# Ultrasound Guided Prostate Biopsy

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## MCINTYRE GEORGE

*Interventional Urology* Springer Nature
Practical Tips in Urology is a compact, illustrated reference which provides the reader with practical tips and advice in managing day-to-day urological issues encountered in a clinical setting. This book draws on practical experience and offers useful information that is often lacking in didactic textbooks of urology and in journal articles. Practical Tips in Urology provides tips in dealing with urological emergencies, elective surgery and common outpatient consultation problems, among other things. Written by experts in the field, Practical Tips in Urology is key reading for all practicing urologists and residents in training.
*Management of Prostate Cancer* Springer Science & Business Media
The detection of tumors in various organ systems remains one of the central applications of ultrasound. This issue of

Ultrasound Clinics will consist of 10 articles under the title “Oncologic Ultrasound and will feature several articles on elastrography (a developing method for distinguishing tumors from normal tissue), as well as endoscopic ultrasound in oncology, ultrasound guidance in tumor ablation, and ultrasound guided biopsies. The editor, Vikram Dogra, who also serves as consulting editor of the series, has put together an issue that addresses the core clinical concerns of oncologic imaging for the radiologist specializing in ultrasound.

*Practical Tips in Urology* Createspace Independent Publishing Platform

Transrectal ultrasound guided prostate biopsy is a common procedure to obtain tissue to make a diagnosis of prostate cancer. The risks of infection in the patient undergoing transrectal ultrasound guided prostate biopsy are a complication of the procedure. Perioperative antibiotics have been established as a mainstay to prevent the infectious complications in the transrectal ultrasound guided prostate biopsy. Medication non-adherence in the patient undergoing a transrectal ultrasound guided prostate biopsy has been recognized as a problem. Medication adherence is a complicated problem in health care. Assessing the cause for medication non-adherence will help nursing implement preoperative adherence interventions for the patient. Nursing plays a significant role in their daily practice to educate patients about adherence to the antibiotic regimen. An

educational program has been developed to enhance medication adherence on the patient undergoing a prostate biopsy in the outpatient setting. This intervention was developed using evidenced based practice. The intent is to implement education for each patient and to incorporate technology into the teaching plan to increase medication adherence. The educational process will be enhanced utilizing a text message or phone call reminder system. The intervention educates the patient on the rationale, timing and dosage of the perioperative antibiotic. The technological component will further enhance the timing of dosage. The role of the nurse is integral in this educational intervention. All patients should be given the opportunity to receive education and support for achieving medication adherence.

**Prostate Cancer Imaging** Springer

From the basic science underpinnings to the most recent developments in medical and surgical care, Campbell-Walsh-Wein Urology offers a depth and breadth of coverage you won't find in any other urology reference. Now in three manageable volumes, the revised 12th Edition is a must-have text for students, residents, and seasoned practitioners, with authoritative, up-to-date content in an intuitively organized, easy-to-read format featuring key points, quick-reference tables, and handy algorithms throughout. Features shorter, more practical chapters that help you find key information quickly. Includes new chapters on Urinary Tract Imaging:

Basic Principles of Nuclear Medicine · Ethics and Informed Consent · Incisions and Access · Complications of Urologic Surgery · Urologic Considerations in Pregnancy · Intraoperative Consultation · Special Urologic Considerations in Transgender Individuals · and more. Covers hot topics such as minimally invasive and robotic surgery; advancements in urologic oncology, including innovative therapeutics for personalized medicine; new approaches to male infertility; technological advances for the treatment of stones; and advances in imaging modalities. Incorporates current AUA/EAU guidelines in each chapter as appropriate Updates all chapters with new content, new advances, and current references and best practices. Extensively updated chapters include Urological Immunotherapy, Minimally Invasive Urinary Diversion, and Updated Focal Therapy for Prostate Cancer. Features more than 175 video clips, including all-new videos on perineal ultrasound, abdominoplasty in prune belly syndrome, partial penectomy, low dose rate brachytherapy, and many more. Written and edited by key opinion leaders, reflecting essential changes and controversies in the field. Expert ConsultT eBook version included with purchase. This enhanced eBook experience allows you to search all of the text, figures, and references from the book on a variety of devices.

