

Review

The Role of Sentinel Node Mapping and Lymphadenectomies in Veterinary Surgical Oncology

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Abstract: Lymph node status is an important prognostic factor in multiple oncologic conditions in humans and companion animals. In addition, the resection of the affected nodes can have a substantial therapeutic effect on various cancer subtypes in both species. Given the impact on prognosis and management, it is paramount to identify and remove affected nodes. While this can be achieved by removing predefined patterns of nodes (regional lymphadenectomy/resection of defined lymphatic stations), modern approaches increasingly utilize sentinel node mapping to identify the draining nodes to decrease the mortality of lymphadenectomies. Recent studies have shown that dogs have more comparable anatomy of the lymphatic system to humans than other animal models such as rodents or pigs. Given the fact that dogs develop spontaneous cancer types that share several similarities to their human counterparts, they represent a valuable translational model. The management of the lymphatic basin and sentinel node mapping have gained increased attention in veterinary surgical oncology in recent years. The present review aims at summarizing the resulting findings and their impact on patient management.

Keywords: staging; therapeutic lymphadenectomy; NIR lymphography; lymphoscintigraphy; CT lymphography; AGASAC; mammary tumor; mast cell tumor; canine head and neck cancer

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1. Introduction

Lymph node (LN) status is an important prognostic factor for the staging of various cancers in human and veterinary medicine, and the resection of metastatic nodes can improve outcomes in selected cancer types [1–6]. Virchow and Halsted already recognized the importance of the lymphatic system serving as a major barrier for cancer cells [7,8]. Initially, it was assumed that the closest regional LNs were the first sites to be affected by metastases, and the radical resection of the tissue surrounding the tumor was advocated to include all regional nodes [7]. Radical surgical resections of the lymphatic basin remained the unchanged treatment of choice for certain tumors in human surgical oncology until the mid-20th century, when sentinel lymph node (SLN) mapping and more selective lymphadenectomies evolved for several cancer types, including malignant melanoma, breast, vulvar, and cervical cancers [9].

Thus far, a potential therapeutic advantage of lymphadenectomy in companion animals has only been advocated in a few cancer types [1]. One problem in the assessment of the impact of lymphadenectomies in various cancers in veterinary patients is that, to date, no generally accepted resection routine exists for most conditions. In most settings, LNs are resected if they appear enlarged or structurally altered [10–12], although studies have repeatedly shown that the size of the lymph node is no predictor of nodal involvement [13–15]. Alternatively, the resection of RLN is performed, involving the removal of a single LN rather than entire lymphatic stations [1]. These approaches are generally poorly standardized and most certainly lead to the undertreatment of potentially affected LNs. Recently, SLN mapping has gained increased attention. This

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The Sentinel Node in Surgical Oncology Mohammad R.S. Keshtgar, Wendy A. Waddington, Sunil R. Lakhani, Peter J. Ell, 2013-12-21 In this volume an account is given of the technologies relevant to the detection of sentinel lymph nodes in the context of surgical oncology This is a rapidly and evolving field and the clinical applications discussed in this volume are exciting and important A multidisciplinary team was assembled to discuss this subject in the light of direct experience gained by each of the groups in the previous 12 months Clinical case material is presented and the methodology of sentinel lymph node imaging and detection is discussed in detail The authors have assembled in a single volume a significant amount of personal data and a comprehensive literature review which will serve as a single reference and teaching source for all those interested in this critical technique relevant to the management of large numbers of patients in surgical oncology *The Sentinel Node in Surgical Oncology* Mohammad R.S. Keshtgar, Wendy A. Waddington, Sunil R. Lakhani, Peter J. Ell, 2014-10-03 In this volume an account is given of the technologies relevant to the detection of sentinel lymph nodes in the context of surgical oncology This is a rapidly and evolving field and the clinical applications discussed in this volume are exciting and important A multidisciplinary team was assembled to discuss this subject in the light of direct experience gained by each of the groups in the previous 12 months Clinical case material is presented and the methodology of sentinel lymph node imaging and detection is discussed in detail The authors have assembled in a single volume a significant amount of personal data and a comprehensive literature review which will serve as a single reference and teaching source for all those interested in this critical technique relevant to the management of large numbers of patients in surgical oncology *The Sentinel Node in Surgical Oncology*, 2001 *Advanced Therapy in Surgical Oncology* Raphael E. Pollock, 2008 Edited by outstanding leaders in the field of surgical oncology this book offers expert advice on prevention diagnosis treatment and reconstruction by recognised authorities The work features the personal treatment protocols of the top surgeons specialising in surgical oncology Conditions covered include benign and malignant tumors pediatric and adult problems routine and advanced or challenging presentations *Principles and Practice of Surgical Oncology* Howard Silberman, Allan W. Silberman, 2012-03-28 *Principles and Practice of Surgical Oncology* uniquely emphasizes a multidisciplinary integrated approach to the treatment of solid tumors It presents treatment strategies that combine surgery with preoperative or postoperative adjunctive chemotherapy hormonal therapy and or radiation therapy to achieve optimal outcome The book features contributions from surgeons basic scientists pathologists radiologists radiation therapists and medical oncologists and offers a comprehensive presentation of genetics molecular biology pathogenesis and multimodal therapeutic approaches A unique feature of the book is a commentary following each chapter which describes alternative approaches and discusses controversial areas of current therapy A companion Website will offer the fully searchable text with images *Surgical Oncology Manual* Frances C. Wright, Jaime M. Escallon, Moises Cukier, Melanie E. Tsang, Usmaan Hameed, 2020-08-27 This

