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Visualisation of diverticula of the upper part of the alimentary tract; comparison of roentgenologic and endoscopic techniques

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Diverticula of the upper part of the alimentary tract, irrespective of their etiology, are frequently observed benign *changes of the pharynx, oesophagus, stomach and duodenum. In the present work, patients of the II General Surgery Department of the Medical University of Lublin, with radiologically or endoscopically proved diverticula of the upper part of the alimentary tract, were examined. The presence of diverticula of such localisation was an indication for supplementary endoscopic or radiological examination. The localisation, size, diameter of the opening, mucosal relief of diverticula and its contiguity were checked and analysed. Our data suggest that both medical procedures are complementary to each other. All previously observed changes in diverticula of the thoracic part of the oesophagus and the infradiaphragm part of the alimentary tract were fully proved. The radiological examination gave a better view of Zenker's diverticulum, especially in short and obese patients. Sampling and better visualisation of the diverticula opening testify to the unquestionable superiority of endoscopy. However, precise evaluation by radiological process fully completes the diagnostic protocol. Both diagnostic procedures are usually supplemented by manometric examination of the oesophagus and superior and inferior oesophageal sphincters. This enables the accurate diverticula etiology to be stated.*

key words: diverticula, alimentary tract, pharynx, oesophagus, stomach, duodenum, radiology, endoscopy

INTRODUCTION

Diverticula of the upper part of the alimentary tract are frequently observed benign changes of the pharynx, oesophagus, stomach and duodenum. Most of them are acquired and develop at the age of 40 years or later. Congenital and early postnatal diverticula are rare but also seen in children and adolescents. Some of the investigators do not distinguish the infantile type of diverticula and classify them as congenital ones [1, 10, 15, 29, 37].

Irrespective of their etiology the two morphological types of diverticula are classified: the true (extraluminal) diverticula and pseudodiverticula (intraluminal ones). The congenital diverticula are usually

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true type formed by herniation of all layers of the alimentary tract wall through muscular defect or in places where arteries enter the wall. The pseudodiverticula are only acquired and formed by mucosal and submucosal layers with some scattered muscle fibres herniated through the muscular fasciculi of the muscular layer of the wall. However, both types can co-exist in one patient. In such cases the pseudodiverticula are usually smaller and surround the true ones, which are more prominent [10, 15, 37].

Diverticula, due to the different pathogenesis, are also divided into pulsion-type and the less frequent traction-type [10, 15, 31].

Anatomical classification divides diverticula depending on their localisation and number. In the pharynx, Zenker's and the lower situated Killian-Jamieson's diverticula are observed. The oesophageal diverticula are seen mostly in the middle (midthoracic diverticula) and distal third of the oesophagus (epiphrenic diverticula). The postero-medial wall of the stomach, near the oesophagogastric junction, is the most common localisation of gastric diverticula. Unlike other localisations, duodenal diverticula occur more often as multiple lesions than single ones, located in the vicinity of the great duodenal papilla (papilla of Vater) followed by transversal and ascending part of the duodenum [1, 10, 15, 20, 22, 29, 37].

The clinical symptoms of diverticula depend on their localisation, number, size and other concomitant diseases. There are no typical manifestations of diverticula. Usually they simulate signs of other diseases, e.g. symptoms of cholecystitis or pancreatitis are characteristic for duodenal diverticula, while dysphagia, regurgitation and pain are common complaints in oesophageal ones. Single, especially small, lesions may be asymptomatic and such diverticula usually are an incidental finding. However, like the bigger ones, they can also produce different complications such as haemorrhage, perforation, ulceration and neoplastic transformation [10, 15, 22, 29].

The aim of our study was to compare the usefulness and repeatibility of the conventional contrast fluoroscopy and endoscopic examinations. Both diagnostic methods are commonly and routinely used in medical procedures to examine the upper part of the alimentary tract. However, there are only limited data regarding their effectiveness when both methods are performed.

