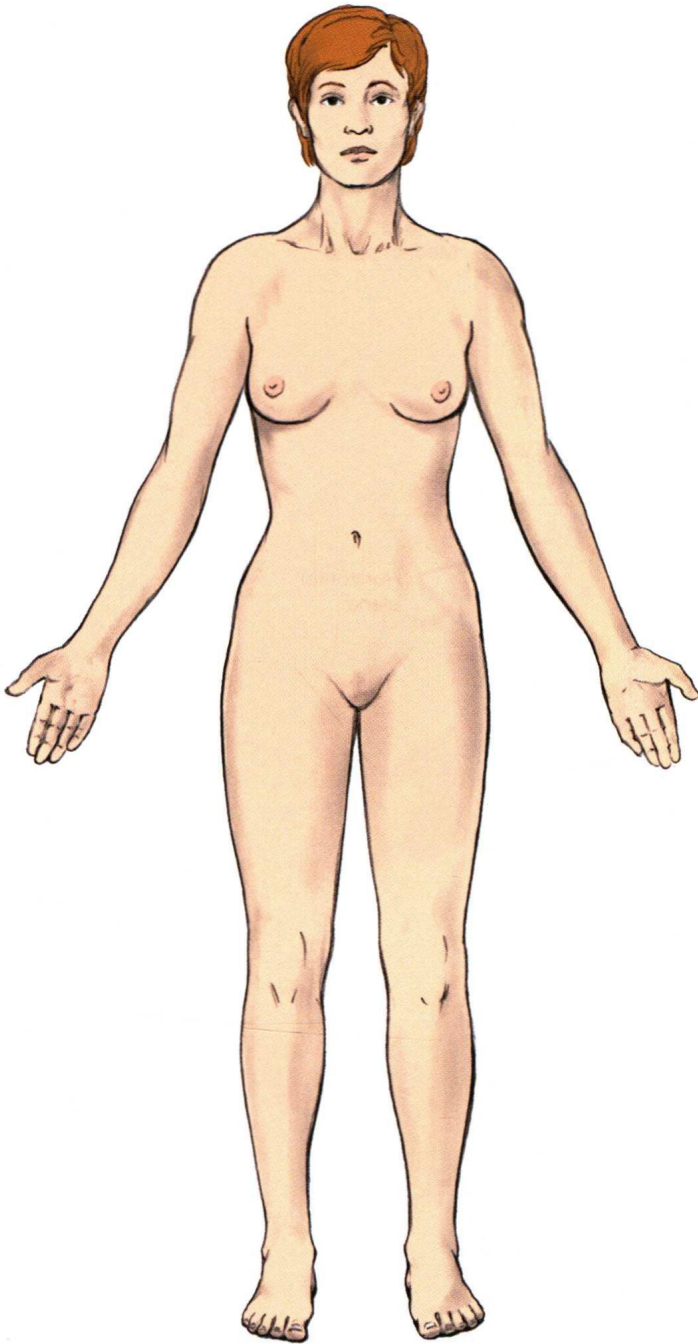


FIGURE 1-2 Body in anatomic position.

Parts of the body in anatomic position can also be described in relationship to these planes (Figure 1-5). A structure located at the median plane (e.g., the nose) is considered **median**. An area closer to the median plane of the body or structure is considered **medial**. An area farther from the median plane of the body or structure is considered **lateral**. For example, the eyes are medial to the ears, and the ears are lateral to the eyes.

Terms can be used to describe the relationship of parts of the body in anatomic position. An area closer to the median plane is considered by anatomists to be **proximal**, and an area farther from the median plane is **distal**. For example, in the upper limb the shoulder is proximal and the fingers are distal.

