

L. M. Portnoy

Radiologic Diagnosis of Gastric Cancer

A new Outlook

L. M. Portnoy

Radiologic Diagnosis of Gastric Cancer

A new Outlook

 Springer

Dr. L. M. Portnoy

1st Aeroportovskaya, 6-196

125319 Moscow

Russia

Springer Medizin Verlag Heidelberg

ISBN-10 3-540-29120-2 1. Auflage Springer-Verlag Berlin Heidelberg New York

ISBN-13 978-3-540-29120-2

Bibliografische Information der Deutschen Bibliothek

Die Deutsche Bibliothek verzeichnet diese Publikation in der Deutschen Nationalbibliografie; detaillierte bibliografische Daten sind im Internet über <http://dnb.ddb.de> abrufbar.

Dieses Werk ist urheberrechtlich geschützt. Die dadurch begründeten Rechte, insbesondere die der Übersetzung, des Nachdrucks, des Vortrags, der Entnahme von Abbildungen und Tabellen, der Funksendung, der Mikroverfilmung oder der Vervielfältigung auf anderen Wegen und der Speicherung in Datenverarbeitungsanlagen bleiben, auch bei nur auszugsweiser Verwertung, vorbehalten. Eine Vervielfältigung dieses Werkes oder von Teilen dieses Werkes ist auch im Einzelfall nur in den Grenzen der gesetzlichen Bestimmungen des Urheberrechtsgesetzes der Bundesrepublik Deutschland vom 9. September 1965 in der jeweils geltenden Fassung zulässig. Sie ist grundsätzlich vergütungspflichtig. Zuwiderhandlungen unterliegen den Strafbestimmungen des Urheberrechtsgesetzes.

Springer Medizin Verlag

© Springer Medizin Verlag Heidelberg 2006

Printed in Germany

Die Wiedergabe von Gebrauchsnamen, Handelsnamen, Warenbezeichnungen usw. in diesem Werk berechtigt auch ohne besondere Kennzeichnung nicht zu der Annahme, dass solche Namen im Sinne der Warenzeichen- und Markenschutz-Gesetzgebung als frei zu betrachten wären und daher von jedermann benutzt werden dürften.

Produkthaftung: Für Angaben über Dosierungsanweisungen und Applikationsformen kann vom Verlag keine Gewähr übernommen werden. Derartige Angaben müssen vom jeweiligen Anwender im Einzelfall anhand anderer Literaturstellen auf ihre Richtigkeit überprüft werden.

SPIN 1156 0968

Umschlaggestaltung: deblik, Berlin

Satz: typographics GmbH, Darmstadt

Druck: Stürtz AG, Würzburg

Gedruckt auf säurefreiem Papier

18/5135/DK – 5 4 3 2 1 0

Author's Foreword

We chose the radiological diagnosis of gastric cancer as the subject of our monograph for the following reasons: First, the diagnosis of gastric cancer has not improved radically during the past 10 years despite the extensive use of endoscopy in practical medicine. Second, the potentials of radiological examination and traditional X-ray diagnosis of gastric cancer are greatly underestimated.

Our thorough and detailed analysis of the situation based on our experience, both scientific and practical, should serve to remind health-care authorities and most clinicians about the advantages of radiological methods in diagnosing gastric cancer. It is necessary to radically revise the diagnostic concept, which was formed in the 1960s–1970s and was based solely on endoscopic examinations.

This book emphasizes the objective necessity of returning to the radiological diagnosis of gastric cancer in close collaboration with endoscopy. The monograph will be helpful to both practical radiological diagnosticians and gastroenterologists, oncologists, surgeons, and health-care authorities. It presents entirely new methodological approaches to the X-ray examination of the stomach and corrected semiotics of the tumor. We also provide a list of clinical symptoms of the disease. A special section in the monograph deals with screening of populations for gastric cancer with special emphasis on radiology.

We present comparative data to show the relations between X-ray data and morphological evidence obtained by examination of resected stomach tissues.

We also describe in detail all currently used methods, such as single and double-contrast barium investigations, ultrasonography, computed tomography, and magnetic resonance imaging. We describe the methodology and semiotics of gastric cancer, which were verified by using these methods, and the results of comparative studies obtained using traditional X-ray examination and morphological studies.

In the section dedicated to ultrasonographic and tomographic methods of examination we explain our point of view regarding the possibilities of modern radiological diagnosis in staging gastric cancer, in determining its spread over the stomach walls and invasion of the neighboring organs and tissues.

