

Advancements in minimal residual disease detection: a practical approach using single-cell droplet PCR for comprehensive monitoring in hematological malignancy

Satoshi Uchiyama*, Kentaro Fukushima*, Seisichiro Katagiri,
Junichi Tsuchiya, Tomohiro Kubo, SungGi Chi and Yosuke Minami

Abstract: The identification of chromosomal abnormalities accompanied by copy number alterations is important for understanding tumor characteristics. Testing methodologies for copy number abnormality have limited sensitivity, resulting in their use only for the sample provided at the time of diagnosis or recurrence of malignancy, but not for the monitoring of minimal residual disease (MRD) during and after therapy. We developed the "DimShift" technology which enable to measure the copy number of target gene/chromosome in each cell, which is given by the single cell droplet PCR. Qualitative result of DimShift given by peripheral blood was perfectly concordant with that of bone marrow. These findings and performances are promising to be the new methodology for MRD detection in malignant diseases utilizing bone marrow as well as peripheral blood.

Keywords: chromosomal abnormalities, droplet digital PCR, minimal residual disease, myelodysplastic syndrome

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Chromosomal abnormalities are frequently observed in hematological disorders. For example, myelodysplastic syndrome (MDS) is frequently accompanied by chromosomal aneuploidies, as in chromosomes 5-, 7-, 8+, 17-, or 20-.¹⁻³ These chromosomal aneuploidies are worth identifying and monitoring since they provide information regarding disease status or indicate poor prognosis.^{4,5} Cytogenetic methods, such as fluorescence *in situ* hybridization or G-banding, are widely used to detect chromosomal copy numbers.⁶ However, because they are low-throughput methods that require numerous steps and may not be welcomed in routine laboratory workflows. Therefore, in this study, we developed a novel high-throughput and sensitive assay for aneuploidy detection using droplet polymerase chain reaction (PCR). A PCR-based method would facilitate more rapid and more frequent monitoring of chromosomal status. Generally speaking, PCR is not suitable for counting just one or two copies, although this technique works as a powerful tool for detecting a novel

genetic marker, such as BCR-ABL,⁷ which is frequently present in cells of patients with chronic myelogenous leukemia and acute lymphoblastic leukemia, but not in cells from healthy patients. In a general real-time PCR, the information of the template molecules is retained during the exponential amplification phase and is reflected as the difference in Ct values. However, the sensitivity is not high enough to determine the ratio of abnormal cells if a sample is a mixture of normal karyotype and aneuploid cells. In digital PCR, where DNA is amplified in a nanoliter-sized compartment, the reaction is efficient enough for the amplification of only one molecule of DNA.⁸ At the endpoint, however, the high efficiency makes it impossible to preserve information regarding the number of template molecules. The results only provide information as to whether or not the DNA of interest was amplified, that is, whether the target DNA was present or absent. We speculated that information on the number of template molecules might be retained before the reaction reaches its

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Correspondence to:
Yosuke Minami
Department of
Hematology, National
Cancer Center East
Hospital, 2-7-1,
Kashiwanoha, Kashiwa,
Chiba 210-8507, Japan
yminami@east.ncc.go.jp
Satoshi Uchiyama
SungGi Chi
Department of
Hematology, National
Cancer Center East
Hospital, Kashiwa, Japan
Kentaro Fukushima
Department of Hematology
and Oncology, Osaka
University Graduate School
of Medicine, Suita, Japan
Seisichiro Katagiri
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and Development, TG
Genetics Inc., Koganei
City, Japan
*These authors
contributed equally.



