

base of skull anatomy ct

base of skull anatomy ct is a vital area of study in radiology that focuses on the intricate structures located at the base of the skull. Understanding the anatomy in this region is crucial for diagnosing various medical conditions, including traumatic injuries, tumors, and congenital anomalies. This article delves into the detailed anatomy of the base of the skull, the role of CT imaging in visualizing this area, and the common pathologies that can be identified through CT scans. Additionally, we will explore the interpretation of CT images, the advantages and limitations of CT in this context, and the implications for clinical practice.

The following sections will provide a comprehensive overview of base of skull anatomy CT, making it an essential read for medical professionals and students alike.

- Understanding the Base of Skull Anatomy
- The Role of CT Imaging
- Common Pathologies Detected via CT
- Interpreting CT Images of the Base of Skull
- Advantages and Limitations of CT Imaging
- Clinical Implications and Future Directions

Understanding the Base of Skull Anatomy

The base of the skull, also known as the cranial base, is comprised of several key structures that play essential roles in supporting the brain and facilitating vital functions. This region houses important foramina through which cranial nerves and blood vessels travel.

Key Structures

The base of the skull can be divided into three primary regions: the anterior cranial fossa, the middle cranial fossa, and the posterior cranial fossa.

- **Anterior Cranial Fossa:** Contains the frontal lobes of the brain and is formed by the frontal bone and the ethmoid bone.
- **Middle Cranial Fossa:** Houses the temporal lobes and parts of the sphenoid bone,

including the sella turcica, which contains the pituitary gland.

- **Posterior Cranial Fossa:** Encloses the cerebellum and brainstem and is bordered by the occipital bone.

These regions are interconnected through various foramina, including the optic canal, superior orbital fissure, and foramen magnum, allowing the passage of essential neural and vascular structures.

Associated Anatomical Features

In addition to the main fossa, several features are significant in the base of skull anatomy:

- **Foramina:** Openings that allow nerves and blood vessels to enter and exit the cranial cavity.
- **Sutures:** Joints between the bones of the skull, such as the lambdoid and sagittal sutures, crucial for skull stability.
- **Sinuses:** Air-filled spaces within the skull bones, including the sphenoid and ethmoid sinuses, affecting pressure and drainage.

Understanding these structures is fundamental for interpreting CT scans accurately and identifying any abnormalities.

The Role of CT Imaging

Computed Tomography (CT) is a powerful imaging modality that provides high-resolution images of the skull's anatomy. It is particularly valuable in evaluating the base of the skull due to its ability to visualize complex structures in detail.

CT Imaging Techniques

CT imaging of the base of the skull typically involves:

- **Multislice CT Scanners:** These allow for rapid acquisition of images, reducing motion artifacts and improving clarity.
- **Contrast Enhancement:** Intravenous contrast agents are often used to enhance the visibility of vascular structures and lesions.

- **3D Reconstruction:** Advanced software can create three-dimensional models of the skull, aiding in surgical planning and diagnosis.

These techniques facilitate a comprehensive assessment of the anatomical structures and any pathological changes.

Indications for CT of the Base of Skull

CT scans of the base of the skull are indicated in various clinical scenarios, including:

- **Trauma:** To assess for fractures and intracranial hemorrhage.
- **Neoplasms:** To evaluate tumors affecting the cranial cavity.
- **Infections:** To identify abscesses or osteomyelitis in the skull base.

Effective use of CT imaging aids in timely diagnosis and management of these conditions.

Common Pathologies Detected via CT

CT imaging is crucial for diagnosing various conditions affecting the base of the skull.

Traumatic Injuries

Trauma to the base of the skull can lead to:

- **Fractures:** Basilar skull fractures can result in complications like cerebrospinal fluid leaks.
- **Hemorrhage:** Intracranial bleeding may occur as a result of trauma, necessitating prompt evaluation.

Neoplasms

Tumors may arise in or metastasize to the base of the skull, leading to:

- **Meningiomas:** Common extra-axial tumors that can be clearly visualized on CT.
- **Chordomas:** Rare tumors that occur at the cranial base and can cause significant structural changes.

Infectious Processes

Infections in the cranial base can be serious and include:

- **Osteomyelitis:** Infection of the skull bones may be detected via CT.
- **Abscess Formation:** CT can help locate and assess abscesses in the skull base.

