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**REVISED AND
ENLARGED
ENGLISH
EDITION**

The Early Radiological Diagnosis of Diseases of the Pancreas and Ampulla of Vater

***ELECTIVE EXPLORATION OF THE AMPULLA OF VATER AND
THE HEAD OF THE PANCREAS BY HYPOTONIC DUODENOGRAPHY***

A clinical monograph based on a study of over 500 patients . . .
establishing a new technique of duodenal radiography . . . filling
a diagnostic gap never filled previously by standard radiological
gastro-intestinal fluoroscopy, cholangiography, peritoneoscopy,
and tomography.

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THE EARLY RADIOLOGICAL DIAGNOSIS OF DISEASES OF THE PANCREAS AND AMPULLA OF VATER

Elective Exploration of the Ampulla of Vater
and the Head of the Pancreas by
Hypotonic Duodenography

By

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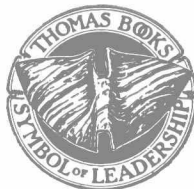
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THE EARLY RADIOLOGICAL
DIAGNOSIS OF DISEASES
OF THE PANCREAS AND
AMPULLA OF VATER

INTRODUCTION

There are serious obstacles to good radiologic exploration of the pancreas and the region of the ampulla of Vater.

The pancreas, lying deep within the abdominal cavity, has about the same degree of radio-opacity as the neighboring organs, for which reason it cannot be seen on plain films. Aside from calcification, neither its shadow nor its shape appears on plain x-ray films. It still is impossible to opacify the pancreatic excretory system through the use of a selectively secreted radio-opaque medium.

A clear radiologic examination of the Vaterian region cannot, on the other hand, be made using ordinary barium meals. Because of the degree of duodenal peristalsis, the pictures vary a great deal from one to another and are difficult to compare. It is rare that they demonstrate early lesions.

Intravenous cholangiography sometimes shows compression or a deformity of the common bile duct, but this can only be considered as a late sign. The same is true of splenoportography.

On the other hand, axial tomography using retroperitoneal and intragastric gas injection has given us for the first time direct images of pancreas.

While we recognize the value of axial stratigraphy, we at the same time recognize the value of hypotonic duodenography, which can give us a clear outline of the shape of the head of the pancreas and of the Vaterian region.

It is to the description of the technique and the analysis of the results of hypotonic duodenography that this book is dedicated.

The hypotonic duodenography permits the study of the radiological contour of the head of the pancreas, the inferior border of the body of the pancreas and region of the ampulla of Vater. Additionally, the technique

can be used to study the pylorus, the bulb, and the rest of the duodenum, and shows abnormal imprints of neighbor organs.

The basic idea in hypotonic duodenography is to obtain a temporary elimination of the peristalsis and tonus of the duodenum, then to inject the barium preparation by tube under pressure to completely fill the duodenal lumen. This segment of the digestive canal will no longer be subject to changes caused by the peristaltic movements and tonic contractions which interfere with serial images while the standard technique is being used. Thus, with hypotonic duodenography an exact moulage of the head of the pancreas should be obtained.

Compared to the standard examination, radiography of the distended duodenum presents a remarkably different aspect:

The duodenal outline by the standard technique corresponds to the passage of the barium in the lumen of the duodenum, virtually the interior outline of the mucous membrane which forms it; and it cannot be said that obtaining this image of the duodenal lumen is other than just that; or that it helps visualization of pancreatic contour.

However, by radiography of the distended duodenum, having lost tonus and being filled under pressure, the duodenal contact outline then conforms to the head of the pancreas. The contrast medium cannot be practically distinguished from the contour of the pancreas, for it is molded against it, giving a faithful outline, or a moulage effect.

In the standard examination, it is often difficult to differentiate a filling defect, or a notch in a single film from a duodenal peristaltic wave, but distended—hypotonic—duodenography repeated on the same lesion gives with certainty and precision a diagnostic image. Thus, here a suspected image can be well studied, better even than in the stomach or the bowel.

All the case histories analyzed in this work were collected at the surgical clinic of Professor P. Mallet-Guy. They have all had operative controls and for the most part biopsy controls.

PREFACE

French Edition

In 1955, my friend, P. MIRIZZI, recommended to me a brief manuscript by a young Argentine surgeon. It was modestly illustrated, but it seemed to contain something very new in radiological examination of the pancreas.

Through the years that problem has been hindered unless calcifications were demonstrable, which were not always helpful, because they did not always account for the symptoms of the patient. Gastric deformations are always late and, perforce, doubtful, and particular changes of the outline of the duodenum really did not usually show the condition of the head of the pancreas.

