Hypotonic duodenography

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Hypotonic duodenography, a selective investigation of a paretic, dilated duodenum, was introduced by Liotta in 1954, and gives a characteristic and regular picture of the duodenum unaffected by peristalsis or contrast in the stomach (Fig. 1). Hypotonic duodenography has been proved by several authors to be a valuable supplement in the diagnosis of disorders of the pancreas (Keul and Rieden, 1965; Kriessmann, 1968; Michellod, 1965; Rösch and Salamoun, 1965; Stage and Banke, 1968). This paper presents the results of using this method for one year.

TECHNIQUE

The patient is prepared in the same way as for a conventional examination of the upper gastrointestinal tract. The duodenum was as a rule intubated the night before the examination with an Usci tube no. 10-14 with side holes on the distal 15 cm and mounted with a mercury

bag containing 0.5 ml. In most cases a pancreatic function test was carried out well before the examination. In a few cases, however, the procedure described by Raia and Kreel (1966), using a Scott-Harden gastroduodenal tube, was adopted. The side holes in the tube were positioned in the duodenum under fluoroscopic control.

Hypotonia was induced with 4 to 6 mg intravenous oxyphenonium (Antrenyl R, Ciba) starting two to three minutes after the injection.

During fluoroscopy, the patient in the supine position, 100 to 200 ml warmed barium sulphate suspension was injected until the duodenum was filled. Radiographs were obtained on film, 18 × 24 cm, in the frontal and right anterior oblique projections. After aspiration of most of the contrast medium and insufflation with 300 ml air, additional radiographs were obtained during the last minutes of insufflation in the same manner as described above.

The examination lasts about 15 minutes.

No serious complications were observed during the examination in spite of the large dose of oxyphenonium used. The prescribed maximum dose is 2 mg intramuscularly. A few patients complained of headache, and all of them showed a moderate degree of tachycardia and dryness of the mouth. On enquiry several patients complained of momentary paresis of accommodation. None complained of urinary retention. The most important inconvenience for the patients was undoubtedly the intubation of the duodenum.

RESULTS

From November 1966 until January 1968, 103 examinations on 99 patients were carried out, of which eight could not be evaluated, three because of lack of intestinal paresis and five because the tube was incorrectly positioned.

Ninety-nine patients were examined: 83 for pancreatic disease, eight for choledocholithiasis, and 12 patients for gastrointestinal ulcer (Table I).

GROUP 1 In 15 patients of the 83 in group 1 we established the diagnosis of pancreatitis by hypotonic duodenography. This diagnosis was confirmed by operation in two patients and was presumably

FIG. 1. Double contrast picture in a normal subject in hypotonic duodenography.

FIG. 2.

FIG. 3.

FIG. 4.

FIG. 2. *Chronic pancreatitis. Corresponding to the concave side of the second part of the duodenum, a flattened pattern proximally and an irregular pattern distally are seen.*

FIG. 3. *Enlarged duodenal loop with a very irregular pattern and calcification of the pancreas in chronic pancreatitis.*

FIG. 4. *Large contrast defect in the concave side of the second part of the duodenum; the ampulla of Vater is intact in a case of tumour of the head of the pancreas.*

confirmed by laboratory tests in another eight cases (Table II and Figs. 2 and 3). In the remaining five patients the diagnosis was refuted. In one patient the operation showed a tumour in the body of the pancreas, and in two stenosis of the coeliac artery due to arteriosclerosis was proved.

In three patients with normal findings in hypotonic duodenography previous operations had proved the existence of inflammatory deformity in the pancreas; in one patient, however, it was only located in the tail of the pancreas.

Using hypotonic duodenography we erroneously diagnosed a cancer in the pancreas as pancreatitis. One patient with pancreatitis verified at operation by arteriography had erroneously been diagnosed as a case of cancer of the pancreas. By conventional upper gastrointestinal tract contrast examination it was only possible to make the diagnosis in two of the presumed 13 cases of pancreatitis.

In eight patients in group 1 using hypotonic duodenography we found deformity compatible with tumour: four in the head of the pancreas, two in

the duodenum, and two in the ampulla of Vater (Table III and Figs. 4 and 5). Six were verified at operation. Radical operation was possible only in the two patients with cancer of the duodenum (Fig. 6).

Of the two patients under suspicion of cancer in the ampulla of Vater only one was operated upon. No tumour was found, but there was an occluding fibrous band over the second part of the duodenum. The other patient was discharged without operation as additional investigations did not support the diagnosis of tumour. One patient with cancer of the head of the pancreas verified at operation was diagnosed erroneously as pancreatitis by hypotonic duodenography.

Using conventional upper gastrointestinal tract examination it was possible in only two cases to assume a diagnosis of tumour. By coeliacography one case of cancer in the pancreas was not diagnosed, and in the remaining patients it was not possible to distinguish between cancer in the duodenum or the pancreas.