**Focal Therapy in Prostate Cancer**

Springer

Methods to diagnosis prostate cancer, a

disease affecting approximately 240,000 men in the U.S. annually, have remained largely unchanged in the last several decades. An increased level of prostate specific antigen (PSA) is the usual initiating event followed by an ultrasound-guided biopsy. Such biopsies are performed in a systematic, but blind manner, and tumor discovery is often fortuitous. Furthermore, such biopsies often cannot differentiate between serious, potentially lethal forms of prostate cancer and insignificant, indolent forms. This inadequate method of diagnosis has led to over-treatment of indolent disease, a major concern due to the quality-of-life issues of impotence and incontinence associated with curative treatment. Targeted biopsy utilizing multi-parametric magnetic resonance (MR) imaging may comprise an important advance in prostate cancer diagnosis. MR-guided biopsies, while effective, suffer from high cost, limited availability, and long procedure times. MR-Ultrasound (MR-US) fusion, marrying the predictive accuracy of MR and the real-time capabilities of ultrasound, offers an alternative that can be performed in most outpatient settings, while potentially retaining the cancer detection accuracy of MR-guided biopsy. This thesis presents comprehensive research studies that validate targeted biopsy using MR-US fusion. We found that the use of image fusion in targeted prostate biopsy yielded an improved cancer detection rate in a low-risk population. Further, we discover that fusion is appropriate for men with prior

negative biopsies and elevated levels of prostate specific antigen (PSA), some of whom may be screened using MRI. In men undergoing repeat biopsy to rule out cancer, we observed a cancer detection rate of almost four times that usually reported (37% vs. 10%). We also discover that significant components to errors in targeting are volume accuracy and registration between MR and TRUS. To this end, this thesis presents a novel method of real-time 3D prostate imaging suitable for image fusion, transurethral ultrasound (TUUS). A number of engineering challenges have been addressed to bring this concept to realization: a catheter-based transducer theoretically capable of volumetric imaging of the prostate was fabricated and evaluated; reconfigurable hardware was designed to provide flexibility in imaging techniques; and image reconstruction techniques were developed and implemented for MR-US fusion.

Prostate Cancer Diagnosis Springer Science & Business Media

This booklet is the seventh volume of the Dattoli Cancer Foundation's Prostate Cancer Essentials for Survival series. It is a guide for informed patients, especially those who are confronted with the prospect of a prostate biopsy. The booklet offers a comprehensive overview of the ultrasound-guided prostate biopsy and related laboratory tests, including the prostate specific antigen (PSA) blood test. Two leading cancer care professionals specializing in state-of-the-art radiotherapy guide readers step by

step through questions to be considered before undergoing a prostate biopsy. The authors share their wealth of knowledge and their experience with the Dattoli Cancer Center & Brachytherapy Research Institute, which has the largest combined program in the country for brachytherapy and Intensity Modulated Radiation Therapy (IMRT), specializing in Dynamic Adaptive Radiation Therapy (DART), the most advanced form of radiotherapy currently available.

**Prostate Biopsy Interpretation: An Illustrated Guide** Elsevier

Prostate biopsy is the clinical standard for cancer diagnosis and is typically performed under two-dimensional (2D) transrectal ultrasound (TRUS) for needle guidance. Unfortunately, most early stage prostate cancers are not visible on ultrasound and the procedure suffers from high false negative rates due to the lack of visible targets. Fusion of pre-biopsy MRI to 3D TRUS for targeted biopsy could improve cancer detection rates and volume of tumor sampled. In MRI-TRUS fusion biopsy systems, patient or prostate motion during the procedure causes misalignments in the MR targets mapped to the live 2D TRUS images, limiting the targeting accuracy of the biopsy system. In order to sample smallest clinically significant tumours of 0.5 cm 3 with 95% confidence, the root mean square (RMS) error of the biopsy system needs to be 2.5 mm. In addition to intermittent prostate motion during the procedure, p rostate deformation due to needle insertion and biopsy gun firing is a potential source of error that