Recognizing these pathologies early is key to effective treatment.

Interpreting CT Images of the Base of Skull

Accurate interpretation of CT images requires a thorough understanding of the expected anatomical features and common pathological findings.

Key Considerations in Interpretation

When interpreting CT scans of the base of the skull, radiologists should consider:

- **Bone Density:** Changes in bone density can indicate pathology such as infection or tumor.
- **Soft Tissue Analysis:** Evaluating the soft tissue structures surrounding the cranial base is crucial for identifying abnormalities.
- **Vascular Structures:** Assessing the course and condition of vessels can help identify vascular diseases.

These considerations are essential for accurate diagnosis and management planning.

Advantages and Limitations of CT Imaging

CT imaging offers several advantages in evaluating the base of the skull, but there are also limitations to be aware of.

Advantages

- **Speed:** CT scans can be performed quickly, making them ideal for emergency situations.
- **Detail:** High-resolution images provide excellent detail of bony structures and some soft tissues.
- **Accessibility:** CT is widely available in medical facilities, allowing for rapid assessment.

Limitations

However, CT imaging does have its limitations:

- **Radiation Exposure:** CT involves exposure to ionizing radiation, which must be managed carefully.
- **Soft Tissue Contrast:** While CT is excellent for bone detail, it may not provide the best soft tissue contrast compared to MRI.

Awareness of these factors is critical for selecting the appropriate imaging modality.

Clinical Implications and Future Directions

The study of base of skull anatomy via CT imaging has significant clinical implications. Accurate imaging and interpretation can lead to improved patient outcomes through timely diagnosis and intervention.

Future Directions

Advancements in imaging technology and techniques hold promise for the future,

including:

- **Improved Reconstruction Techniques:** Enhanced imaging algorithms may offer better visualization of complex anatomy.
- **Integration with Artificial Intelligence:** AI could aid in identifying abnormalities more efficiently.
- **Non-Invasive Techniques:** Research into alternative imaging modalities may reduce reliance on CT while maintaining diagnostic accuracy.

As these innovations develop, they will further refine the evaluation of base of skull anatomy and enhance patient care.

Q: What is the base of skull anatomy?

A: The base of skull anatomy refers to the structures at the bottom of the skull, including the anterior, middle, and posterior cranial fossae, as well as various foramina, sutures, and sinuses that house and protect the brain.

Q: Why is CT imaging used for the base of skull examination?

A: CT imaging is used for the base of skull examination because it provides high-resolution images that can reveal detailed information about the bony structures, soft tissue abnormalities, and vascular conditions, making it essential for diagnosing trauma, tumors, and infections.

Q: What common pathologies can CT detect in the base of skull?

A: Common pathologies that CT can detect in the base of skull include traumatic fractures, hemorrhages, neoplasms such as meningiomas and chordomas, and infectious processes like osteomyelitis and abscesses.

Q: What are the advantages of using CT for base of skull imaging?

A: The advantages of using CT for base of skull imaging include its speed, detail in visualizing bony structures, and accessibility in medical facilities, making it ideal for emergency situations.

Q: What are the limitations of CT imaging in this context?

A: Limitations of CT imaging include exposure to ionizing radiation and relatively poor soft tissue contrast compared to MRI, which can affect the evaluation of certain conditions.

Q: How can CT images of the base of skull be interpreted effectively?

A: Effective interpretation of CT images of the base of skull involves assessing bone density, analyzing soft tissue structures, and evaluating the condition of vascular elements, while being aware of normal anatomical landmarks.

Q: What future advancements are expected in CT imaging for the base of skull?

A: Future advancements in CT imaging for the base of skull may include improved reconstruction techniques, integration with artificial intelligence for enhanced diagnosis, and the development of non-invasive imaging alternatives.

Q: What role does contrast enhancement play in CT imaging of the base of skull?

A: Contrast enhancement in CT imaging of the base of skull helps improve the visibility of vascular structures and lesions, making it easier to identify abnormalities and assess their extent.

Q: Can CT scans of the base of skull be performed in emergency situations?

A: Yes, CT scans of the base of skull can be performed in emergency situations due to their rapid acquisition time and ability to provide critical information for trauma assessment.

Q: What is the significance of foramina in the base of skull anatomy?