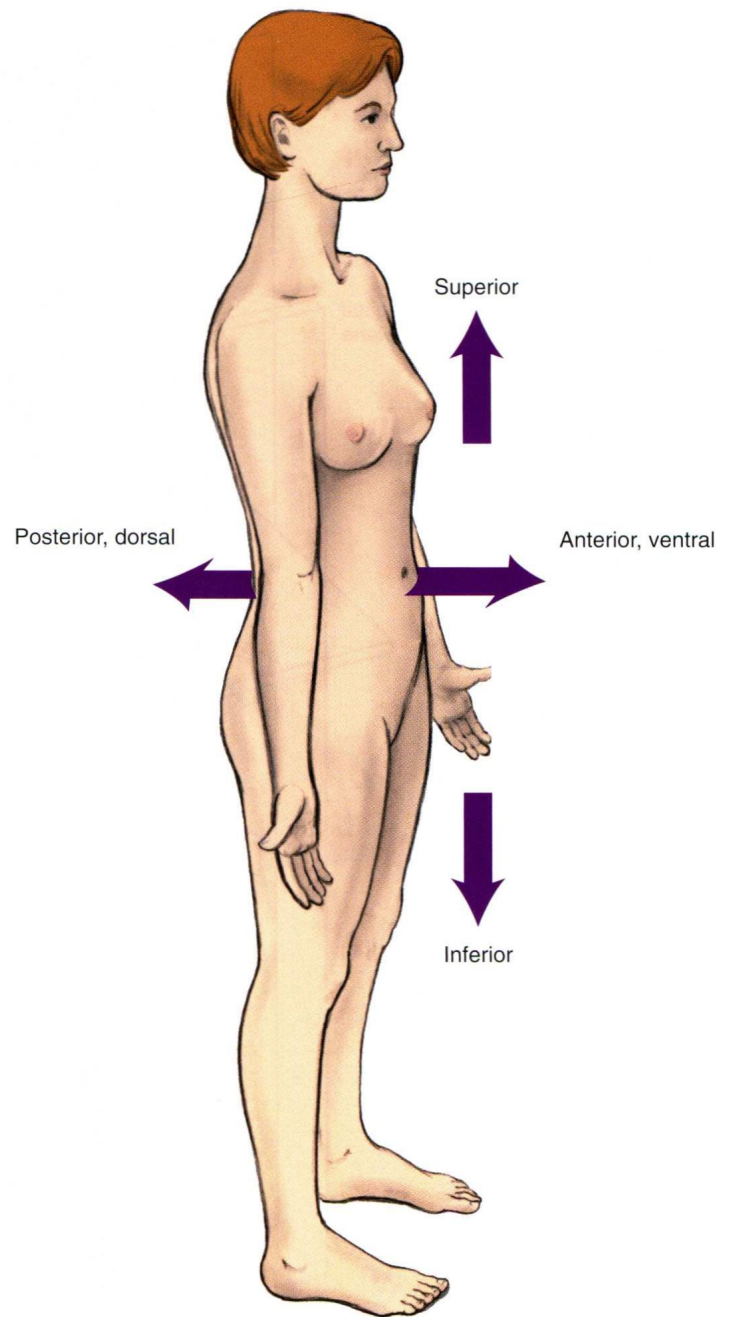


FIGURE 1-3 Body in anatomic position with the anterior (or ventral), posterior (or dorsal), superior, and inferior areas noted.

Additional terms can be used to describe relationships between structures. A structure on the same side of the body is considered **ipsilateral**. A structure on the opposite side of the body is considered **contralateral**. For example, the right leg is ipsilateral to the right arm but contralateral to the left arm.

Certain terms can be used to give information about the depth of a structure in relationship to the surface of the body. A structure located toward the surface of the body is **superficial**. A structure located inward, away from the body surface, is **deep**. For example, the skin is superficial, and the bones are deep.

Terms also can be used to give information about location in hollow structures such as the braincase of the skull. The inner side of