limits needle targeting accuracy . Using non-rigid registration of 2D TRUS images, we quantified the deformation that occurs during the needle insertion and the biopsy gun firing and showed that the tissue deformation was such that throughout the length of the needle axis, spherical tumours with radius 2.1 mm or more can be sampled with 95% confidence, under the assumption of zero error elsewhere in the biopsy system. The target misalignments due to intermittent prostate motion during the procedure can be compensated by registering the live 2D TRUS images acquired during the biopsy procedure to the pre-acquired baseline 3D TRUS image. The registration must be performed both accurately and quickly in order to be useful during the clinical procedure. We developed an intensity-based 2D-3D rigid registration algorithm and validated it by calculating the target registration error (TRE) using manually identified fiducials within the prostate. We discuss two different approaches that can be used to improve the robustness of this registration to meet the clinical requirements. Firstly, we evaluated the impact of intra-procedural 3D TRUS imaging on motion compensation accuracy since the limited anatomical context available in live 2D TRUS images could limit the robustness of the 2D-3D registration. The results indicated that TRE improved when intra-procedural 3D TRUS images were used in registration, with larger improvements in the base and apex regions as compared with the mid-gland region.

Secondly, we developed and evaluated a registration algorithm whose optimization is based on learned prostate motion characteristics. Compared to our initial approach, the updated optimization improved the robustness during 2D-3D registration by reducing the number of registrations with a TRE 5 mm from 9.2% to 1.2 % with an overall RMS TRE of 2.3 mm. The methods developed in this work were intended to improve the needle targeting accuracy of 3D TRUS-guided biopsy systems. The successful integration of the techniques into current 3D TRUS-guided systems could improve the overall cancer detection rate during the biopsy and help to achieve earlier diagnosis and fewer repeat biopsy procedures in prostate cancer diagnosis.

Image-Guided Prostate Biopsy Sydney University Press

This open access book deals with imaging of the abdomen and pelvis, an area that has seen considerable advances over the past several years, driven by clinical as well as technological developments. The respective chapters, written by internationally respected experts in their fields, focus on imaging diagnosis and interventional therapies in abdominal and pelvic disease; they cover all relevant imaging modalities, including magnetic resonance imaging, computed tomography, and positron emission tomography. As such, the book offers a comprehensive review of the state of the art in imaging of the abdomen and pelvis. It will be of interest to general radiologists, radiology

residents, interventional radiologists, and clinicians from other specialties who want to update their knowledge in this area.

**Slice-to-volume Registration for Transrectal Ultrasound-guided Prostate Biopsy** Springer

Prostate UltrasoundSpringer

*Practical Urological Ultrasound* John Wiley & Sons

Transrectal ultrasound (TRUS) guided prostate biopsy is the standard approach for diagnosis of prostate cancer (PCa). However, due to the lack of image contrast of prostate tumors, it often results in false negatives. Magnetic Resonance Imaging (MRI) has been considered to be a promising imaging modality for noninvasive identification of PCa, since it can provide a high sensitivity and specificity for the detection of early stage PCa. Our main objective is to develop a registration method of 3D MR-TRUS images, allowing generation of volumetric 3D maps of targets identified in 3D MR images to be biopsied using 3D TRUS images. We proposed an image-based non-rigid registration approach which employs the modality independent neighborhood descriptor (MIND) as the local similarity feature. An efficient duality-based convex optimization-based algorithmic scheme was introduced to extract the deformations. The registration accuracy was evaluated using 20 patient images by calculating the target registration error (TRE) using manually identified corresponding intrinsic fiducials. Additional performance metrics (DSC,