A: The foramina in the base of skull anatomy are significant because they allow for the passage of cranial nerves and blood vessels, playing essential roles in neurological function and vascular supply to the brain.

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base of skull anatomy ct: ExpertDDX: Head and Neck - E-Book Bernadette L. Koch, Bronwyn E. Hamilton, 2019-08-19 Now fully revised and up-to-date, Expert DDX: Head and Neck, 2nd edition, quickly guides you to the most likely differential diagnoses based on key imaging findings and clinical information. Expert radiologists Bernadette L. Koch, MD and Bronwyn E. Hamilton, MD present more than 160 cases across a broad spectrum of head and neck diseases, classified by specific anatomic locations, generic imaging findings, modality-specific findings, and clinically based indications. Readers will find authoritative, superbly illustrated guidance for defining and reporting useful, actionable differential diagnoses that lead to definitive findings in every area of the head and neck. - Presents at least eight clear, sharp, succinctly annotated images for each diagnosis (more than 2,500 annotated images in all); a list of diagnostic possibilities sorted as common, less common, and rare but important; and brief, bulleted text offering helpful diagnostic clues - Shows both typical and variant manifestations of each possible diagnosis - Includes new cases, expanded differential considerations, new references, and updated imaging throughout - Covers hot topics such as the evolving role of imaging with respect to many head and neck conditions, new ACR white paper recommendations on incidental thyroid nodule work-up, an expanding number of recognized genetic and syndromic diseases, updated information about IgG-4 related disease imaging manifestations in the head and neck, and how progressive information on HPV-related head and neck cancer impacts prognosis and treatment

base of skull anatomy ct: Applications of Three-dimensional Imaging for Craniofacial Region Shailendra Singh Rana, Prabhat Kumar Chaudhari, Abhishek Gupta, 2024-10-18 The book provides sound knowledge of 3D imaging of dentofacial craniofacial region. It guides the students and faculty for understanding the dentofacial craniofacial region in depth. It incorporates the latest techniques, frameworks and technologies in the imaging area of oral health. The book emphasizes on the dentofacial and craniofacial region and thus fills the gap in the medical imaging literature. The development in this book is not only on the imaging techniques but also emphasis will be on the

three-dimensional (3D) frameworks to deal the patients for their diagnosis and treatment planning. The chapters of this book are designed in such a way that the readers may get the complete package of the exploration of the imaging clinical applications of craniofacial areas. This book will be helpful not only for the students and faculty but also for the researchers working in the relevant areas. This book will provide easy, simple way but the most authentic material to learn the craniofacial region imaging. In this manual we will incorporates authentic, internationally accepted terms and definition. To make it interesting and simple, our approach is to incorporate the material in systematic manner in a simple and easy way by incorporating maximum illustrations and flowcharts. This book provides sound knowledge of various advanced technologies for dentist imaging. This book will highlights the importance and explore the current research in the dentofacial and craniofacial areas.

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base of skull anatomy ct: Dual Energy CT: Applications in Head and Neck and Neurologic Imaging, An Issue of Neuroimaging Clinics of North America Reza Forghani, Hillary R. Kelly, 2017-08-01 This issue of Neuroimaging Clinics of North America focuses on Dual Energy CT: Applications in Neurologic, Head and Neck Imaging, and is edited by Drs. Reza Forghani and Hillary R. Kelly. Articles will include: Dual Energy CT: Physical Principles and Approaches to Scanning, Part 1; Dual Energy CT: Physical Principles and Approaches to Scanning, Part 2; Dual Energy CT Applications for Differentiation of Intracranial Hemorrhage, Calcium, and Iodine; Dual Energy CT Angiography of the Head and Neck and Related Applications; Miscellaneous and Emerging Applications of Dual Energy CT for the Evaluation of Intracranial Pathology; Applications of Dual Energy CT for the Evaluation of Head and Neck Squamous Cell Carcinoma; Dual Energy CT Applications for the Evaluation of Cervical Lymphadenopathy; Miscellaneous and Emerging Applications of Dual Energy CT for the Evaluation of Pathologies in the Head and Neck; Dual Energy CT Applications for the Evaluation of the Spine; Applications of Dual Energy CT for Artifact Reduction in the Head, Neck, and Spine; Advanced Tissue Characterization and Texture Analysis

using Dual Energy CT: Horizons and Emerging Applications; and more!