In this monograph we also discuss the indications for radical surgery which, in our opinion, need correction as well, because only histological evidence is now regarded as an indication for the operative treatment of gastric cancer.

January, 2006

Dr. L. M. Portnoy

Preface

This book deals with problems which are sufficiently important to become the subject of studies. Cancer of the stomach remains one of the most pressing medical problems. Meanwhile, scientific and practical interest in this problem has markedly diminished during recent years. According to some experts, this can be explained first by the decreasing incidence of gastric cancer. But this concerns only some developed countries, where effective measures are taken for the prevention and early diagnosis of malignant tumors. It is noteworthy that everything concerning gastric cancer today requires objective and comprehensive analysis. Another important factor is the vast amount of scientific information which has been accumulated on this problem. According to popular opinion, all possible scientific research in the diagnosis of gastric cancer has already been completed. But this is not so. Factors that force us to reconsider the problem include the relatively high incidence and low percentage of cancer diagnosis at its early stages, the high occurrence of inoperable tumors and the low 5-year survival, certain changes in the concept of gastric cancer morphogenesis and, more particularly, the prevalence of diffuse forms, and »new« proportions regarding the primary locations of the tumor in various parts of the stomach, characterized by significantly increasing frequency of the primary lesion on the greater curvature and the anterior wall of the stomach.

The leading role of the traditional X-ray studies in the complex examination of gastroenterological patients was challenged by excessive indulgence in modern endoscopy, which became dominant in the diagnosis of gastroenterological pathologies. But close studies of this problem show that the diagnostic benefits of endoscopy are overestimated. The incorporation of new, highly informative technologies (quite unjustified in some cases) into the set of procedures used for primary diagnosis of gastrointestinal pathologies pushed back the traditional X-ray methods.

Needless to say, despite recent advancements in the treatment of gastric cancer, in surgery in particular, the efficacy of this treatment depends largely on timely diagnosis of the disease.

We believe that it is necessary to change the commonly held attitude regarding the relationship between endoscopy and X-ray methods of examination, with due consideration given to the changed views on the morphogenesis of gastric cancer. It should be remembered that in its essence, the traditional X-ray examination is now one of the branches of radiological diagnosis which has been supplemented with new possibilities owing to the appearance of up-dated technologies such as ultrasonography, computed tomography, and magnetic resonance tomography. They all, in combination with the traditional X-ray examination, have significantly improved the overall diagnostic potential of the X-ray in revealing gastric cancer.

The authors believe that the main objective of this book, i.e., to share the vast experience of the authors and our colleagues in the radiological diagnosis of gastric cancer with radiologists, gastroenterologists, oncologists, and surgeons, will justify the resolute manner in which our opinions are presented in some of the sections. This sort of confidence is also based on our firm belief that every error in clinical examination of the patient, and every incorrect interpretation of the findings, is detrimental to the effectiveness of treatment of patients with cancer of the stomach.

Introduction

Until the 1960s–1970s, X-ray examination was the leading method of diagnosing gastrointestinal diseases [1, 11]. A great army of experienced radiologists in Russia and other countries were able to effectively establish the diagnosis of gastrointestinal diseases. At that time, no one suspected that the X-ray examination might be ever displaced from the diagnostic algorithm.

Meanwhile, significant changes in the diagnosis of gastric cancer took place during the last decades of the twentieth century. This period (beginning with the 1960s–1970s) was characterized by the almost unrivalled prevalence of endoscopy [62, 79, 90]. In 1958, the appearance of fiber-optic endoscopic tools initiated a new diagnostic trend in gastroenterology and gastroentero-oncology. The physicians were given the chance to visualize the mucous membranes *in vivo*. Fiber-optic instruments were successfully used to diagnose diseases of the gastrointestinal viscera, including cancer of the stomach.

Beginning in 1964, fibergastrosopes became available, which could be used to take samples of new growth tissues. In 1978, instruments equipped with photo and cine cameras made it possible to record the endoscopic pictures.

On the whole, the increasing popularity of this trend could be described as an endoscopic boom. An avalanche of scientific papers, monographs, and other publications appeared. All were dedicated to the use of endoscopes in the diagnosis of practically all gastrointestinal pathologies, gastric cancer included. The number of physicians who started practicing endoscopic diagnosis increased accordingly. Meanwhile endoscopy is one of the main diagnostic tools, and each gastroenterologist must be able to use it in his or her examination of patients with gastroenterological diseases.

Once given the chance to visualize the surface of the mucous membrane (we do mean the surface of the mucous membrane, rather than the wall of the stomach), gastroenterology abruptly changed its diagnostic orientation: The proportion of X-ray examinations dramatically decreased, whereas endoscopy became practically the only instrumental method to reveal diseases of the gastrointestinal tract, gastric cancer included [32, 58].