MATERIAL AND METHODS

In the presented study, data obtained from patients of the 2nd General Surgery Department of the Medical University of Lublin, hospitalised in 1998–2000, were evaluated. Radiologically or endoscopically proved diverticula of the upper part of alimentary tract were the criterion that classified a patient to the study group. The presence of diverticula of such localisation was an indication for supplementary endoscopic or radiological examination. Concomitant serious disease of the upper alimentary tract, such as neoplasm located directly to diverticula, and poor general condition excluded a patient from the studied group.

The radiological examination was performed using the Siemens Siregraph CF-System (Erlangen, Germany) during single or double contrast fluoroscopy. Barium Sulfuricum suspension (TERPOL Przedsiębiorstwo Farmaceutyczne S.A., Poland) or Prontobario HD (Bracco S.P.A., Italy) were used as a positive contrast. Stomach air or Duogas (Bracco S.P.A., Italy), administered before examination, were used as a negative contrast. Each radiological examination was started in Trendelenburg position, followed by supine, semirecumbent, AP and lateral erect positions. In patients with pharyngeal diverticula examination in low inclination was also performed. Any other positions such as oblique at different angles were used when needed. Single and serial pictures with acquisition time 1 up to 4 pictures per 1 s were stored on hard disc and scanned on X-ray film.

Endoscopic examination was performed using the high-resolution Olympus video endoscope GIF-Q140. The Reversor EVIS CV-140 was used as a light source. No preliminary patient sedation was performed. Size of diverticula was determined endoscopically by comparison with the known size of the cup of the biopsy forceps.

Through the entire study period the same team of experienced radiologists and endoscopists performed both examination procedures. In most cases, radiological study preceded endoscopy, precluding knowledge of the endoscopic results by the radiologist.

The localisation, size, diameter of the opening, mucosal relief of diverticula and their contiguity were checked and analysed. Assessment of diverticula size was based on direct measurement when the diverticulum was visible radiologically or on endoscopic estimations when the diverticulum could not be identified radiographically.

RESULTS

Forty-five patients met the criteria and only their data were analysed. Lack of endoscopic data in radiologically proven diverticula lowered the final number of patients in the analysed group. Oesophageal and

pyloric strictures, poor general state and lack of patient's consent were the most common reason for abandoning the endoscopic examination.

There were 22 cases of pharyngeal diverticula. Most of them morphologically and topographically corresponded to Zenker's diverticula (Fig. 1a–c). In two cases diverticula bigger then 6 cm in longitudinal diameter were observed. Small right side Killian-Jamieson's diverticulum was seen only in one case. Radiological examination supplied a better view of Zenker's diverticula in short and stocky patients due to difficulty with their endoscopic visualisation.

Oesophageal diverticula were observed in middle and lower third in 2 and 4 cases, respectively (Fig. 1d–f). All of them were located on the level of or lower than tracheal bifurcation. There was one case of giant diverticulum arising from lower third of anterior oesophageal wall.