base of skull anatomy ct: Radiology at a Glance Rajat Chowdhury, Iain Wilson, Christopher Rofe, Graham Lloyd-Jones, 2013-07-08 Following the familiar, easy-to-use at a Glance format, and in full-colour, this brand new title provides an accessible introduction and revision aid for medical students and students of radiography and physiotherapy. Reflecting changes to the content and assessment methods used in medical education, Radiology at a Glance provides a user-friendly overview of radiology to encapsulate all that the student needs to know. Radiology at a Glance: Addresses the basic concepts of radiation physics and radiation protection together with a structured approach to image interpretation Offers coverage of the radiology of plain X-rays, fluoroscopy, ultrasound, CT, MRI, intervention, and nuclear medicine Presents both theory and clinical practice through theoretical and case-based chapters Features common and classic cases in each chapter Includes OSCE preparation and self-assessment chapters with self-test radiographs Provides easy access tables to help assess which radiological procedures are most appropriate for specific clinical problems Allows for quick, easy access and reference whilst on the wards Reflects the rapidly evolving impact of interventional radiology in managing patients Includes a Foreword by the President of the Royal College of Radiologists For further information, please visit www.ataglanceseries.com and www.wileymedicaleducation.com This title is also available as a mobile App from MedHand Mobile Libraries. Buy it now from Google Play or the MedHand Store.

base of skull anatomy ct: Otorhinolaryngology- Head & Neck Surgery Chris de Souza, 2017-12-31 Otorhinolaryngology- Head & Neck Surgery is the latest edition of this comprehensive two-volume guide to all the sub-specialties of otorhinolaryngology, including brand new chapters and the most recent developments in the field. The two volumes are divided into six extensive sections, covering rhinology; endoscopic sinus surgery; facial plastics; head and neck, cranial base and oncology; laryngology; otology. In this new edition, endoscopic sinus surgery is given its own section encompassing all aspects of this surgery, and an entirely new section on otology is comprised of 37 chapters including otitis media and cochlear implants. The facial plastics section provides information on dermabrasion, chemical peels, laser treatment, botox and rhinoplasty, amongst many other topics. New topics in this edition include laryngopharyngeal reflux, trauma and stenosis of the larynx, and laryngeal cancer, bringing the text firmly up to date. Illustrated in full colour across 2000 pages, this vast two-volume set is an ideal source of reference for otorhinolaryngology practitioners and residents. Key Points New edition of comprehensive two volume set covering all sub-specialties in otorhinolaryngology Previous edition published 2009 (9788184486797) New sections on endoscopic sinus surgery and otology New topics include laryngopharyngeal reflux, trauma and stenosis of the larynx, and laryngeal cancer

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Imaging of the head and neck, the cardiovascular system, the abdomen, and the lungs is covered in depth, describing the application of multislice CT in a variety of tumors and other pathologies. Emerging fields such as pediatric imaging and CT-guided interventions are fully addressed, and emergency CT is also covered. Radiation exposure, dual-energy imaging, contrast enhancement, image postprocessing, CT perfusion imaging, and CT angiography all receive close attention. The new edition has been comprehensively revised and complemented by contributions from highly experienced and well-known authors who offer diverse perspectives, highlighting the possibilities offered by the most modern multidetector CT systems. This book will be particularly useful for general users of CT systems who wish to upgrade and enhance not only their machines but also their knowledge.