Managing Minimal Residual Malignancy In Man

Siamak Daneshmand



Managing Minimal Residual Malignancy In Man:

Management of Minimal Residual Malignancy in Man Peter Reizenstein, Georges Mathé, Mario Dicato, 1988

Cancer Management in Man Paul V. Woolley, 2012-12-06 This volume the last in this series on cancer growth and Moreover the current status of plant derived vinca alkaloid progression is a companion volume to Volume IX and alkaloid natural products is summarized further explores established and novel approaches for the Advances in hyperthermia and additional approaches for therapy of patients with malignant neoplasms The strategies for the therapy of malignancies are also presented strategies reflected in these volumes are direct extrapolations The volume continues with chapters on bone marrow from the basic science of cancer biology growth and pro transplantation as well as hematologic and nutritional support progression described in earlier volumes of this series Some port for the cancer patient Blood pressure in the cancer approaches are directed towards the eradication or modification of patient therapy for nausea and vomiting as well as pain are cation of the properties of heterogeneous malignant tumor discussed The last chapter is devoted to the problems of the cells at various stages of tumor progression while other terminally ill including evaluations of the burden relatives approaches are directed towards modification of the host and friends of the cancer patient have to bear antitumor defense systems e.g. enhancement of host anti It is clear that important advances in the basic science of tumor immune reactivity **Current Catalog** National Library of Medicine (U.S.), First multi year cumulation covers six years 1965-70 Cancer Management in Man: Chemotherapy, Biological Therapy, Hyperthermia and Supporting Measures Boris Minev, 2011-01-13 This book represents a comprehensive description and evaluation of the most up to date approaches to cancer management Each chapter prepared by leading basic researchers and clinicians provides an in depth description of a specific method for cancer management The chemotherapy section of the book is updated to include the newest drugs as well as those currently in development Organized by drug class this section provides the latest information on most drugs including their mechanisms of action interactions with other agents toxicities side effects and mechanisms of resistance The biological therapy section of the book provides expanded coverage of the currently used cytokines vaccines and cell based therapies of cancer Full consideration is also given to other modern treatment approaches such as tyrosine kinase inhibitors inhibitors of tumor angiogenesis and the transcatheter management of cancer Current advances in hyperthermia in cancer treatment hematologic and nutritional support bone marrow transplantation pain management and care of the terminally ill patients with cancer are also presented In summary this book provides a comprehensive coverage of the current knowledge on the most innovative systematic and multidisciplinary approaches to the treatment of patients with cancer *National Library of Medicine Current Catalog* National Library of Medicine (U.S.), 1989 *New Approaches to the Treatment of Leukemia* Emil J. Freireich, 2012-12-06 The European School of Oncology came into existence to respond to a need for information education and training in the field of the diagnosis and treatment of cancer There are two main reasons why such an initiative was considered necessary

Firstly the teaching of oncology requires a rigorously multidisciplinary approach which is difficult for the Universities to put into practice since their system is mainly disciplinary orientated Secondly the rate of technological development that impinges on the diagnosis and treatment of cancer has been so rapid that it is not an easy task for medical faculties to adapt their curricula flexibly With its residential courses for organ pathologies and the seminars on new techniques laser monoclonal antibodies imaging techniques etc or on the principal therapeutic controversies conservative or mutilating surgery primary or adjuvant chemotherapy radiotherapy alone or integrated it is the ambition of the European School of Oncology to fill a cultural and scientific gap and thereby create a bridge between the University and Industry and between these two and daily medical practice Principles of Cancer Biotherapy R.K. Oldham, 2012-12-06 At the time of the first edition of Principles of Cancer Biotherapy this book represented the first comprehensive textbook on biological therapy Whereas in 1991 when the second edition was published there was still some doubt on the part of many oncologists and cancer researchers as to the therapeutic value of these new approaches it is now generally agreed that biopharmaceuticals are producing major opportunities for new cancer therapies Cancer biotherapy has truly matured into the fourth modality of cancer treatment The third edition is now needed as a result of the tremendous progress that has been made in recent years using biologicals in cancer treatment The book summarizes an evolving science and a rapidly changing medical practice As we near the millennium it now becomes possible to envision a much more diversified system of cancer research and treatment that will afford greater opportunities for patients Some forms of cancer biotherapy use the strategy of tumour stabilization and control through continued biological therapy akin to the use of insulin in the treatment of diabetes This textbook illustrates new methods of thinking and new strategies for control of cancer It is always difficult to move from past dogma to future opportunity but this third edition of Principles of Cancer Biotherapy illustrates why it is so important to the patients for researchers and clinicians to explore and apply these new opportunities in cancer biotherapy **A**