The absolute domination of endoscopy did not, however, increase the percentage of diagnosed «minor» cancers of the stomach. Following the experience of Japanese physicians, who significantly improved the quality of diagnosis of gastric cancer, in its initial stages in particular, by population screening, physicians have also markedly improved the situation. Radiology and now radiological diagnosis and the traditional method of examination, is slowly but steadily regaining its position as one of the main diagnostic methods used for patients with gastroenterological pathologies. All this, after all, has markedly improved the effectiveness of uncovering gastric cancer and increased the 5-year survival of patients.

In 1962, an endoscopic classification of early gastric cancer was worked out. This classification was acknowledged not only by endoscopists but also by diagnosticians of other specialties, X-ray and morphology experts included. Endoscopy is undoubtedly a powerful tool for diagnosing various gastroenterological diseases. Many scientific and practical developments have been achieved using endoscopy, and many medical researchers and practitioners began to regard endoscopy as the gold standard for abdominal visualization. But during the last decades of the past century, the proportion of infiltrative gastric cancer increased significantly, and endoscopy often fails to answer many practical questions in such cases.

Practitioners often question which of the diagnostic tools is more informative, radiology or endoscopy. Their interest in this problem is easy to understand. They are often faced with a discrepancy between the results of diagnostic examinations and the final diagnosis. Thus, they cannot make a final decision about which primary examination method they should choose,

and they tend to assume that endoscopy is the sole sufficient examination, simply because this was the traditional attitude to endoscopy in the second half of the twentieth century. Strange as it may appear, no one can give a definite answer to their question. This is a kind of medical paradox. Both methods are aimed at attaining the same goal. But they cannot be compared as regards their informative value, because the current roentgenosemiotics of gastric cancer is founded on a standpoint that is quite different from the former one. It is now based on the evaluation of the stomach wall rather than on characteristics of mucosal relief, including so-called microrelief. Neither can the two methods be regarded as being in contraposition to each other. In future, they can probably work together. Endoscopic ultrasonography and optical coherent tomography are a good example of how two examination methods can be combined. Informative value is a relative notion, and it depends largely on the particular diagnostic apparatus and materials used for examination of patients and, of course, on the professional skill of the examiner.

An oft-cited criticism of radiological diagnosis is the ionizing radiation, which is undoubtedly harmful for the patient. But modern X-ray units and digital technologies with high-quality contrast media can improve X-ray examinations and broaden the potentials of X-ray diagnosis with a substantially reduced radiation dose for the patient. Of course, updated digital X-ray units and MRI are expensive, but we cannot make a diagnosis without these new modalities in the twenty-first century.

The other reason for the inefficient organization of diagnostic examinations of gastroenterologic patients is related directly to radiological diagnosis, and more particularly to the almost complete dismissal of X-ray examinations as a way of uncovering gastric cancer. The opinion exists that tumors are exclusively the subject of oncology. But we believe that one of the main aims of the field of oncology is (in addition to treatment of patients) the organizational and methodological management of oncological services rendered to the population, with due consideration of medical and social aspects. The problem of early diagnosis of malignant tumors of the gastrointestinal tract, which constitute 25–30% of all tumors, will not be solved unless the thesis suggesting that the most common tumors, such as tumors of the lung, stomach, mammary gland, and rectum should be revealed at the stage of outpatient examination with active involvement of screening (selective screening in particular) is adopted as an axiom. Thus, X-ray diagnosticians must do their best to reveal tumoral diseases of the gastrointestinal tract.

Based on our long and vast experience in discovering gastric cancer, we must say that, since the introduction of endoscopy into gastro-oncology and the active dismissal of the X-ray method, there has been no improvement in the early diagnosis of gastric cancer. The 5-year survival, one of the major proofs of successful surgical treatment, remains at a very low level [6, 8, 16].

There are periodical discussions in the literature about the necessity of screening the so-called risk groups in the population for gastric cancer aimed at early revealing of carcinoma. On the whole, this problem has been solved only in Japan, where gastric cancer was extremely frequent in the 1960s, accounting for 40–45% of oncological morbidity. The Japanese used a modified X-ray examination with double-contrast X-ray investigation of the stomach to screen their population. Remote-control X-ray units were developed which reduced the radiation dose for the personnel and thus increased the number of examinations that could be conducted by one roentgenological team. It is worthy of note that Japan was the first country to employ modern endoscopy. Owing to economic considerations, this method did not become popular in countries where the incidence of gastric cancer was lower. A concept of examining risk groups was produced as an alternative, and programs for prevention of pre-cancer pathologies of the

gastrointestinal tract were also adopted. These measures did, after all, substantially reduce the incidence of gastric cancer; they increased the number of early (minor) cancers diagnosed, and increased the 5-year survival in the USA, Great Britain, Canada, Belgium, and some other countries [125, 144, 165, 170, 186, 236].