base of skull anatomy ct: Specialty Imaging: Temporomandibular Joint and Sleep-Disordered Breathing E-Book Dania Tamimi, 2023-04-08 Meticulously updated by board-certified oral and maxillofacial radiologist, Dr. Dania Tamimi and her team of sub-specialty experts, *Specialty Imaging: Temporomandibular Joint and Sleep-Disordered Breathing*, second edition, is a comprehensive reference ideal for anyone involved with TMJ imaging or SDB, including oral and maxillofacial radiologists and surgeons, TMJ/craniofacial pain specialists, sleep medicine specialists, head and neck radiologists, and otolaryngologists. This detailed, beautifully illustrated volume covers recent advances in the diagnosis and treatment of both the TMJ and SDB, including how related structures are affected. Employing a multifaceted, multispecialty approach, the clinical perspectives and imaging expertise of today's research specialists are brought together in a single, image-rich, easy-to-read text. - Reflects the current emphasis on holistic diagnosis and treatment not just of the TMJ but of all related structures that can be adversely affected by any TMJ dysfunction - Examines a variety of presenting clinical signs or symptoms, discusses imaging strategies and the associated conditions revealed by imaging, and helps you develop differential diagnoses - Provides current, detailed information on the relationship between TMJ disorders and SDB, how imaging shows the correlation between the two, and risk factors for SDB - Includes upper respiratory tract diagnoses, with multiple subsections on the nasal cavity, paranasal sinuses, nasopharynx, oropharynx, and hypopharynx, each with multiple new chapters - Features new chapters on ultrasonography of the TMJ and upper respiratory tract, new content on 3D and 4D modeling and surface rendering, a new section on imaging of upper respiratory tract procedures, and new content detailing the tie-in between occlusion and SDB - Includes an expanded Modalities section that includes new chapters on formulating a TMJ/upper respiratory tract report; plain film imaging of the TMJ and upper respiratory tract; CBCT analysis of the upper respiratory tract; dynamic MR of the TMJ and upper respiratory tract, and ultrasound of the TMJ - Covers the role that TMJ plays in facial growth and development, stomatognathic system function, and how TMJ abnormalities change the dimensions of the facial skeleton and surrounding structures - Contains over 5,000 print and online-only images (more than 300 are new), including radiologic images, full-color medical illustrations, and histologic and gross pathology photographs - Reflects updates to the Research Diagnostic Criteria for Temporomandibular Disorders (RDC-TMD)—the major clinical classification method and a key tool to assess/diagnose TMJ issues and facilitate communication for consultants, referrals, and prognoses

base of skull anatomy ct: Sataloff's Comprehensive Textbook of Otolaryngology: Head & Neck Surgery Robert T Sataloff, Anil K. Lalwani, Marvin P. Fried, Christopher J Hartnick, Abtin Tabaei, Michael S. Benninger, 2015-11-30 *Sataloff's Comprehensive Textbook of Otolaryngology: Head & Neck Surgery - Pediatric Otolaryngology* is part of a multi-volume textbook covering basic and clinical science across the entire field of otolaryngology. Volumes in the set include; otology, neurotology and skull-based surgery; rhinology, allergy and immunology; facial plastic and reconstructive surgery; laryngology and head and neck surgery. The full set is enhanced by over 5000 full colour images and illustrations, spanning nearly 6000 pages, complete with a comprehensive index on DVD. Edited by Robert T Sataloff from Drexel University College of Medicine, Philadelphia, this volume includes contributions from internationally recognised experts in

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base of skull anatomy ct: *Imaging of the Post Treatment Head and Neck, An Issue of Neuroimaging Clinics of North America, E-Book* Prashant Raghavan, Robert E. Morales, Sugoto Mukherjee, 2021-11-30 In this issue of Neuroimaging Clinics, guest editors Drs. Prashant Raghavan, Robert E. Morales, and Sugoto Mukherjee bring their considerable expertise to the topic of Imaging of the Post-Treatment Head and Neck. Top experts in the field cover key topics such as imaging of the postoperative temporal bone, imaging after sinonasal surgery, imaging after dental and TMJ surgery, advanced CT and MR imaging of the post-treatment head and neck, and more. - Contains 15 relevant, practice-oriented topics including NI-RADS to predict residual or recurrent head and neck squamous cell carcinoma; lymph node dissection: principles and postoperative imaging; surgical free flaps and grafts in head and neck reconstruction: principles and postoperative imaging; imaging after facial fracture fixation; and more. - Provides in-depth clinical reviews on imaging of the post-treatment head and neck, offering actionable insights for clinical practice. - Presents the latest information on this timely, focused topic under the leadership of experienced editors in the field. Authors synthesize and distill the latest research and practice guidelines to create clinically significant, topic-based reviews.