Multidisciplinary Analysis of Controversies in the Management of Prostate Cancer Donald S. Coffey, 2012-12-06 These proceedings emanate from the Second Prostate Neck Conference on prostate cancer held on October 17-19 1986 the theme of which was treatment with focus on current issues and future research that is needed to answer critical questions related to optimal management of the various stages of prostate cancer The objective was to reveal the most crucial problems impeding progress and to crystallize the combined multidisciplinary input generated by the conference into focused concepts or recommendations for presentation to the National Cancer Institute NCI with the ultimate intent of targeting research to address the priority issues identified In organizing the workshop every effort was made to maintain a multidisciplinary balance among nationally renowned authorities on prostate cancer Thus leading surgeons radiation and medical oncologists and biostatisticians were in equal presence While there were spirited exchanges with careful scrutiny and critique of all data presented there was a common belief that the challenge of prostate cancer would be best approached

in this multidisciplinary Organ Systems oriented fashion During the course of the conference it became apparent to all present that major nomenclature and procedural barriers have made it generally difficult and frequently impossible to compare results of clinical research

Management of Hematologic Malignancies Susan O'Brien, Julie M. Vose, Hagop M. Kantarjian, 2010-11-18 Hematologic malignancies were the first human cancers to be studied in depth at the molecular level and recent years have seen important advances in treatment This comprehensive reference book covers the full range of hematologic malignancies including all subtypes of leukemias lymphomas and plasma cell dyscrasias Authored by internationally known experts each chapter emphasizes diagnostic work up staging and therapeutic approaches Up to date hematopathology treatment and outcomes data are presented in a way which is directly applicable to patient care Highly illustrated with color images graphs flowcharts and treatment algorithms the book is perfect for quick clinical reference as well as providing detailed reference lists for further study With its authoritative and practical focus and visually stimulating presentation this is a key text for hematology and oncology fellows physicians oncology nurses physician assistants and other healthcare workers in the field of oncology

Diagnosis and Management of Malignant Solid Tumors in Infants and Children Daniel M. Green, 2012-12-06 The field of pediatric oncology encompasses four groups of malignancies acute leukemias brain tumors lymphomas and solid tumors The history diagnosis and management of children with acute leukemias and lymphomas has been thoroughly examined in several excellent textbooks of pediatric hematology and oncology Brain tumors have historically been managed by neurosurgeons and radiation therapists The role of the pediatric oncologist in the management of these patients is evolving This book was written to provide a thorough historical evaluation of the most frequent solid tumors of children A detailed examination of the natural history of these tumors is essential to the design and evaluation of therapeutic trials The highly lethal nature of many of these tumors the occurrence of some of them at several different primary sites and the rarity of these tumors have made systematic study of them difficult Conclusions regarding the efficacy of a particular modification of the therapeutic strategy can be strongly influenced by the assumed natural history of the tumor I have tried to develop as accurate as the literature would allow a picture of the natural history of the common malignant solid tumors knowing that the image would be imperfect I adopted a convention which was employed in all graphs constructed from case reports summarized from the literature

Modern Management of Cancer of the Rectum Walter E. Longo, Vikram Reddy, Riccardo A. Audisio, 2014-11-27 Modern Management of Cancer of the Rectum is intended to provide a comprehensive overview of all aspects of rectal neoplasms It addresses epidemiology biology screening and chemoprevention the role of imaging in diagnosis staging and prognosis radiation therapy medical and surgical treatment as well as new modalities of therapy including laparoscopy and transanal endoscopic surgery A greater understanding of prognostic factors patterns of spread and natural history has occurred during the past decade together with new diagnostic modalities this has led to significant changes in the management of patients with rectal cancer This book will

be invaluable for all those who treat rectal cancer

New Perspectives in Molecular and Clinical Management of Gastrointestinal Tumors Ernst D. Kreuser, Peter M. Schlag, 2012-12-06