I had already happily encountered in 1953 the first transverse tomograms which without doubt visualized in detail the gland for the first time, the condition of the pancreatic body and tail, but the procedure caused discomfort for the patient.

Two years later, coincidentally with the first visualization by intravenous cholangiography of the bile duct and its deformations, the technique published by DOMINGO LIOTTA gave the exact contour outline of the head of the pancreas. It brought earlier radiological diagnosis of cancer of the pancreas and of the ampulla of Vater and was of great value for chronic pancreatic diseases and their complications, as well as for certain calculi of the bile ducts and the ampulla of Vater.

DR. PAUL JACQUEMET was using the technique on my service when DR. DOMINGO LIOTTA came to Lyon in 1956. A dynamic and fruitful association followed, in which there was a refinement of technique and increased knowledge and experience.

After collaborating for two years in my clinic, in 1959 they evaluated the physiologic principles of the method and made a critical appraisal of

PREFACE

earlier observations. Each of these studies had the necessary operative controls, and, in any questionable cases, histopathological checks.

This valuable little book, which I am happy to present, is not a hasty publication. It represents a sustained experience of the entire service of more than seven years to which I pay homage. Each phrase has been weighed; each affirmation, considered for its facts and validity.

No doubt this work will find among those interested in pancreatic pathology—and especially the radiologists—a warm reception. It merits that, for its excellent presentation and the originality and interest of the subject.

PIERRE MALLET-GUY

ACKNOWLEDGMENTS

The author was Chief of Surgical Clinic when hypotonic duodenography was originated more than ten years ago. He was in one of the finest gastroenterology services in Latin America, under Professor P. Mirizzi, famed for his operative cholangiography.

Hypotonic duodenography is simple, it depends on placing the distal end of a catheter into the second portion of the duodenum. The temporary hypotonia following parenteral injection of Antrenyl and instillation of viscous xylocaine upon the duodenal mucosa allow the distention of the duodenum, placing its contrasting lumen into pseudocontact with the pancreatic surface.

This maneuver permits observations which are unattainable during the standard radiological examination. A radiological moulage of the pancreatic head is obtained by this technique which allows for comparison of a suspected image in a series of films.

At best, during standard radiological examination, the contrast medium is subject to constant motion, and so are the outlines of the central duodenal lumen. Anyone unfamiliar with hypotonic duodenography usually cannot appreciate the actual physical distance between the mobile central duodenal lumen and the pancreatic surface. Conversely, hypotonic duodenography visualizes the duodenal lumen in its response to the contiguous pancreas, which assists detection of early lesions of the pancreas and the ampulla of Vater.

I am constrained to dedicate this procedure of clinical investigation to the young university doctor everywhere, particularly in Latin America.

This procedure could never have been developed without the facilities and the most kind assistance of Professor Pierre Mallet-Guy of Lyon, France. He directed the research in its most critical period, during the clinical inter-

ACKNOWLEDGMENTS

pretation and evaluation of this technique. It was his enthusiasm and scientific dedication which supported Dr. Jacquemet and me during the years of this investigation. My personal gratitude toward him is deeply founded.

We are indebted to Dr. George L. Jordan, Jr., Professor of Surgery, Baylor University, and Dr. Raymond Pruitt, Professor of Medicine, Baylor University, for reviewing this work and to Dr. C. William Hall, Assistant Professor of Surgery for the final revision and countless additional suggestions.

DOMINGO LIOTTA, M. D.

Houston, Texas, U.S.A.

HISTORICAL

Hypotonic duodenography involves the technical field of pharmacoradiology to influence tonus and peristalsis affecting the digestive canal. This obliged us to consider other techniques which have been proposed by different authors, and certain of them can be compared to ours.

Most of this work has been to assist the radiological study of the stomach and the duodenal bulb by suppressing spasm and causing better evacuation of the stomach in order to obtain more complete filling of the bulb. These have never been used primarily for the purpose of better study of the deformities of the duodenal canal as a result of pancreatic lesions.

The works of Ritvo in 1937, who used belladonna orally, then of Ritvo and Weiss, in 1927, recommending physostigmine; those of Myreson and Ritvo in 1963 using benzedrine sulphate orally. Finally, Ritvo in 1936 who comments on the good results of physostigmine and benzedrine, and proposed a new substance, Mecholyl, to control a localized spasm, atony or intestinal paralysis.

Bernard, in 1963, extolled subcutaneous administration of atropine for better viewing of the bulb.

In 1938, Cottonot, Levy and Cherigie advised atropine sulphate, 0.5 to 1.0 mg., with 10 cc. of 10 per cent calcium gluconate intravenously to provoke a hypotonic distention of the duodenum, the effect beginning about ten minutes after injection.