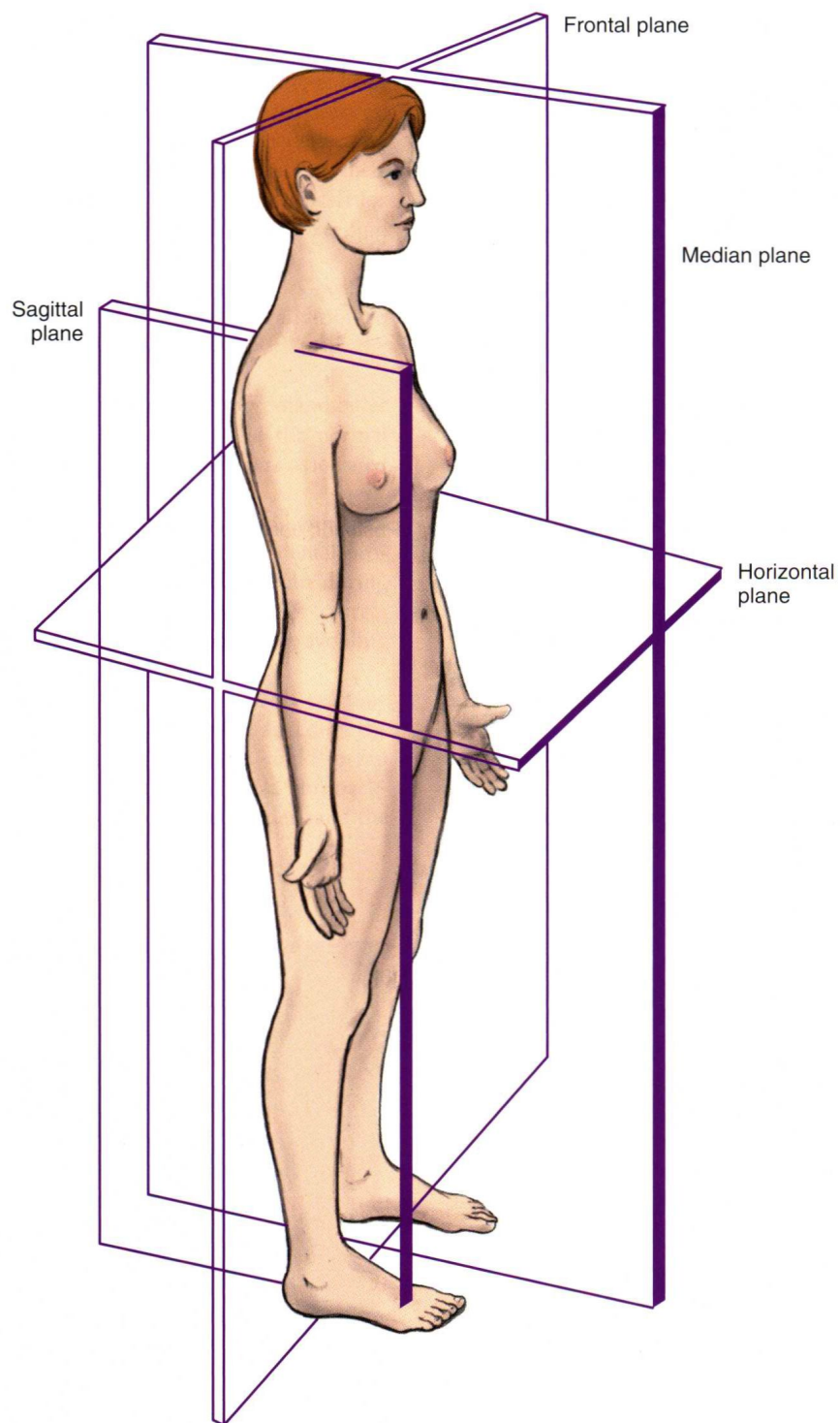


FIGURE 1-4 Body in anatomic position with the median, sagittal, horizontal, and frontal planes noted.