third edition manual provides a comprehensive insightful evidenced based review of general surgical oncology and serves as a valuable resource for general surgeons in training practicing general surgeons and surgical oncologists The volume describes a multidisciplinary approach that integrates clinical radiologic and pathologic data in formulating practical clinical management and offers a practical approach to the most common situations when treating cancer patients Each chapter focuses on an individual malignancy and describes the presentation of the malignancy integrated management based on stage landmark trials and suggestions for who to discuss at multidisciplinary cancer conferences Multiple tables in each chapter provide a concise yet comprehensive summary of the current status of the field Clinical pearls or tips and tricks from high volume surgeons at the University of Toronto are also discussed The third edition of the Surgical Oncology Manual will serve as a critical resource for general surgeons in training and practicing surgeons dealing with this challenging field

Surgical Oncology Graeme J. Poston, Lynda Wyld, Riccardo A. Audisio, 2016-11-25 Surgical oncology is now a recognized specialty in the US and several European countries and cancer surgery takes up a significant part of any general surgeon's workload This thoroughly updated second edition of this bestseller is officially endorsed as a textbook for the syllabus and curriculum of the UEMS examination in Surgical Oncology which is administered by ESSO European Society for Surgical Oncology The examination is for trainees at the end of training or established consultants seeking to expand their accreditation

Surgical Oncology Quyen D. Chu, John F. Gibbs, Gazi B. Zibari, 2014-10-20 This volume provides a comprehensive perspective on surgical oncologic diseases that are relevant to those who have an interest in surgical oncology Its purpose is to distill a voluminous amount of information to readers so they will have the opportunity to apply relevant information and knowledge to their particular needs Each chapter is written by experts in their field who provide concise and in depth information on their topic and supply references to key articles Illustrations diagrams and photographs are included to assist the visual learners Each chapter begins with bulleted key points to focus the readers on the material that will be covered and concludes with an appendix that summarizes the salient points This unique set up can be used as a tool to quickly review the topic at hand The text also includes a set of short questions and answers at the end of each chapter to reinforce the salient points

Surgical Oncology A Practical and Comprehensive Approach is a valuable resource for Medical students surgical oncology fellows general surgeons and educators

Breast Cancer, An Issue of Surgical Oncology Clinics of North America Lisa Newman, 2014-07-28 This issue of Surgical Oncology Clinics of North America is devoted to Breast Cancer and is edited by Lisa Newman MD of the University of Michigan Expert authors in this issue review this topic in articles such as Applications for Breast MRI Lobular Neoplasia Epidemiology of Breast Cancer Percutaneous Ablation of Breast Tumors Triple Negative Breast Cancer and the Basal Breast Cancer Subtype Molecular Profiling of Breast Cancer Surgical Leadership and Standardization of Multidisciplinary Breast Cancer Care Neoadjuvant Primary Systemic Therapy for Breast Cancer Management of the Clinically Node Negative Axilla in Patients with Primary and Locally Recurrent Breast