MAD, and MAXD) were also calculated by comparing the MR and TRUS manually segmented prostate surfaces in the registered images. Experimental results showed that the proposed method yielded an overall median TRE of 1.76 mm. In addition, we proposed a surface-based registration method, which first makes use of an initial rigid registration of 3D MR to TRUS using 6 manually placed corresponding landmarks in each image. Following the manual initialization, two prostate surfaces are segmented from 3D MR and TRUS images and then non-rigidly registered using a thin-plate spline algorithm. The registration accuracy was evaluated using 17 patient images by measuring TRE. Experimental results show that the proposed method yielded an overall mean TRE of 2.24 mm, which is favorably comparable to a clinical requirement for an error of less than 2.5 mm.

Urological Pathology Elsevier Health Sciences

Accompanying DVD-ROM, in pocket at front of v. 1, contains ... "video clips referenced in the text."--DVD-ROM label.

**Smith's Textbook of Endourology**

Prostate Ultrasound

This updated text provides a concise yet comprehensive and state-of-the-art review of evolving techniques in the new and exciting subspecialty of interventional urology. Significant advances in imaging technologies, diagnostic tools, fusion navigation, and minimally invasive image-guided therapies such as focal ablative

therapies have expanded the interventional urologists' clinical toolkit over the past decade. Organized by organ system with subtopics covering imaging technologies, interventional techniques, recipes for successful practice, pitfalls to shorten the learning curves for new technologies, and clinical outcomes for the vast variety of interventional urologic procedures, this second edition includes many more medical images as well as helpful graphics and reference illustrations. The second edition of Interventional Urology serves as a valuable resource for clinicians, interventional urologists, interventional radiologists, interventional oncologists, urologic oncologists, as well as scientists, researchers, students, and residents with an interest in interventional urology.

*Imaging and Focal Therapy of Early Prostate Cancer* Springer Nature

This book is a basic, practical guide to performing and interpreting state-of-the-art prostate MRI, utilizing the latest guidelines in the field. Prostate MRI has become one of the fastest growing examinations in the radiology practice, and this demand has continuously increased within the past decade. Since it is relatively new, MRI of the prostate is predominantly being performed at academic institutions, however there is a growing demand within the lower-tier health care institutions to offer this examination to their patients. This is an ideal guide for radiologists who want to enhance or initiate prostate MRI service for their referring clinicians and as a

manual for technologists and those who are in training. Prostate cancer is the second leading cause of cancer death in men, exceeded only by lung cancer. The best predictor of disease outcome lies with correct diagnosis, which requires precise imaging and diagnostic procedures aided by prostate MRI. Urologists, medical oncologists and radiation oncologists all agree that multi-parametric prostate MRI is essential for evaluation of prostate cancer. However, the technical aspects of prostate MR imaging are not as straightforward as for the other imaging modalities and constantly evolving. Its small size presents a real challenge to the radiologist, who needs to do the T2 and diffusion weighted images and perform a dynamic contrast enhanced sequence correctly. These images may also need to be analyzed on an independent workstation. Due to the absence of a current reference manual, when a radiologist wants to establish a prostate imaging service, he/she needs to attend dedicated prostate MR workshops or dive into the literature search alone, only to get more confused about what to do and how to do it. With this book, expert authors were asked to give clear guidance to those who want to enhance or initiate their prostate imaging service. With this much-needed, concise, practical guidance, radiologists can perform and interpret multi-parametric prostate MRI in a standardized fashion, in concordance with PI-RADS v2.1 that can be applicable to all available hardware platforms (GE, Philips,

