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WHAT IS NEW IN GASTROINTESTINAL RADIOLOGY

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SUMMARY – Few subspecialty fields in radiology have undergone so many changes in the last several decades as has gastrointestinal (GI) radiology. We have witnessed the appearance of previously unknown or very uncommon diseases and observed changes in the prevalence and treatment of known diseases. In the clinical setting, abdominal radiology had a seminal role in evaluating these conditions. Scientific and technological advancements, hand-in-hand with clinical practice, have reached previously inconceivable outcomes. From luminal barium examinations gastrointestinal radiology has moved into the realm of cross-sectional imaging and interventional procedures. It now encompasses not only the alimentary canal, but also organs such as the liver, pancreas and spleen. The interest in imaging of intra- and extraperitoneal spaces and organs has grown among GI radiologists.

Introduction

Few subspecialty fields in radiology have undergone so many changes in the last several decades as has gastrointestinal (GI) radiology[1]. We have witnessed the appearance of previously unknown or very uncommon diseases and observed changes in the prevalence and treatment of known diseases. In the clinical setting, abdominal radiology had a seminal role in evaluating these conditions. Scientific and technological advancements, hand-in-hand with clinical practice, have reached previously inconceivable outcomes. From luminal barium examinations gastrointestinal radiology has moved into the realm of cross-sectional imaging and interventional procedures. It now encompasses not only the alimentary canal, but also organs such as the liver, pancreas and spleen. The interest in imaging of intra- and extraperitoneal spaces and organs has grown among GI radiologists[2,3].

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The Society of Gastrointestinal Radiologists was founded in the 1970s. The goal of the alliance, which has 365 members, is to amalgamate radiological science and techniques in the abdomen, extraperitoneum and pelvis at educational meetings, and to share information among its members[4].

Changes in Gastrointestinal Pathology

Immunocompromised patients suffering from acquired immunodeficiency syndrome, undergoing chemotherapy or radiation treatment are prone to infections with agents such as *Candida albicans*, *Cryptosporidium*, *Mycobacterium avium-intracellulare*, *Cytomegalovirus* and other opportunistic infections, and to neoplasms such as Kaposi's sarcoma and B-cell non-Hodgkin's lymphoma[5,6]. These have created new diagnostic challenges for abdominal radiologists.

Only two decades ago, adenocarcinoma of the esophagus represented less than 5% of all esophageal cancers. Today, adenocarcinoma accounts for at least 30% of newly diagnosed esophageal cancers and represents the most rapidly proliferating malignancy in the United States.

Barrett's esophagus is a leading etiologic factor for adenocarcinoma of the esophagus[7,8]

Helicobacter (H.) pylori has proven responsible for a significant fraction of peptic ulcers, gastric adenocarcinoma and mucosa-associated gastric lymphoma[9,10]. The number of gastric and duodenal peptic ulcers has diminished due to over-the-counter availability of potent antiacid medications and treatment of H. *pylori.*

While the prevalence of gastric adenocarcinoma remains high in Asian countries, it has dropped precipitously in the United States over the last forty years and continues to decrease[10].

Colorectal carcinoma is the second leading cause of cancer deaths in the United States and other countries of the West. However, in the last decade the incidence rate has leveled off and commenced to very slowly decrease. It was believed that all colorectal cancers evolved from adenomatous polyps. A majority of colorectal carcinomas can be prevented by removal of adenomas. However, it has been recognized that some 15% of colorectal cancers develop also from depressed, primary ulcerated lesions[11].

In the graft-versus-host disease (GVHD), a complication of allogeneic bone marrow transplantation, the host tissues are attacked by donor lymphocytes. Principal target organs in the abdomen are the liver and alimentary canal. In acute GVHD there is mucosal loss resulting in tubular appearance of the small bowel. In chronic GVHD, desquamation of upper esophageal mucosa leads to submucosal fibrosis producing webs[12].

Some new, unexpected relationships between known pathological entities have also been established by GI radiologists: an increased risk of esophageal carcinoma in patients with esophageal intramural pseudodiverticulosis was demonstrated[13].

Barium Sulfate Studies

Barium studies are still considered sensitive in diagnosing luminal lesions even at an early stage[14]. However, as the result of development of flexible fiberoptic endoscopes in the 1970s, the number of barium examinations started to decline and continued so through mid-1990s, when it plateaued. There has been at least an 80% drop in barium studies. At present, barium sulfate procedures are but a relatively narrow portion of the current spectrum of methods used in GI radiology[1]. The primary diagnostic role of barium examinations is maintained in the studies of swallowing, examinations of the small bowel, and defecography. Double-contrast enema is frequently used to supplement for incomplete colonoscopy. Digitalization of fluoroscopic equipment has significantly facilitated fluoroscopic procedures and selection of representative spot images.

Abdominal Ultrasound

Ultrasonography (US) continues to play an important role in the evaluation of the acute abdomen and is increasingly used as a screening tool for abdominal trauma[15]. Advances in US, such as doppler and power doppler imaging, have led to its utilization in the evaluation of stent patency and organ transplants. More recently, contrast harmonic imaging using microbubbles has shown improved organ and vascular visualization[16].

US is increasingly used for tumor diagnosis and staging. Endoscopic US is currently the imaging modality of choice for local staging of gastrointestinal tumors, both for assessing depth of wall invasion and local nodal involvement. Continued advances in miniprobe technology show promise for improved endoscopic pancreaticobiliary imaging[17]. Intraoperative and laparoscopic use of US improves detection of small lesions during the evaluation of resectability of pancreatic and hepatobiliary tumors[18,19].