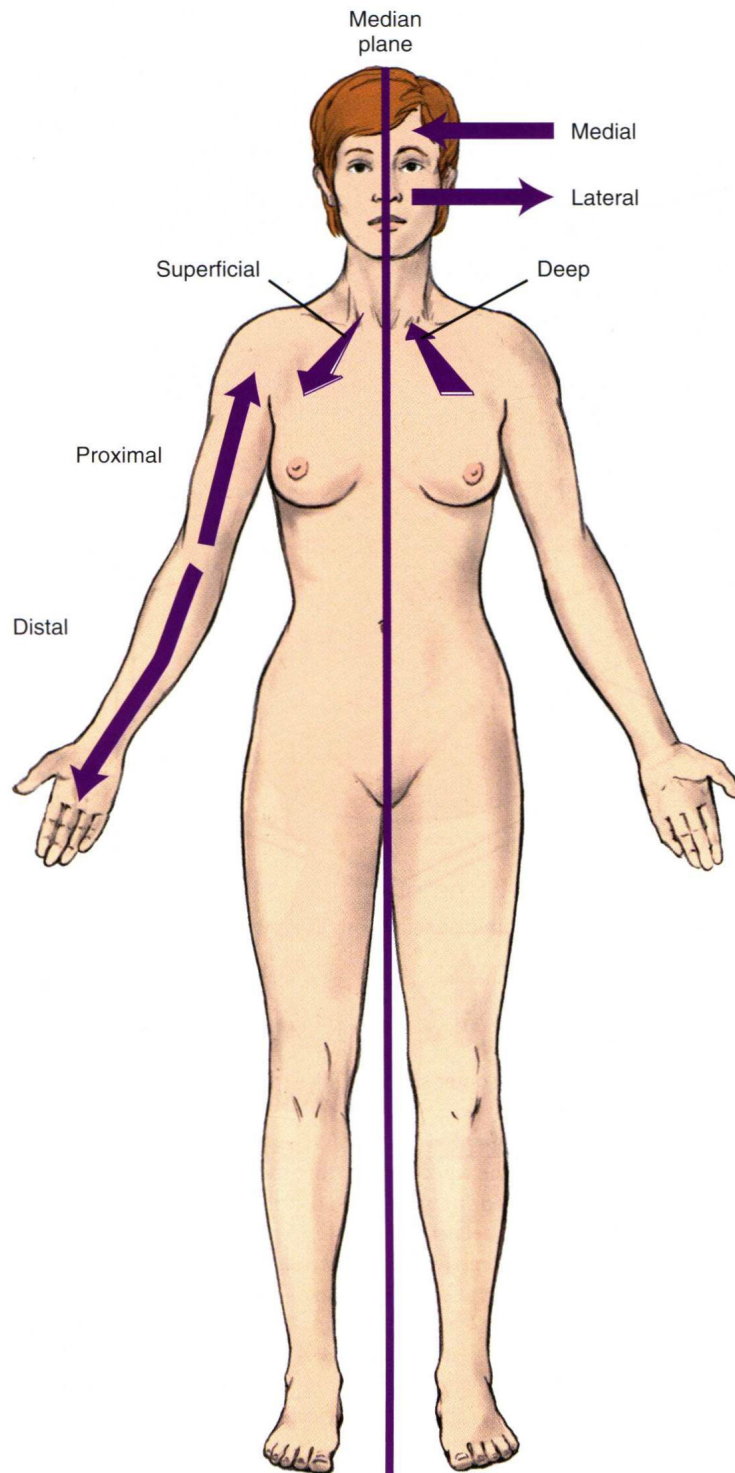


FIGURE 1-5 Body in anatomic position with the medial (or proximal), lateral (or distal), and superficial (or deep) areas noted.