The usefulness of the formation of such risk groups with the aim of increasing the effectiveness of gastric cancer diagnosis is indisputable. But now a new subject of special concern has appeared which is an important argument for improving the current disadvantageous situation in the diagnosis of this pathology, namely: the accents in the morphogenesis of gastric cancer have radically changed [102, 121, 244]. By using the double-contrast technique extensively in combination with elements of the traditional X-ray examination, we have acquired convincing evidence of the leading position of diffuse and mixed tumors among the anatomical forms of gastric cancer. Slowly developing and only manifesting clinically at later stages, intramural tumors are the most difficult to reveal, even using the most advanced technologies. Such tumors show themselves as minimal changes on the surface of the mucous membrane of the stomach and are a serious challenge to endoscopic diagnosis of the tumor. And finally, it is necessary to mention a significant increase in the incidence of cancer of the upper part of the stomach, the greater curvature, and the anterior wall of the stomach. This suggests that it is necessary to radically correct the existing viewpoints on the problem of gastric cancer diagnosis, based mostly on the endoscopic classification of 1962, and to emphasize the particular necessity of urgently resuming radiological diagnosis, such as the traditional X-ray technique. Working in close contact with endoscopists we became convinced that, in a significant proportion of cases, the current radiological and endoscopic semiotics of early cancer of the stomach, in its classical understanding, restricts the framework of diagnosis of carcinomas at their initial stages [28, 32].

In this connection we return to the problem of linitis plastica, the form of diffuse cancer, in which we see the origin of the difficulties that persist today and are connected with the diagnosis of gastric cancer on the whole. We appreciate the authors who, early in the twentieth century, interpreted linitis plastica as being the most common and fatal disease, but today we regard it from the standpoints of current possibilities of diagnosis of the disease at its early stage. Furthermore, guided by the pathogenetic mechanisms of propagation of blastomatous infiltration in linitis plastica patients, we have arrived at the conclusion that their major elements occur in most patients with gastric cancer.

We have formulated a special symptom complex characterizing the initial manifestations of gastric tumor [31, 32]. Thus it can be definitely stated that, if our aim is to improve the situation in gastroenterology and gastroentero-oncology, the traditional significance of radiology in the diagnosis of gastric cancer must be restored.

Radiological diagnosis methods have changed substantially, mainly because of developments in digital technologies. Modern digital X-ray units have greatly reduced the doses for patients and simultaneously increased diagnostic efficiency. Ultrasonography, CT and MRI have broadened the possibilities for radiological diagnosis of the gastrointestinal tract on the whole and of gastric cancer in particular [2, 20, 29, 49, 92, 230, 273].

Contents

Author's Foreword	V
Preface	VII
1 Some Current Problems in the Epidemiology of Gastric Cancer	1
2 Morphology of Gastric Cancer	7
Introduction.....	7
Incidence.....	8
Histogenesis.....	8
Localization.....	8
Multiple Gastric Cancers.....	10
Staging.....	10
Histological Classification.....	12
Early Gastric Cancer.....	16
3 Clinical Symptoms of Gastric Cancer	21
Introduction.....	21
Symptomatology.....	31
Conclusion.....	43
4 Radiological Diagnosis of Gastric Cancer	47
Introduction.....	47
Traditional X-ray Investigations.....	47
Ultrasonography.....	68
Computed Tomography.....	70
Magnetic Resonance Imaging.....	79
5 Radiological Signs of Gastric Cancer	97
Introduction.....	97
Traditional Radiological Signs.....	102
Ultrasonographic Signs.....	140
Computed-Tomography Signs.....	149
Magnetic Resonance Signs.....	169
6 Relationship Between Radiology and Endoscopy in the Diagnosis of Gastric Cancer	185
7 Some Correction of Current Views on Cancer Location in Various Parts of the Stomach	217
Cancer of the Cardiac Part.....	217
Cancer of the Antral and Pyloric Parts.....	238
Cancer of the Greater Curvature.....	260
Cancer of the Anterior Wall.....	270

8	Radiological Examination in Screening for Gastric Cancer	285
9	Summary	295
10	References	297