This volume focuses on new and exciting approaches in the molecular and clinical management of gastrointestinal tumors. The first part presents recent insights into carcinogenesis including alterations in cyclins and adhesion receptors, molecular structures which might be new targets of gene therapy. The second part of the volume offers new diagnostic tools such as receptors for gastrointestinal hormones, proliferation markers, tumor suppressor proteins and the multiple drug resistance gene predicting response to therapy and prognosis in gastrointestinal tumors. The third part gives an update of successful approaches in primary and secondary prevention of colorectal carcinoma. Nutritional factors and pharmacologic agents can clearly decrease the risk and fecal occult blood tests and endoscopy can reduce the mortality in colorectal carcinoma. Laparoscopic staging with subsequent biopsy of suspicious lymph nodes provides essential information in esophageal and gastric cancer. In locally advanced gastric cancer, preoperative chemotherapy provides sufficient evidence to investigate this approach as compared to primary surgery. Standards have recently been established in the adjuvant treatment of patients with gastrointestinal carcinoma and promising new drugs including monoclonal antibodies, thymidylate synthase and topoisomerase inhibitors as well as taxoids are currently being tested in phase I, II and III trials of gastrointestinal tumors.

Modern Management of Testicular Cancer

Siamak Daneshmand, 2019-07-10. In consultation with Consulting Editor Dr Samir Taneja. Dr Sia Daneshmand has put together a state of the art issue of the Urologic Clinics devoted to Modern Management of Testicular Cancer. The issue focuses on surgical techniques and diagnostic modalities for testicular cancer. Clinical review articles are specifically devoted to the following: Imaging For Testicular Cancer, Management of Stage I Germ Cell Tumors, Management of Stage II Germ Cell Tumors, Current Management Of Disseminated GCT, Post Chemotherapy Resection of Residual Mass in NSGCT, Indications For Surgery in Disseminated Seminoma, Growing Teratoma Syndrome, Management of The Primary Testicular Tumor, High Dose Chemotherapy and Autologous Stem Cell Transplantation, mRNA As Biomarkers For Germ Cell Tumors, Minimally Invasive RPLND, Is There a Role Complications of RPLND, Preservation of Fertility in Testis Cancer, Management Readers will come away with the latest information they need to optimize surgical and management outcomes in the patient with testicular cancer.

Management of Prostate Cancer Michel Bolla, Hendrik van Poppel, 2012-04-24. This book provides an exhaustive review of the current state of the art in the management of prostate cancer from screening to treatment. A particular feature is the emphasis placed on the value of a multidisciplinary approach. The opening chapters address basic aspects including epidemiology, biology and chemoprevention. The role of individual and mass screening is carefully appraised and diagnosis, clinical work up and the role of active surveillance are discussed in detail. Subsequent chapters are devoted to each of the therapies that may be employed including open and robotic laparoscopic radical prostatectomy, the various forms of radiation therapy, high intensity focused ultrasound, cryotherapy, hormonal therapy and targeted therapies and vaccination.