Cancer Management of the Axilla in Patients with Node Positive Breast Cancer Prophylactic Bilateral Mastectomy and Contralateral Prophylactic Mastectomy Advances in Reconstruction of Mastectomy and Lumpectomy Defects Nipple Sparing Mastectomy and Breast Cancer Disparities **Clinical Scenarios in Surgical Oncology** Vijay P. Khatri, 2006 This unique case based review of surgical oncology offers excellent preparation for oral board examinations which emphasize both general knowledge and case management The book presents 91 cases structured to reflect the surgeon's decision making process Each case begins with a patient presentation and imaging studies or pathology results and proceeds through a series of decision points differential diagnosis requests for additional tests diagnosis surgical approach discussion of potential pitfalls and follow up Cases are grouped by organ system and each section ends with a treatment algorithm summarizing the decision points Nearly 400 radiologic images and other relevant illustrations accompany the text The M.D. Anderson Surgical Oncology Handbook Barry W. Feig, David H. Berger, George M. Fuhrman, University of Texas M.D. Anderson Cancer Center. Dept. of Surgical Oncology, 2006 Written by current and former surgical oncology fellows of the world renowned M D Anderson Cancer Center this portable handbook is a practical guide to established surgical oncology principles for each organ system This new Fourth Edition features extensive updates including new chapters on reconstructive surgery in the cancer patient Concise chapters illustrated with algorithms and line drawings outline the essential elements of diagnosis staging and clinical management of solid tumors treated in surgical practice The authors emphasize multidisciplinary treatment planning including therapy sequencing and biologic therapies *Surgical Oncology* Raphael E. Pollock, 1997-11-30 Among the standard oncology modalities surgical oncology is singular in that it lacks a separate board certification or even an added qualification mechanism Card carrying surgical oncologists are certified by the American Board of Surgery as are all other general surgeons What distinguishes the surgical oncologist is a set of cognitive skills rather than a specific armamentarium of surgical techniques This different conceptual framework is derived from extensive additional training that leads to an in depth understanding of the natural history and biologic behavior of the various solid tumor systems Equipped with this perspective the surgical oncologist is particularly well positioned to integrate the various available therapeutic modalities into a coherent care program for the solid tumor patient As a central theme the chapters of this book demonstrate that increasingly sophisticated diagnostic and staging approaches are helping to move chemotherapy and radiotherapy into the preoperative neoadjuvant setting This fundamental alteration is based on the awareness that even early stage solid tumor disease is frequently systemic at the time of presentation at least on a subclinical level And although the primary tumor may be controllable by surgery with radiotherapy the uncontrolled and initially clinically unapparent distant disease ultimately determines patient survival The other perspective driving the neoadjuvant approach is an emerging awareness that for most solid tumor systems neoadjuvant treatment responses can facilitate less mutilating surgery with comparable levels of local disease control **Comparative Effectiveness in Surgical Oncology** Karl Y.

Bilimoria, Christina A. Minami, David M. Mahvi, 2015-02-12 Despite tremendous recent advances in the treatment of most malignancies there remain several critical questions for each cancer This particularly true for the surgical management of solid organ malignancies Comparative effectiveness is a relatively new term which encompasses the age old concepts of how best to treat cancer patients Comparative effectiveness is defined as the direct comparison of healthcare interventions to determine which work best for which patients when considering the benefits and risks The Institute of Medicine has defined comparative effectiveness research CER as the generation and synthesis of evidence that compares the benefits and harms of alternative methods to prevent diagnose treat and monitor a clinical condition or to improve the delivery of care CER is certainly best done with well conducted randomized controlled trials Unfortunately clinical trials are not always feasible owing to the impracticality of conducting the trial the considerable cost and the time required to complete the trial These challenges are even more pronounced with respect to surgical treatment Thus alternative approaches may need to be considered in order to address pressing questions in the care of the oncology patient These approaches may include well conducted retrospective cohort studies from cancer registries and other data sources decision and cost effectiveness analyses and other novel methodologies This book lays out the current critical questions for each major malignancy and proposes approaches to gain answers to these pressing questions