Other uses include image guided biopsy and drainage.

Computed Tomography

Computed tomography (CT) with refinements of intravenous and enteral contrast application has revolutionized imaging of peritoneal and extraperitoneal spaces, abdominal parenchymal organs and bowel wall diseases[1,3]. Spiral CT has almost completely replaced conventional radiography in evaluation of the acute abdomen. It is a cornerstone in diagnosing appendicitis and diverticulitis[20.] Liver and bile duct abnormalities such as fatty infiltration, cirrhosis and hemochromatosis, metastases, bile duct and hepatocellular carcinomas are readily demonstrated by CT. Spiral CT cholangiography and unenhanced CT safely demonstrate common duct stones. The three-phase study (arterial, portal venous and delayed) has increased sensitivity in the detection of liver abnormalities. Staging of pancreatitis and the diagnosing and staging of pancreatic adenocarcinoma are readily achieved. However, accurate distinction of chronic pancreatitis from pancreatic carcinoma is still a challenge[2].

Multidetector CT has created unparalleled increase in spatial and temporal resolution combining narrow scan collimation with rapid data acquisition. Multidetector CT has the advantage of sagittal and coronal reconstructions of similar quality as axial imaging. When combined with CT angiography and 3D volume rendering, evaluation of a range of clinical pathologies is possible. Multidetector CT hepatic angiography is capable of revealing small hepatomas[21].

CT Colonography

CT colonography also known as virtual colonoscopy, may become a primary method for large bowel cancer screening. Using combined 2D and 3D imaging, the accuracy for polyp detection in a prospective study equaled that of colonoscopy for the detection of polyps which were 6 mm or larger in diameter[22,23]. CT colonography has excellent sensitivity for detection of clinically important (10 mm or larger) polyps. The overall sensitivity and specificity are 90% and 72%, respectively[24]. CT colonography is well tolerated. After cleansing of the colon, air is insufflated in the prone position into the colon and single breath-hold helical CT scanning is performed using 5 mm collimation and reconstruction intervals of 2 mm. Image processing is performed on the work station with commercially available software. With the advent of multidetector CT, 1-mm slices can be obtained through the abdomen while shortening the breath-hold to less than 30 s. The improved speed and spatial resolution of multislice CT results in sharp reconstructions allowing for detection of polyps less than 3 mm in size[25]. However, a number of technical and practical problems such as postprocessing of a large number of images remain before virtual colonoscopy can be applied at the population level[26]. The quality of 3D-rendered MR studies at present is inferior to CT[23].

Magnetic Resonance Imaging

Magnetic resonance imaging (MRI) is applicable in a variety of abdominal disorders. With the advent of faster pulse sequences with high T2 image contrast and anatomic resolution, along with new contrast agents, MRI provides for improved diagnostic accuracy in the detection of liver lesions[2]. However, lesions at the 10-mm-size level still remain a challenge.

Magnetic resonance cholangiopancreatography (MRCP) has become a competitive alternative to ERCP[27]. Although the cost-benefit implications should be further evaluated, the nonaggressiveness of the method is a significant advantage. High-resolution MRI methods are more sensitive than CT in diagnosing of small pancreatic carcinoma[2].

MRI enteroclysis readily detects bowel wall thickening, abscesses, and fistulae in inflammatory bowel diseases. MRI should be performed in patients with extraintestinal complications[28]. MRI-guided procedures in abdominal interventional radiology have proven useful.

Positron Emission Tomography

Positron emission tomography (PET) has a high sensitivity in detecting carcinoma of the esophagus, stomach and pancreas. The high rate of metabolic activity in tumor-involved lymph nodes has a potential to improve the staging of these diseases. However, inflammatory changes such as pancreatitis can cause false-positive interpretations[29].

PET is an accepted clinical modality in the evaluation of recurrent colorectal carcinoma. It is valuable to differentiate the changes following treatment from recurrent neoplasm, and benign from malignant lymph nodes.

Abdominal Interventional Radiology

Interventional radiology has profoundly changed the reaches and realm of abdominal radiology. However, it is beyond the scope of this review to address the many advances of this subspecialty field.

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Sažetak

ŠTO JE NOVO U RADIOLOGIJI GASTROINTESTINALNOG SUSTAVA?

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Proteklih desetljeća malo je supspecijalističkih područja radiologije doživjelo toliko promjena kao radiologija gastrointestinalnog sustava. Postali smo svjedoci pojavljivanja dosad nepoznatih ili vrlo rijetkih bolesti te promjena učestalosti i liječenja poznatih bolesti. U kliničkim okvirima abdominalna radiologija imala je ključnu ulogu u procjenjivanju tih stanja. Znanstveni i tehnološki napredak, zajedno s kliničkom praksom, postigli su dosad nezamislive rezultate. Gastrointestinalna radiologija je od pretraživanja lumena barijem prešla u područje prikazivanja poprečnih presjeka i intervencijskih postupaka. Danas ona ne obuhvaća samo probavnu cijev, nego i organe poput jetre, gušterače ili slezene. Među radiolozima koji se bave probavnim sustavom sve veće je zanimanje za prikazivanje intraperitonealnih i ekstraperitonealnih prostora i organa. Udruženje gastrointestinalnih radiologa osnovano je sedamdesetih godina prošloga stoljeća. Cilj ovoga udruženja, koje ima 365 članova, objedinjavanje je radioloških spoznaja i metoda u području abdomena, ekstraperitoneuma i zdjelice na edukacijskim skupovima, te razmjena informacija.