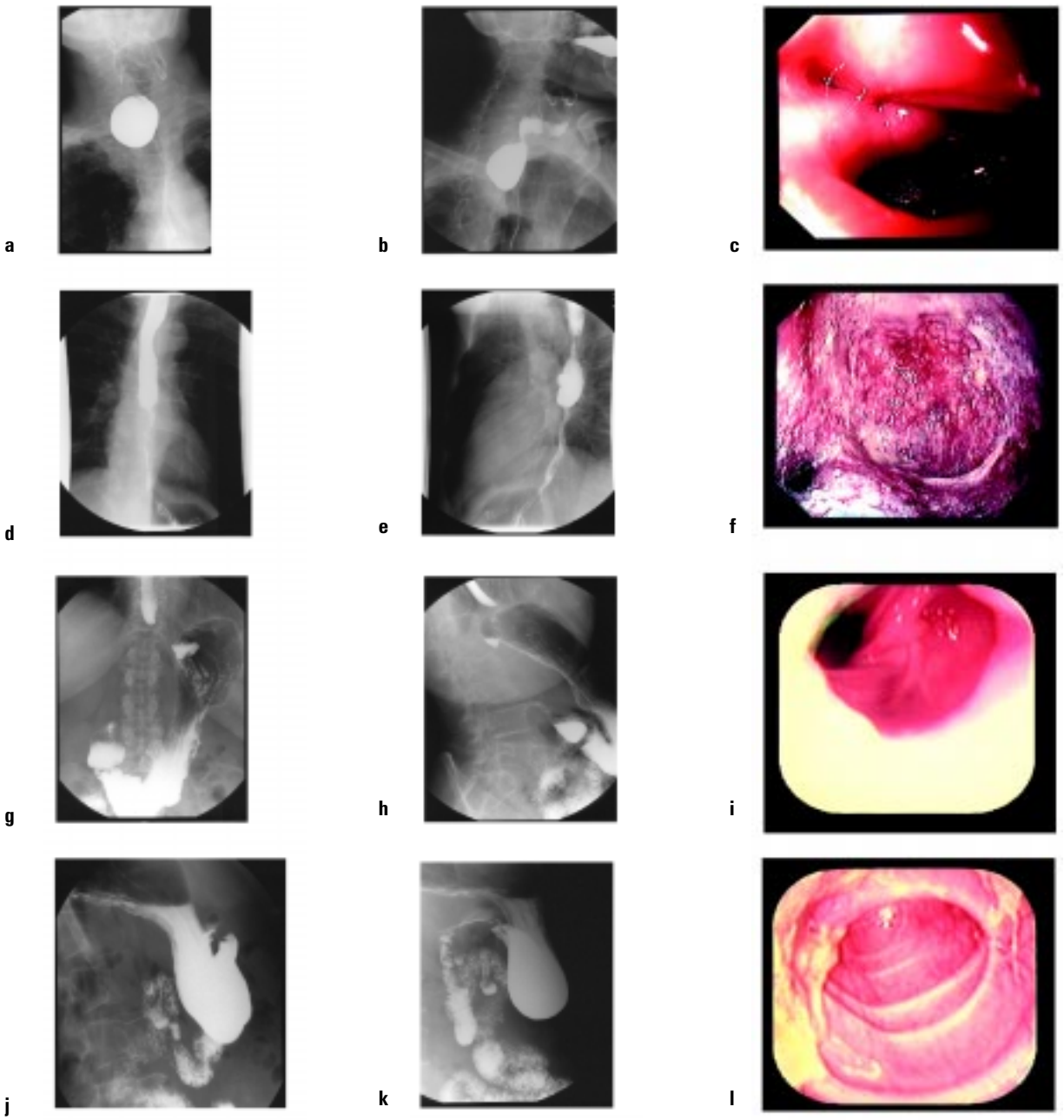

Figure 1. AP — anterior-posterior (**a**), lateral (**b**) radiological view of Zenker's diverticula and its endoscopic picture (**c**); AP (**d**), lateral (**e**) radiological view of oesophageal diverticula and its endoscopic picture (**f**); AP (**g**), lateral (**h**) radiological view of stomach diverticula and its endoscopic picture (**i**); AP (**j**), lateral (**k**) radiological view of multiple duodenal diverticula. Endoscopic picture of upper duodenal diverticula (**l**) presented in the previous two pictures.

Four gastric diverticula were seen in superior half of the medial stomach curvature or close to it (Fig. 1g–i). Their size was similar to each other.

There were 9 cases of single and 4 multiple duodenal diverticula in the examined group. The single ones were seen in bulb and descending part of duodenum (Fig. 1j–l). Four out of 6 bulbal diverticula were located on anterior wall. The remaining 2 arose from the posterior one. Diverticula of descending part of duodenum were located close to great duodenal papilla. Endoscopic retrograde cholangiopancreatography (ERCP) performed during same examination showed obstruction on the distal end of the common bile duct. Multiple diverticula were observed in the descending part or distally, and were absent in duodenal bulb.