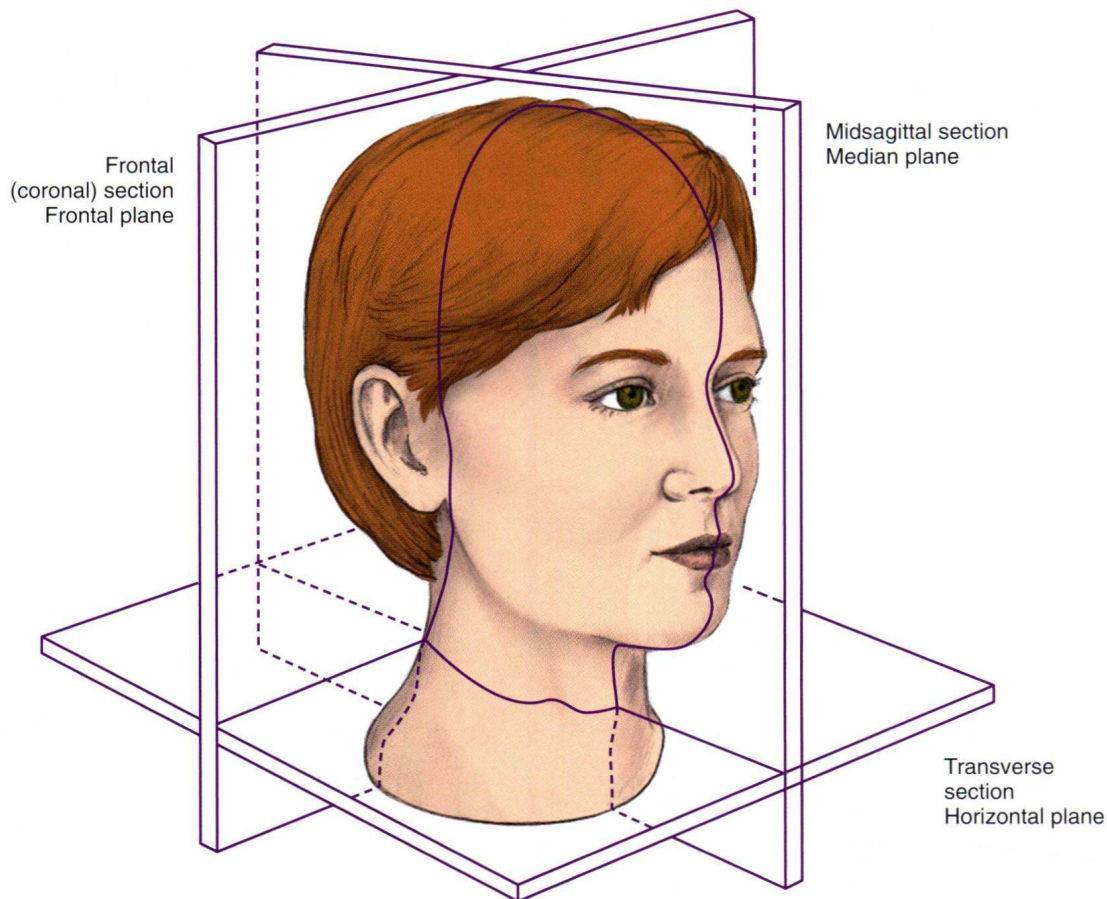


FIGURE 1-6 Head and neck in anatomic position with the midsagittal, transverse, and frontal sections and related planes noted.

the wall of a hollow structure is referred to as **internal**. The outer side of the wall of a hollow structure is **external**.

The body or parts of it in anatomic position can also be divided into sections along various planes in order to study the specific anatomy of a region (Figure 1-6). The **midsagittal section** or *median section* is a division through the median plane. The **frontal section** or *coronal section* is a division through any frontal plane. The **transverse section** or *horizontal section* is a division through a horizontal plane.

It is important to keep in mind when looking at diagrams or even clinical photographs, especially those of dissections, to first note any directional aids (e.g., view, section) and then pick out a familiar structure (e.g., apex of tongue or nose, mandible) to allow for orientation. This process will help in the study of the head and neck.

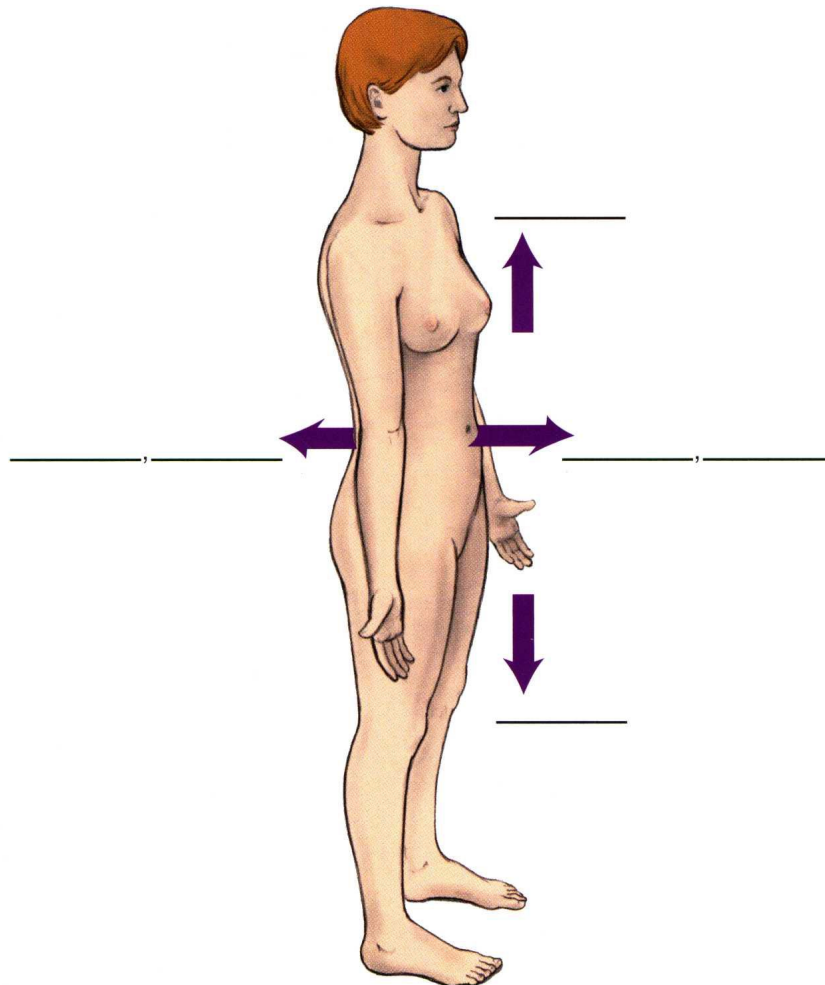
NORMAL ANATOMIC VARIATION

When studying anatomy, the dental professional must understand that there can be anatomic variations of head and neck structures that are still within normal limits. The number of bones and muscles in the head and neck is usually constant, but specific details of these structures can vary from patient to patient. Bones may have different sizes of processes. Muscles may differ in size and details of their attachments. Joints, vessels, nerves, glands, lymph nodes, fasciae, and spaces of an individual can vary in size, location, and even presence. The most common variations of the head and neck that affect dental treatment are discussed in this text.