Siemens, Toshiba). Additionally, they can perform post-processing for possible targeted biopsy and interpret post-therapy and PET studies. The book discusses imaging protocols (planning and prescription) and sequence parameters with representative images for each MRI sequence. This handbook-style practical manual can be used in the radiology reading room by those interpreting the MR exam as a reference as well as at the MRI scanner by the technologists as a guide. Coverage of basic prostate anatomy, pathology, Urologists' point of view, MRI guided radiation treatment planning and molecular imaging is also included. Throughout the book, authors will discuss basics, pitfalls, and provide tips in image acquisition and interpretation, alongside several case examples.
*Ultrasound-Guided Procedures* Humana Press
Based on the highly successful first edition of Prostate Biopsy: Indications, Techniques, and Complications, this new volume presents new concepts that have emerged in answer to current questions from its audience. Many new perspectives and technologies are presented, many from the authors' internationally recognized work on the topic. Substantial developments in techniques and complications are explored in detail. The chapter authors comprise a complete spectrum of specialists in their respective subject areas. All authors are internationally accepted as the premier authorities on their chosen topics. Prostate Cancer

Diagnosis: PSA, Biopsy, and Beyond presents new data on the controversial issue of PSA screening and thresholds as indication to perform biopsy. Office based transrectal saturation biopsy is covered in detail. Other topics explored include template guided biopsy and image-guided biopsy as well as a completely new paradigm for prevention of complications. Prostate Cancer Diagnosis: PSA, Biopsy, and Beyond will be of great value and utility to all practicing urologists.

*Men at Risk* Springer Science & Business Media

Prostate cancer is the most common malignancy among men. The gold standard clinical diagnosis method for prostate cancer is histopathologic analysis of biopsy samples acquired under ultrasound guidance. However, most prostate tumors lack visually distinct appearances on medical images. Therefore, pathologically significant cases of cancer can be missed during biopsy, resulting in false negative or repeated trials. The goal of our research is to augment ultrasound-guided prostate biopsy by adding tissue typing information that can be used for targeted biopsies. As a new paradigm in tissue typing, we hypothesize and demonstrate that if a specific location in tissue undergoes sequential interactions with ultrasound, the time series of echoes, which we call radiofrequency (RF) time series, would carry ``tissue typing'' information. We provide a potential physical explanation for this phenomenon and justify it based on

computer simulations of the ultrasound probe and scattering media. We also report laboratory and animal studies that illustrate the utility of the method. We rely on a set of seven spectral and fractal features extracted from RF time series for tissue typing. To show the clinical value of the proposed approach, we report an ex-vivo study involving 35 patients in which the utility of RF time series features for detection of prostate tumors is confirmed. The outcomes are validated using histopathologic disease distribution maps provided for the studied specimen. We show that the RF time series features are powerful tissue typing parameters that result in an area under receiver operating characteristic (ROC) curve of 0.87 in 10-fold cross validation for diagnosis of prostate cancer. They are significantly more accurate and sensitive than spectral features extracted from single RF frames, and also B-scan texture features (area under ROC curve of 0.78 and 0.72, respectively). A combination of these three categories of features results in a feature vector that p.

Surgical Techniques for Prostate Cancer

AuthorHouse

Prominent physicians review past, current, and future applications of the many powerful imaging techniques now used in the diagnosis, staging, treatment, and outcomes assessment of cancers of the prostate, central nervous system (CNS), and breast. Topics range from the use of screening mammography and approaches to breast cancer detection using MRI to

improved visualization of the prostate gland from transrectal ultrasound and MRI, to MRI-guided resection of neoplasms.

Imaging and Focal Therapy of Early Prostate Cancer Springer Science & Business Media

There is now increasing awareness by the general public in European countries that prostate cancer is a serious threat to health, and this has created higher expectations for improved and more effective methods for detecting and treating the disease. However, urologists are very conscious of the limitations of the diagnostic methods that are available and are even more concerned about the apparent lack of therapeutic advances made during the past 50 years since Huggins discovered the fundamental principles of endocrine treatment for is theo prostate cancer. Recent efforts to detect the disease when it retically "curable" have been successful, certainly in the USA, but this has highlighted our uncertainty about the best treatment for early stage prostate cancer, and there is no doubt that radical pro statectomy is sometimes carried out on men who may not be threa tened by their illness. While it is generally accepted that many men with prostate cancer will die of old age rather than this malignancy, it cannot be ignored that this disease kills many others in a process that is frequently lingering, miserable, and humiliating, not only for the victim but also his family. There are many important issues about prostate cancer that remain unclear at

the present time, some of which are addressed by the reviews in this book. The debate about early detection and screening can arouse considerable heat in otherwise placid urological mee tings.