Up to date data from clinical trials are included The editors are members of the EORTC who have coordinated phase III EORTC trials and have worldwide reputations Management of Prostate Cancer Eric A. Klein,1999-12-10 Prostate cancer remains the most common malignant tumor in elderly men The National Cancer Institute estimated 210 000 new cases of prostate cancer in 1997 There is however no means of documenting the true incidence of prostate cancer because of the difficulty in detecting all cases Even using yearly rectal exams PSA determinations and ultrasound guided prostate biopsies many cases are missed Suffice it to say that prostate cancer is a widely occurring disease in men and early detection and treatment are extremely important When I trained in Urology under Dr Reed Nesbit at the University of Michigan from 1956 to 1959 the diagnosis of prostate cancer was made by a rectal examination and an acid phosphatase determination If there was a small nodule in the prostate then an anterior posterior X ray of the pelvis was obtained to look for possible bony metastases If the acid phosphatase was normal and there was no evidence of a bony metastasis the prostate was exposed through the perineal approach and a biopsy of the nodule was obtained and sent for frozen section to Pathology to determine if it was indeed a cancer of the prostate If the biopsy came back positive the surgeon then proceeded to do a radical perineal prostatectomy In those days we usually did eight to ten radical perineal prostatectomies yearly Many times the nodule that was biopsied was benign and the incision was simply closed *Cancer and its Management* Jeffrey S. Tobias,Daniel Hochhauser,2014-10-03 Now in its seventh edition this highly regarded book is designed as an introductory and reference text on the principles of diagnosis staging and treatment of tumors As for the last 6 editions of the book the aim and scope of the new edition are once again to provide a thorough yet reasonably brief account of the whole field of oncology focusing on the latest principles of cancer management The book is already well established having been first published in 1986 and in continuous print since then The authors are rightfully proud of their strong legacy of providing carefully revised new editions of this standard and well received cancer text for audiences in the UK and abroad Oncology is a very rapidly changing speciality with many new treatments and even treatment modalities coming on stream with bewildering speed Besides a thorough general updating of the text figures and tables the new seventh edition adds a new chapter on Molecular Targeted Therapy making the book 30 chapters in total This accessible and practical resource is invaluable to trainees and specialists alike in oncology palliative care and general medicine as well as specialist nurses general practitioners medical students and professions allied to medicine **Innovations in the Management of Neuroendocrine Tumors, An Issue of Endocrinology and Metabolism Clinics of North America** Ashley B. Grossman,2018-08-11 This issue of Endocrinology and Metabolism Clinics edited by Dr Ashley Grossman will focus on Innovations in the Management of Neuroendocrine Tumors Topics include but are not limited to Molecular targeted therapy of NETs State of the art Surgical approaches to the management of liver metastases Liquid biopsies for NETs circulating tumour cells and DNA Novel functional imaging of NETs The problem of appendiceal carcinoids Peptide radioreceptor therapy comes of age Current chemotherapy use in NETs

The problem of grade 3 NETs Molecular genetic studies of pancreatic neuroendocrine tumours reveal new therapeutic approaches The new WHO classification Gastrinomas medical or surgical treatment When and how to use somatostatin analogues The NETest as the way forward Lung and thymic carcinoids Carcinoid heart disease Gastric carcinoids New treatments for the carcinoid syndrome and The genesis of the NETs concept From Oberdorfer to 2018 *Oxford Desk Reference: Oncology* Thankamma Ajithkumar, Sarah Jane Jefferies, 2021 This easy to read practical guide distils and compiles all the disparate literature on cancer into one succinct volume It includes the essential evidence based clinical guidelines needed for the safe and effective management of patients with cancer and has a clear layout to allow for quick reference whilst on the ward All aspects of cancer and its management are covered including prevention screening diagnosis and treatment The text begins by outlining the clinical approach to suspected cancer and the principles of multidisciplinary prevention and management It then progresses through site specific cancer management including head and neck CNS thoracic breast gastrointestinal system genitourinary system female genital system skin musculoskeletal system haemopoietic system and endocrine Later chapters cover oncological emergencies and acute oncology and special situations such as cancer in younger and older people and pregnancy and fertility The guide also offers information about coping with the lifestyle and social issues that may arise with a diagnosis of cancer such as insurance travel and support and includes a chapter dedicated to palliative care for the cancer patient A unique appendix of clinical management flowcharts assists fast appropriate decision making *Cancer Treatment Reports*, 1982 Perez and Brady's Principles and Practice of Radiation Oncology Edward C. Halperin, Carlos A. Perez, Luther W. Brady, 2008 The thoroughly updated fifth edition of this landmark work has been extensively revised to better represent the rapidly changing field of radiation oncology and to provide an understanding of the many aspects of radiation oncology This edition places greater emphasis on use of radiation treatment in palliative and supportive care as well as therapy

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