base of skull anatomy ct: *Atlas of Emergency Imaging from Head-to-Toe* Michael N. Patlas, Douglas S. Katz, Mariano Scaglione, 2025-07-26 This new reference work provides a comprehensive and modern approach to the imaging of numerous non-traumatic and traumatic emergency conditions affecting the human body. It reviews the latest imaging techniques, related

clinical literature, and appropriateness criteria/guidelines, while also discussing current controversies in the imaging of acutely ill patients. The first chapters outline an evidence-based approach to imaging interpretation for patients with acute non-traumatic and traumatic conditions, explain the role of Artificial Intelligence in emergency radiology, and offer guidance on when to consult an interventional radiologist in vascular as well as non-vascular emergencies. The next chapters describe specific applications of Ultrasound, Magnetic Resonance Imaging, radiography, Multi-Detector Computed Tomography (MDCT), and Dual-Energy Computed Tomography for the imaging of common and less common acute brain, spine, thoracic, abdominal, pelvic and musculoskeletal conditions, including the unique challenges of imaging pregnant, bariatric and pediatric patients. There are two new sections for 2nd edition. One section is devoted to imaging of emergency conditions in geriatric patients. The second section covers special considerations in emergency imaging including imaging of intimate partner violence and emergencies in transplant patients. Written by a group of leading North American and European Emergency and Trauma Radiology experts, this book will be of value to emergency and general radiologists, to emergency department physicians and related personnel, to obstetricians and gynecologists, to general and trauma surgeons, as well as trainees in all of these specialties.

base of skull anatomy ct: Surgery of the Sellar Region and Paranasal Sinuses M. Samii, 2012-12-06 The sellar region and paranasal sinuses constitute the anatomical sections of the skull base in which pathological entities warrant interdisciplinary management. Processes originating in the paranasal sinuses can reach and involve the skull base in and around the sella, sometimes not respecting the natural dural boundary. On the other hand, lesions involving the sellar block, such as pituitary adenomas and meningiomas, can also extend downwards into the paranasal sinuses. The orbit and cavernous sinus may be subject to involvement and infiltration by both paranasal and sellar pathology. The advancement and new achievements of modern diagnostic procedures, such as high-resolution CT, three-dimensional reconstruction, MRI, and MRI angiography, as well as the detailed selective angiographic protocols and endovascular techniques, have increased the possibilities for surgical management of this type of pathology with extra- and intracranial involvement. Long-standing and intense interdisciplinary work has led to sophisticated operative approaches which for benign tumors allow total excision with preservation of structures and function, and for some malignant lesions permit an en bloc resection via a combined intracranial-extracranial approach. This volume reflects the work and scientific exchange which took place during the IV International Congress of the Skull Base Study Group, held in Hanover. Leading authorities in the basic sciences including anatomy joined with diagnosticians, clinicians, and surgeons from different fields to evaluate the state of the art of this topic in skull base surgery.

base of skull anatomy ct: Imaging Atlas of Ophthalmic Tumors and Diseases J. Matthew Debnam, 2023-03-09 This atlas describes an array of tumors and diseases that affect the orbit and associated cranial nerves. Often lacking in radiology residency and fellowship training is teaching of the anatomy of the orbit and cranial nerves, as well as the imaging appearance of orbital tumors and diseases that affect these regions. This atlas fills this gap of knowledge with tumors and diseases encountered and treated at MD Anderson Cancer Center, providing a review of the imaging anatomy and the appearance of the tumors and diseases that should aid in formulating a differential diagnosis. The text consists of ten chapters divided into separate anatomic sections followed by an eleventh chapter describing the treated orbit and tumor recurrence. Each of the first ten chapters begins with a description of the relevant anatomy, labeled CT and MRI images and drawings to highlight important anatomic considerations. This is an ideal guide for practicing general radiologists, neuroradiologists and trainees, as well as ophthalmologists, head and neck surgeons, neurosurgeons, medical and radiation oncologists, and pathologists who interpret or review orbital images as part of their daily practice.

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epidemiological and aetiopathogenic factors involved in the development, progression and metastatic spread of head and neck cancers (HNCs). Improvements in diagnostics and imaging techniques, advancements in various treatment modalities, and incorporation of quality-of-life and functional outcomes in HNCs have also significantly influenced the management and outcomes of the disease. This book brings together a broad, comprehensive and balanced view of current approaches to the multidisciplinary management and underlying biology of HNCs. It covers a wide range of exciting new findings in both the clinical and the basic sciences relevant to HNC. International experts in surgical, medical and radiation oncology and the basic sciences have contributed authoritative overviews of the current status and new frontiers in the management of HNCs. The multidisciplinary scope of this book provides the necessary grounding for residents, otolaryngologists and head and neck surgeons, medical and radiation oncologists and allied specialists involved in the management of HNCs.

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