**Slice-to-volume Registration for Transrectal Ultrasound Guided Prostate Biopsy** Createspace Independent Publishing Platform

This book covers all the practical issues related to the interpretation of prostatic biopsies in day-to-day practice, including: biopsy sampling and processing; the diagnosis of limited cancer; differentiation of prostate cancers from benign lesions and recognition of histologic variants; the recognition and clinical significance of “atypical” diagnoses and HGPIN; the identification of recently described entities; the contemporary approach to Gleason grading; the utility of immunohistochemical markers and emerging molecular markers; and the reporting of prostate biopsies. Algorithms, flow charts, and tables are used throughout to simulate the thought and decision-making process upon encountering common clinical scenarios during sign-out of prostate biopsy. The book is richly illustrated with carefully selected, high-quality color images and will appeal especially to practicing surgical pathologists as well as pathology residents and fellows in training.

Prostate MRI Essentials John Wiley & Sons

This book provides a comprehensive source for all aspects of percutaneous

image-guided biopsy. A synthesis of rationale, technique and evidence-based medicine, it offers a clear approach to imaging, devices, procedures and patient care. Replete with case studies, radiological images, illustrative diagrams and tables, this valuable reference is an indispensable addition to the bookshelves of all radiologists in training as well as practicing radiologists who would like to expand their biopsy service and refine their skills. The easy to follow format, organization and graphic presentations create a high-yield approach to practical information such as indications, technical considerations, anatomical considerations, outcomes and complications. This timely compendium is a necessity in this rapidly progressing field.

Improving Preoperative Antibiotic Prophylaxis in the Patient Undergoing a Prostate Biopsy Lippincott Williams & Wilkins

Dr. Ronald E. Wheeler is unique in the medical world and the practice if Urology. Dr. Wheeler is one of the worlds leading diagnostic and treating Prostrate Cancer Specialists based upon a very sophisticated skill set. Dr. Wheeler diagnoses and treats only prostate disease in a full time clinical practice in Sarasota, Florida. Less than a handful of Urologists form around the world can make claim to specializing in prostate related issues only. Dr. Wheelers clinical expertise in the diagnosis and treatment of prostate cancer has superseded the credentialing process. In fact, Dr. Wheeler intends to establish

credentialing guidelines for physicians relevant to prostate specific diagnostic and treatment modalities. Dr. Wheeler is a world expert in High Intensity Focused Ultrasound (HIFU), having diagnosed and treated more patients for prostate cancer from more countries than any other treating doctor in the world. HIFU worldwide is a viable treatment option for prostate cancer, benign prostatic hyperplasia (BPH) and Uterine fibroids in women. Dr. Wheeler is arguable the worlds most acclaimed Urologist in the application of prostate imaging through ultrasound and 3.0 Tesla Magnetic Resonance Imaging (with or without spectroscopy) while improving excellence in outcome data compared to doctors who rely on random ultrasound guided biopsies as a questionable standard care. The fact that 40-60% of men fail to be cured from prostate cancer by 7-10 years following radiation or radical prostatectomy (including the Da Vince robot) speaks to the inability of ultrasound to identify cancer accurately and further supports the need for other Urologists to follow the path Dr. Wheeler has chosen. Beyond this, Dr. Wheeler is the Medical Director for a Tampa, Florida based company that has developed an oncolytic virus that expects to alter the landscape of some of the most unpredictable diseases men and woman face including prostate and breast cancer. Because of Dr. Wheelers passion and expertise, patients seek his leadership in disease assessment from all over the world!

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