Porcher, in 1944, at first to assist radiological visualization of ulcers of the bulb, used a dose of morphine chloride, 10 mg. subcutaneously and the

series were made with the patient in the supine position. This caused duodenal stasis, as he commented several times. Thus, Abbot and Pendergrass explained two successive phases: the first of hypertonia and duodenal hypermotility for twenty minutes, followed by about three hours of hypotonia. Caroli reckoned the morphine induced a duodenal distention by the force of the gastric thrust which is greater than the duodenal contraction force. Whatever it is, after injection of morphine, it is possible to get very good radiological images of the duodenal bulb. Also, when taken in the supine position, sometimes an enlargement of the entire duodenal canal can be seen. However, the duodenal filling is variable following the patient's reaction to the morphine. From Porcher, Bourdon, Boudaghina, and Sauvegrain, 1949, the result was positive in 80 per cent of cases, no action in 12 per cent of cases, and in 8 per cent there were side reactions of weakness, nausea and vomiting.

Porcher's technique, especially for the duodenal bulb, in summation, produces good visualization of the canal without causing a true hypotonia.

Abbott, Ledoux-Lebard and Buhot, in 1944, advised the successive injection of atropine intravenously and morphine subcutaneously to assure good visibility of the bulb.

Abbot, Renaux and Girard in 1964 showed that eight units of insulin given ten to fifteen minutes before the barium meal cause gastric hypertonia and hyperperistalsis associated with dilatation of the bulb. However, if the dose were increased, a dilatation of the entire duodenal canal was obtained. The action of insulin approximated that of morphine without the inconvenience and side effects.

Tetraethylammonium bromide has been studied by numerous French and Americans. Debray, Pergola, and Muffang, and later the same year, 1950, Debray, LeCanuet and Chabonier obtained effects on the stomach and duodenum. If the drug were given intravenously thirty minutes before the barium meal, there were increased gastric tonus and contractions with moderate dilatation of the duodenal canal; given after the meal, the duodenum showed hypotonia and sluggishness.

In comparison with this pharmacodynamic research, the efforts of Buckstein in 1924-1925 are recalled, the direct injection of the contrast material

through a duodenal tube. Without doubt the duodenal outline was plainly distinguished from the gastric shadow, but it lasted only a few seconds.

In summary, all these techniques improved the radiography of the duodenal bulb, but were without the purpose to distinguish the exact contour of the head of the pancreas.

The hypotonic duodenographic technique was originated and first used by one of us, Dr. Domingo Liotta, while on the service of Prof. P. Mirizzi, Cordoba, Argentina. The first objective had been to render the biliary ducts opaque retrogradely through the ampulla of Vater by injecting the contrast medium between two balloons on a Miller-Abbot tube. It was unsuccessful for this purpose; but the radiograms did foretell the usefulness of the technique for pancreatic and duodenal examinations. The first trials for duodenography had been dominated by the mechanics of the problem. In effect, the contrast medium was introduced into the duodenum by a Miller-Abbot tube between two balloons which would dam off the rest of the duodenum. This was badly tolerated and very often after a few minutes the duodenum violently ejected the tube into the stomach. The idea occurred to us that this ejection could be avoided by rendering the duodenum hypotonic. Then trials were made with different pharmacodynamic agents capable of producing excellent hypotonia and their physiologic results observed.

In 1954, an early report was presented to the Argentine Association of Surgery, Buenos-Aires, on the results of tests with atropine sulphate and scopolamine by injection and novocain instilled by duodenal tube. Different anti-cholinergics had been tried: prantal, avagal, Antrenyl[®], lispamol, and finally, some derivatives of phenothiazine.

In July, 1954, we used prantal preceding the examination but it had to be used in 100 mg. doses orally each six hours for two whole days preceding. This procedure was proposed in the first publication in the *Lyon Chirurgical* in 1954, but the forty-eight-hour period of preparation was impractical. This is why we became interested in Antrenyl[®], one of the anti-cholinergic injectable drugs. After numerous comparative trials, we determined the associated use of the injected anti-cholinergic Antrenyl, with the duodenal installation by tube of Xylocaine Viscous[®] to eliminate motor reflexes by anesthesia of the duodenal mucosa gave the best and most constant results in all subjects.

HISTORICAL

A technique emerged. It was introduced on the service of Prof. P. Mallet-Guy for trial or adoption, where it could be studied on a greater scale with special attention to biliary and pancreatic diseases.

Reports of results obtained by this method were published in different reviews.

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