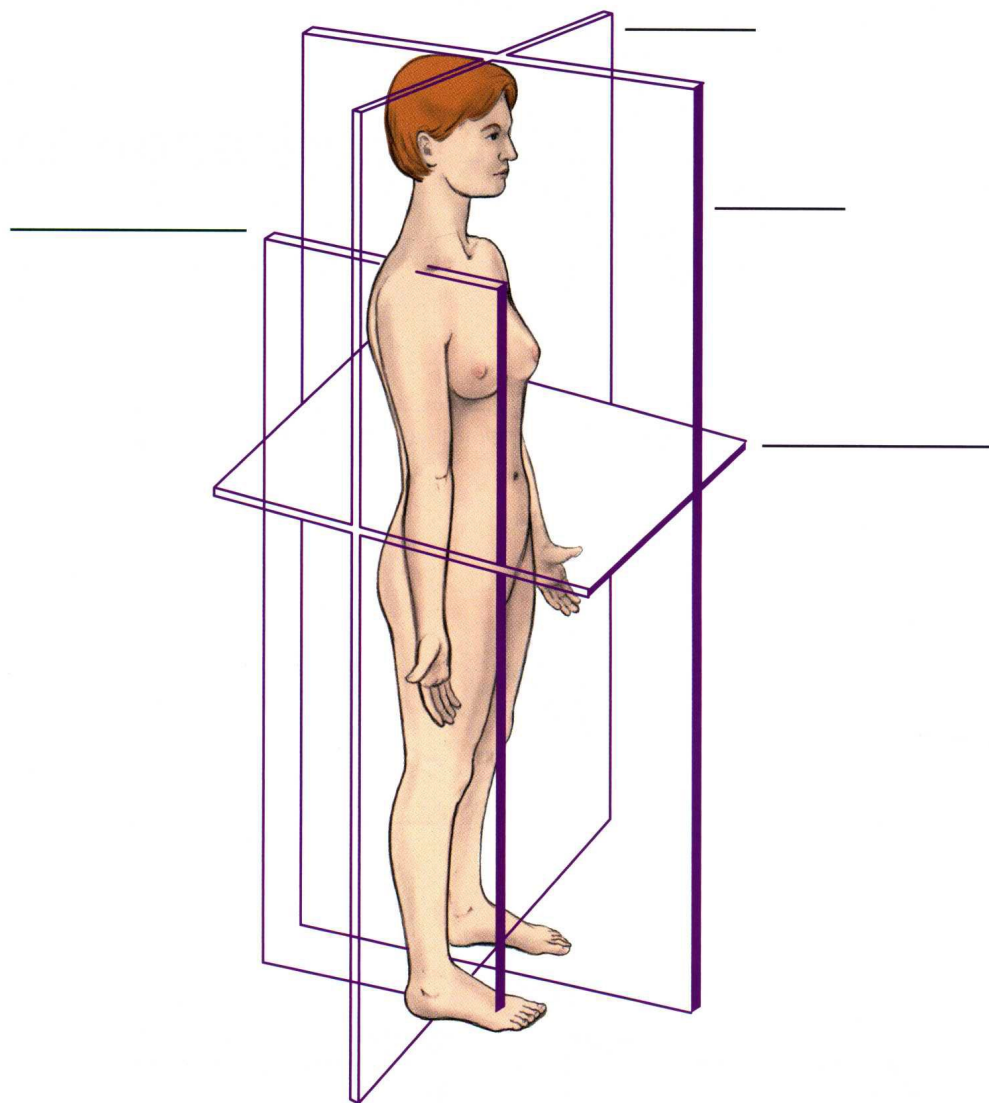
Identification Exercises

Identify the structures on the following diagrams by filling in each blank with the correct anatomic term. You can check your answers by looking back at the figure indicated in parentheses for each identification diagram.