New Technologies in Surgical Oncology Antonio Mussa, 2009-12-08 Oncological surgeons are often requested in their clinical practice to identify and manage uncommon and complex situations It is therefore of the utmost importance that they are well aware of the most recent technological evolutions in order to achieve the best possible results in term of oncological outcome with a concern on quality of life and economical issues Furthermore new techniques can give a fundamental contribution in overcoming the limitations of standard approaches An essential aim of this book is to underline the great importance and the need of an effective coordination of multi disciplinary care among surgeons medical oncologists radiation therapists plastic surgeons and ancillary services in order to optimise patient outcome

Clinical Trials in Surgical Oncology, An Issue of Surgical Oncology Clinics of North America Elin R. Sigurdson, 2017-09-26 This issue of Surgical Oncology Clinics of North America guest edited by Dr Elin R Sigurdson is devoted to Clinical Trials in Surgical Oncology Dr Sigurdson has assembled expert authors to review the following topics Commentary on Randomized Controlled Trials Randomized Clinical Trials in Soft Tissue Sarcoma Randomized Clinical Trials in Gastrointestinal Stromal Tumors Randomized Clinical Trials in Melanoma Randomized Clinical Trials in Breast Cancer Randomized Clinical Trials in Gastroesophageal Carcinoma Randomized Clinical Trials in Hepatocellular Carcinoma An Update on Randomized Clinical Trials in Advanced and Metastatic Colorectal Carcinoma Randomized Clinical Trials in Colon and Rectal Cancer Randomized Clinical Trials in Anal Cancers The Elderly in Randomized Clinical Trials Hereditary Syndromes in Clinical Trials Future Clinical Trials Genetically Driven Trials Randomized Clinical Trials in Neuroendocrine Tumors and more

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Feig, 2023-02-24 Now with additional review content and a larger page size The MD Anderson Surgical Oncology Manual Seventh Edition focuses on multidisciplinary cooperative management approaches to issues confronting today's surgical oncologist Lead editor Dr Barry W Feig is joined by recently graduated surgical oncology fellows Michael G White Cameron E Gaskill Anai N Kothari and Sandra R DiBrito to bring you comprehensive yet concise information on the complete range of oncologic considerations needed to effectively understand cancer and all aspects of its treatment **Multidisciplinary Care of the Cancer Patient , An Issue of Surgical Oncology Clinics** Gregory A. Masters, 2013-04-28 This issue of the Surgical Oncology Clinics of North America Guest Edited by Dr Greg Masters will highlight the multidisciplinary approach to a variety of common malignancies focusing on how surgical oncologists work together with medical oncologists and radiation oncologists to provide the most up to date management for many different malignancies It will focus on the latest data from updates in basic science and clinical trials including the importance of new technology and surgical techniques new radiation techniques and the latest in chemotherapy biologic and targeted drug development in the multidisciplinary care of cancer patients *Surgical Oncology* David L Bartlett, Pragatheeshwar Thirunavukarasu, Matthew D Neal, Phil Bao, 2011 The field of oncology is changing more rapidly than any other speciality and new biology as well as new therapies are constantly being tested This entire text keeps the reader updated with these important advances in a comprehensive but readable format This outstanding book has been authored by the world renowned experts in surgical oncology practicing in a rising center of excellence in the field It introduces Level of Evidence tables to list the various options available for the treatment of each cancer and the strength of evidence available to support it The text has been developed as **Surgical Oncology** David L Bartlett, Pragatheeshwar Thirunavukarasu, Matthew D Neal., Phil Bao, 2011-03-31 Written by world renowned experts in surgical oncology this book examines various types of cancer and their treatment options based on Level of Evidence tables The text provides an up to date review of the knowledge required by surgical oncologists from basic biology to the application of regional chemotherapy minimally invasive surgery and palliative care Personalizing Breast Cancer Care, An Issue of Surgical Oncology Clinics of North America, E-Book Melissa Pilewskie, 2023-09-19 In this issue guest editors bring their considerable expertise to this important topic Provides in depth reviews on the latest updates in the field providing 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 these timely topic based reviews

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