Statistical analysis showed that there were no significant differences between diverticula diameters measured during roentgenologic and endoscopic examination. All endoscopically observed changes in diverticula of thoracic oesophagus and infradiaphragmatic part of the alimentary tract were fully confirmed during radiological examinations.

DISCUSSION

Our data suggest that both medical procedures are complementary. However, the radiological examination was better tolerated by patients, and gave a better view of pharyngeal diverticula. It is also the first, sometimes the only, choice for examination of the upper part of the alimentary tract in patients with strictures of oesophagus or at different levels [10, 15]. However, sampling and better visualisation of the diverticula opening testify to the unquestionable superiority of endoscopy, but precise radiological evaluation completes the diagnostic protocol [5, 10, 11, 14, 15].

Most of the investigators choose contrast fluoroscopy as the prime diagnostic tool, due to the fact that endoscopy adds little to the evaluation of diverticulum but may be indicated in the assessment of other oesophageal, gastric and duodenal abnormalities [5, 23]. Endoscopy seems to be necessary in patients with duodenal diverticula, especially those located in descending part of duodenum, in the vicinity of the major duodenal papilla or encompassing it, which may not be evident in X-ray study [5, 20, 22, 27, 33]. Such localisation can cause formation of gallbladder stones, primary choledocholithiasis and onset of chronic pancreatitis secondary to increasing ductal pressure by chronic obstruction of the distal opening of the hepatopancreatic duct [3, 8, 19, 20, 26, 27, 30, 33, 36]. Endoscopy should also be the initial investigation in cases of upper gastrointestinal bleeding and perforations that complicate diverticula [16, 18].

The authors were unable to find any paper regarding comparison of roentgenologic and endoscopic methods in examination of the upper part alimentary tract diverticula. Upper gastrointestinal endoscopy as a gold standard in oesophageal, gastric and duodenal examinations showed its superiority in gastric and duodenal ulcer diagnosis. The radiological sensitivity is lower and depended on size of lesion and used method. Ott et al. [28] showed that only 56% of ulcers under 5 mm of diameter, and 88% of larger ones, could be detected with single-contrast method. Using double-contrast method they detected 45% of small ulcers and 78% of those larger ones. However, statistical analysis showed equal effectiveness of single- and double-contrast radiography. The superiority of endoscopy in ulcer detection was proved in other studies [4–7, 9, 11––14, 17, 21, 23–25, 32, 34] The same results were also seen by investigators evaluating the effectiveness of endoscopic and radiological procedures in cases of gastritis, benign and malignant neoplasms [5, 11, 14, 18, 24]. However, large lesions, especially the ones of diameter smaller than the internal diameter of alimentary tract, are clearly visible in endoscopic as well as radiological examination. The high, equal effectiveness of radiological examinations observed in our study seems to be secondary to the large size of the diagnosed diverticula. Other studies, in which the effectiveness of both methods in diagnosis of smaller diverticula will be evaluated, are needed to complete our observations.

At present patient preferences are also important factors during the entire diagnostic process [7, 35]. Previous study showed that in the group of patients who underwent both investigations, more patients, especially older ones, had preference for endoscopy preceded by pharmaceutical sedation [35]. When sedation was not routinely used, a smaller number of patients expressed a preference for upper gastrointestinal endoscopy, which was also seen in our study.

Both diagnostic procedures are usually supplemented by manometric and pH-metric examination of oesophageal body, superior and inferior oesophageal sphincter, to enable the accurate midthoracic and epiphrenic diverticula etiology, but these are of little use in diagnosis of pharyngeal, stomach and duodenal diverticula [1, 31, 37].

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