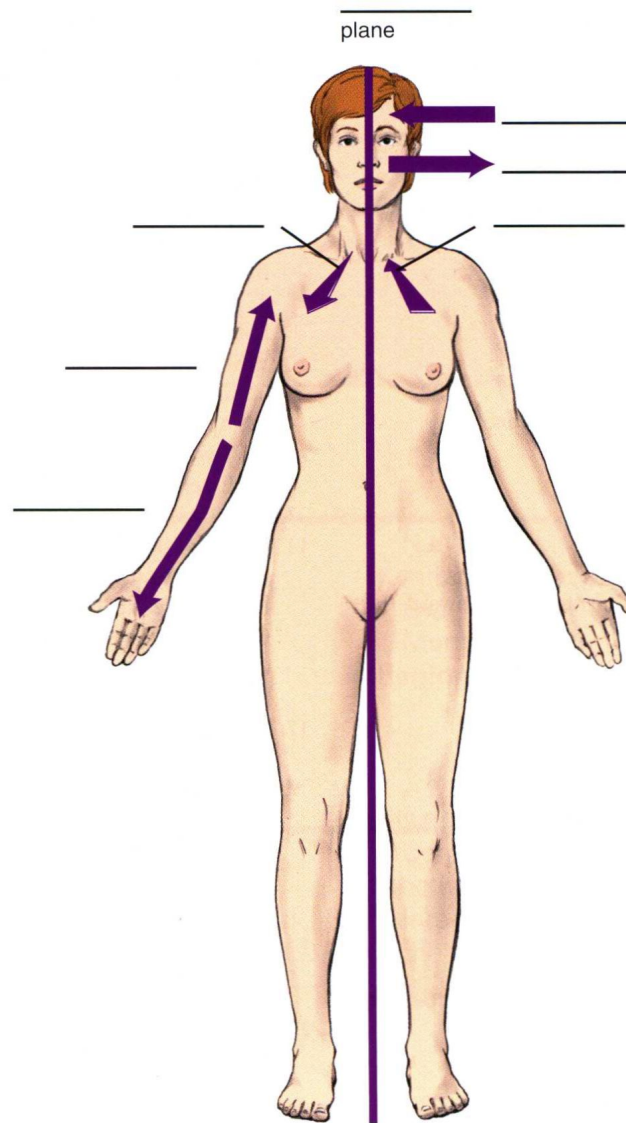
1. (Figure 1-3)



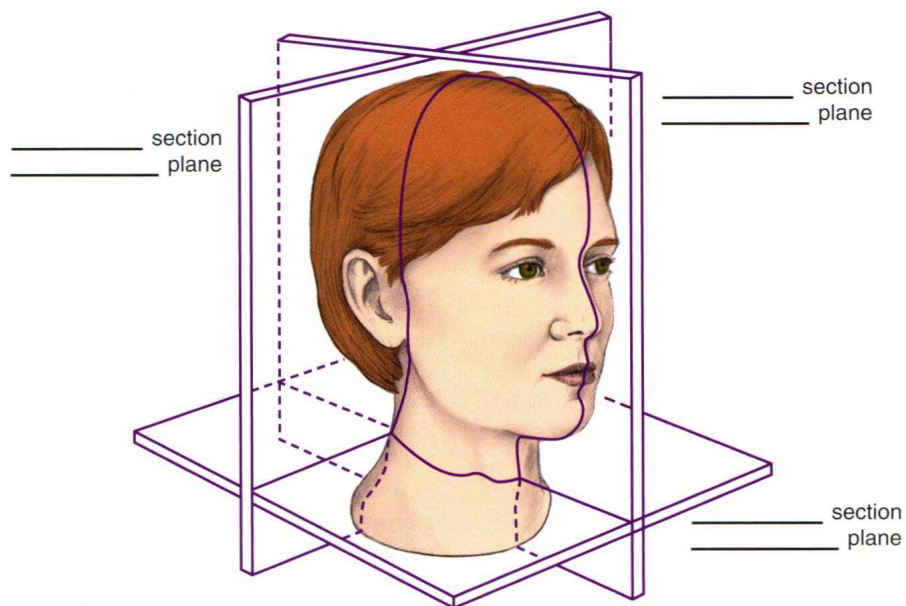
2. (Figure 1-4)



3. (Figure 1-5)



4. (Figure 1-6)