TABLE I

RESULTS OF HYPOTONIC DUODENOGRAPHY IN 103 CASES

Site	No.	Not Evaluable	Cause	
			No Paresis	Tube Incorrectly Placed
Duodenum, pancreas	83	4	2	2
Choledochus	8	0	0	0
Resected stomach anastomosis	12	4	1	3

GROUP 2 Eight patients had previously undergone choledochoduodenostomy or sphincteroplasty. In all hypotonic duodenography showed retrograde contrast filling of the choledochal duct, in three instances with filling defects verified at operation as choledochus concrements. In two of these three patients it was impossible to carry out intravenous cholangiography due to impaired liver function. Operation in one additional patient in this group did not reveal any abnormal condition. Seventeen

TABLE II

RESULTS OF HYPOTONIC DUODENOGRAPHY IN 83 CASES

No.	Hypotonic Duodenography	Diagnosis	Result
3	Pancreatitis	Two chronic pancreatitis One acute pancreatitis	One operated
12	Presumptive pancreatitis	Seven pancreatitis (3 presumptive) One tumour in the body Two arteriosclerotic stenosis Two others	One operated Palliative One operated
3	Normal	Chronic pancreatitis	Previously operated

TABLE III

RESULTS OF HYPOTONIC DUODENOGRAPHY IN 83 CASES

No.	Hypotonic Duodenography	Diagnosis	Result
4	Tumour in the head of pancreas	Carcinoma of pancreas	Two palliative Two inoperable
2	Tumour in the second part of duodenum	Adenocarcinoma in the duodenum	Both radical
2	Tumour in the ampulla of Vater	One fibrous band One steatorrhoea—no other signs of tumour	One operated
1	Presumptive pancreatitis	Tumour in the body of the pancreas	Operated

FIG. 5.

FIG. 6.

FIG. 7.

FIG. 5. *Enlargement of the duodenal loop with an irregular pattern on the concave side in the second and third parts with contrast defects in a case of tumour of the head and body of the pancreas.*

FIG. 6. *Distinct concentric stenosis with irregular walls in the proximal part of the second part of the duodenum in a case of tumour.*

FIG. 7. *Choledocholithiasis with oedema of the ampulla of Vater; enlarged ampulla with filling defect.*

patients in our survey had previously undergone cholecystectomy without choledochus relieving operation. We did not find retrograde filling using hypotonic duodenography in any of these patients.

GROUP 3 Twelve patients with gastric resection were investigated for recurrent ulcer. The result of hypotonic duodenography in these patients was not very satisfactory. First, three of the investigations could not be evaluated due to incorrect positioning of the tube, and in the remaining patients the picture of the anastomosis was not superior to one obtained by conventional x-ray contrast examination of the stomach.

Of additional incidental findings by hypotonic duodenography we would mention duodenal diverticula and malformations of the duodenum.

Forty-five of the 99 patients in the survey were operated on.

DISCUSSION AND CONCLUSION

The technique used differs from that of Liotta on three points. We have excluded the instillation of a local anaesthetic into the duodenum, and have given a larger dose of oxyphenonium, which we injected intravenously not intramuscularly. We have thus reduced considerably the duration of the investigation without affecting the quality. The three examinations of patients with incomplete paresis were carried out using the minimum dose of oxyphenonium, 4 mg, whereas according to our present routine we use 6 mg. The incorrect positioning of the tube in five patients was due to lack of practice.

It should be noted that hypotonic duodenography was not performed on patients suffering from diseases which might contraindicate the use of an anticholinergic drug—glaucoma, urinary retention, uncompensated cardiac diseases, and severe angina pectoris.

For the evaluation of the radiographs we used the criteria laid down by Jacquement, Liotta, and Mallet-Guy (1965) based on 500 investigations by hypotonic duodenography. In diseases of the pancreas the concave side of the duodenum is especially affected, as the typical pattern of pancreatitis is flattening or irregular outlines whereas tumours give contrast defects.

The survey is hardly sufficient to allow of a conclusive comparison with other methods of examination. The method seems to be of distinctly greater diagnostic value in diseases of the pancreas and duodenum than the conventional x-ray examination of the stomach and duodenum. The examination should be combined with a pancreas function test

(Thaysen, Müllertz, Worning, and Bang, 1964) and with exfoliative cytology of the pancreas (Asnaes, Johansen, and Møller, 1968).

In our survey hypotonic duodenography for tumours of the pancreas and duodenum has given the same results as coeliacography. For pancreatitis it is more uncertain, especially as it can be difficult to differentiate between pancreatitis and cancer of the pancreas.

When operations to relieve biliary obstruction have previously been performed, the technique can be used when obstruction is suspected, especially in cases of affected liver function where intravenous cholangiography is not possible.

In our hands the investigation has not given better results than a conventional x-ray examination of the stomach for demonstrating the anastomosis on patients with gastrectomies.

We would emphasize that the investigation is comparatively easy to perform. There are no serious complications, it is inexpensive, and it is not very time-consuming.

SUMMARY

A new radiological contrast investigation, hypotonic duodenography, has been carried out in 99 patients. The investigation is used for diagnosing diseases of the pancreas, duodenum, and deep biliary ducts after intravenous injection of oxyphenonium in large doses and direct contrast filling of the duodenum through a duodenal tube.

Of 103 investigations eight could not be evaluated. In 45 patients the diagnosis was firm and they were operated upon after the investigation.

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