REVIEW QUESTIONS

- Which of the following planes divides the body in anatomic position into right and left halves?
 - Horizontal plane
 - Median plane
 - Coronal plane
 - Frontal plane
- Which of the following terms is used to describe an area of the body that is farther from the median plane?
 - Proximal
 - Lateral
 - Medial
 - Ipsilateral
 - Contralateral
- Structures on the same side of the body are considered
 - proximal.
 - lateral.
 - medial.
 - ipsilateral.
 - contralateral.
- An area of the body in anatomic position that faces toward the head is considered
 - inferior.
 - superior.
 - proximal.
 - distal.
 - dorsal.
- Through which plane of the body in anatomic position is a midsagittal section taken?
 - Horizontal plane
 - Median plane
 - Coronal plane
 - Frontal plane
- Which of the following statements concerning anatomic position is CORRECT?
 - Body is erect with eyes looking forward.
 - Arms are at sides with palms directed backward.
 - Arms are behind the head with toes directed forward.
 - Body is supine with eyes closed.
- Which of the following sections is considered also a horizontal section?
 - Midsagittal section
 - Transverse section
 - Frontal section
 - Median section
- Structures that are located inward, away from the body surface, are considered
 - distal.
 - superficial.
 - deep.
 - contralateral.
 - external.
- Which of the following planes divides any part of the body further into anterior and posterior parts?
 - Sagittal plane
 - Horizontal plane
 - Frontal plane
 - Median plane
- Which of the following is a CORRECT statement concerning human anatomy?
 - Apex of a conical structure is the flat base.
 - Two halves of the body are completely symmetric.
 - External surface is the inner wall of a hollow structure.
 - Joints, vessels, nerves, glands, and nodes vary in size.
- Which of the following is a CORRECT statement when considering facial features?
 - Ears are medial to the nose.
 - Ears are lateral to the nose.
 - Ears are medial to the eyes.
 - Mouth is lateral to the nose.
- Proximal refers to a body part that is
 - closer to the medial plane of the body than another part.
 - farther from the medial plane of the body than another part.
 - farther from the point of attachment to the body than another part.
 - closer to the point of attachment to the body than another part.
- The median plane placed through the body will divide the right arm and the
 - right leg.
 - brain.
 - nose.
 - left leg.
- A frontal plane placed through the body will ALWAYS bisect the
 - nose.
 - mouth.
 - arms.
 - eyes.
- If a transverse plane occurs through the navel, which of the following statements is CORRECT?
 - Chest and ears will be on different part of the body.
 - Chest and knees will be on the same part of the body.
 - Feet and knees will be on different parts of the body.
 - Thighs and feet will be on the same part of the body.

Surface Anatomy

CHAPTER OUTLINE

Surface Anatomy Overview

Regions of Head

Frontal Region
Parietal and Occipital Regions
Temporal and Auricular Regions
Orbital Region

Nasal Region

Infraorbital, Zygomatic, and Buccal Regions

Oral Region

Mental Region

Regions of Neck

LEARNING OBJECTIVES

1. Define and pronounce the **key terms** and **anatomic terms** in this chapter.
2. Discuss how the surface anatomy of the face and neck may impact dental clinical procedures.
3. Locate and identify the regions and associated surface landmarks of the head and neck on a diagram and a patient.
4. Correctly complete the review questions and activities for this chapter.
5. Integrate an understanding of surface anatomy into the clinical practice of dental procedures.

KEY TERMS

Buccal (buk-al) Structures closest to the inner cheek.

Facial Structure closest to the facial surface.

Golden Proportions Guidelines used to consider the facial view of the anterior teeth or the vertical dimensions of the face to create a pleasing proportion.

Labial (lay-be-al) Structures closest to the lips.

Lingual (ling-gwal) Structures closest to the tongue.

Palatal (pal-ah-tal) Structures closest to the palate.

Surface Anatomy Study of the structural relationships of the external features of

the body to the internal organs and parts.

Vertical Dimension of the Face Face divided into thirds.

SURFACE ANATOMY OVERVIEW

The dental professional must be thoroughly familiar with the surface anatomy of the head and neck in order to examine patients. **Surface anatomy** is the study of the structural relationships of the external features of the body to the internal organs and parts. The features of the surface anatomy provide essential landmarks for many of the deeper anatomic structures that will be discussed and examined in subsequent chapters. Thus the examination of these accessible surface features by visualization and palpation can give vital information about the health of deeper tissue ([Appendix B](#)). Any changes noted in these surface features must be recorded by the dental professional

in the patient record. In addition, procedures in dental practice are related to the anatomic features of the head and neck (see [Chapter 1](#)).

A certain amount of variation in surface features is within a normal range. However, a change in surface features in a given person may signal a condition of clinical significance. Thus it is not variations among individuals but changes in a particular individual that should be noted. The underlying histologic and embryologic concerns may also help in the study of a patient's head and neck; therefore, related reference materials may need to be reviewed ([Appendix A](#)).

The study of anatomy of the head and neck begins with the division of the surface into regions. Within each region are certain surface