Could I live up to the Illustrious Speakers
Jim Leland
When Pittsburgh Pirate Manager

I knew we would have a tough season when we lined up for the National Anthem, and one of my players said,

“Every time I hear that song, I have a bad game”
What Has Changed ??

- The Times
- The People
- The Size of the Division
- The Volume
- The Publications

Not the Clinical Care
Not the Fun and Games
I Know Things Were Different

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The Boston Globe

YES!!!

FINALLY!

World champions
The Boston Globe Thursday, October 26, 2004

Amazing Red Sox end 86 years of frustration with Series sweep. Page

Red Sox complete sweep, win first Series in 86 years

Victory transforms a region's identity

Sports Illustrated

SPORTSMEN OF THE YEAR

BOSTON RED SOX
Things have Changed!!

Jim Thrall  Tom Brady
Is he really the Chairman?

The T.B.
Health care recruiting gets aggressive

**Health Care**

Northeastern, Boston College, Simmons — they all offer opportunities for returning students in nursing, radiography, and other health care fields," said Susan Shaw, director of operations for nursing at Children's Hospital. "We've had enormous success with second career people."

Helping employees move up the ladder into second careers is part of Children's tuition reimbursement plan. The program, Shaw explained, encourages clinical assistants to become registered nurses, pharmacy technicians to become pharmacists, or secretaries to become radiologists.

Shaw sees education as key at every level — not only in helping people enter or switch into medical fields, but also in arousing an interest in health care among the younger generation.

"By 2010, demand for nursing care will outstrip supply by about 20 percent," she said, citing an aging population, decreasing staff levels, and a shortage of students. "Nurses, radiographers, pharmacists — those definitely are the top three areas of concern."

"We're getting into high schools and middle schools, working with guidance counselors. The role of the physician gets lots of press," she said, but "we have a responsibility to show kids there's the variety."

Children's hosts "career days" when high school students shadow health professionals. And, at a recent career event at Simmons College for 200 Girl Scouts from around the country, Children's pitched health care careers to the 17-year-olds.

Employee referral bonuses also help Children's acquire new talent. "It's double if the new employee is a nurse or radiographer."

"For recruiting, we're not sticking with the traditional, we're being creative," said Joseph Cabrall, Children's manager of employment and diversity. Although Massachusetts' overall unemployment rate was at 4.7 percent in December, "for health care workers it's almost zero percent," noted Cabrall.

Brigham and Women's Hospital also faces a growing problem of finding qualified health care workers. "Like everyone else, we're concerned," said Brigham and Women's Nancy Kruger, vice president for patient care services and chief nursing officer. "The number of days for recruiting to fill a nursing position has increased from about 30 days to 60 days."

Kruger noted that radiography and pharmacy jobs are also taking longer to fill. To meet demand, Brigham and Women's recruiters travel around the country to job fairs, colleges and universities, and annual meetings of professional societies like the Association of Operating Room Nurses.

"We're working with colleges, universities, and community colleges to establish programs for specialty areas like operating room nurses," she said, "and we've been talking with students in junior high and high schools to get them interested in hospitals as places to look for careers."

Kruger notes in particular concerns about shortages in nursing specialties and various fields of radiology, including standard radiology and nuclear and MRI scanning units. To combat a shortfall of pharmacists, she says, "We've become more aggressive in increasing our residency programs at Northeastern and Mass. College of Pharmacy."

In nursing, nagging problems with pay, work schedules, and what many nurses consider "mandatory overtime" continue to plague the field.

Karen Higgins, president of the Massachusetts Nurses Association, says she feels frustrated. "I've been a nurse for 35 years," she says, "and it's an absolutely wonderful profession. But they keep missing the point — the working conditions. Citing downsizing in recent years, increased work loads, and overtime requirements, Higgins says nurses become harder to recruit and harder to keep. Hospitals that increase staffing, she says, are much better able to hire and retain nurses.

Student nurse Dow says she knows there are problems with staffing, scheduling, and pay in the nursing field. "I see them," she says, "but I'm definitely secure in my decision. Nurses have worked with seen happy with their work. "A lot of my friends are going into nursing," she adds. "I do hear a lot of people say, Why would you go into nursing — there's no respect in it.' I feel I'm helping somebody in some way, that's enough respect for me."
Shaw explained, encourages clinical assistants to become registered nurses, pharmacy technicians to become pharmacists, or secretaries to become radiologists.
THE TEAM
1978
Jack Wittenberg
Joe Ferrucci
Mueller and Simeone
THE TEAM

2000 or so
Times Have Changed

Imaging & Intervention

- Ronald S. Arellano, MD
- Michael Blake, MD
- Giles W. Boland, MD
- Steve L. Dawson, MD
- Suvranu Ganguli, MD
- Michael S. Gee, MD, PhD
- Debra A. Gervais, MD
- Reginald E. Greene, MD
- Alexander R. Guimaraes, MD, PhD
- Peter F. Hahn, MD, PhD
- Deborah A. Hall, MD
- Mukesh G. Harisinghani, MD
- Susanna L. Lee, MD, PhD
- Kathleen A. McCarthy, MD
- Peter R. Mueller, MD
- Benjamin J. Pomerantz, MD
- Dushyant Sahani, MD
- Sanjay Saini, MD
- Anthony Samir, MD
- Joseph F. Simone, MD
- Mary M. Staffa, MD
- Ashraf Thabet, MD
- Raul N. Uppot, MD
- Ralph Weissleder, MD, PhD
- Jack Wittenberg, MD
- Isabel C. Yoder, MD
- Michael E. Zalis, MD
What Do They All Do?

**Imaging**
- Blake
- Samir
- Gee
- Lee
- Boland

**Research**
- Saini
- Sahani
- Harisinghani
- Zalis
- Pandharipande

**Intervention**
- Mueller
- Thabet
- Weisledder
- Dawson
- Arellano

**Education**
- Wittenberg
- Simeone

**Management**
- Gervais
- Guimaraes
- Uppot
- Mueller
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Post RSNA late 1980s
4 PM Rounds
1978-2010 (> 75,000 cases)
Life was Different

Hepatic Cysts: Diagnosis and Therapy by Sonographic Needle Aspiration

Seven patients with a sonographic diagnosis of hepatic cyst underwent sonographically guided percutaneous aspiration for definitive diagnosis. In three patients the percutaneous puncture also afforded effective therapeutic decompression. Hepatic cyst puncture, like the more widely used percutaneous renal cyst puncture, may be useful in excluding the possibility of a necrotic malignant tumor or an abcess.

With the increasing application of hepatic sonography for evaluation of suspected liver metastases, radionuclide liver scan defects, and upper abdominal masses, benign hepatic cysts are being encountered with considerable frequency [1]. Usually, the unique ability of sonography to detect and distinguish cystic from solid hepatic lesions will allow a percutaneous aspiration [2].

Percutaneous Aspiration of Hepatic Cysts Does Not Provide Definitive Therapy

Follow-up of 13 patients who underwent radiologically guided percutaneous needle aspiration of simple liver cysts revealed cyst recurrence in all patients within 2 years. While still effective as a primary diagnostic maneuver, percutaneous aspiration seems to lack permanent therapeutic benefit. However, it may be used as a therapeutic trial to assess the possible role of intracystic injection of ethanol in this series.

Sajmy Saini
Peter H. Mueller
Joseph T. Ferrucci, Jr.
Joseph F. Simeone
Jack Wittenberg
Rodney J. Bush

AJR: 1981

AJR: 1983
IT’S NOT THE X’S AND O’S
It’s the Jims and Joes
The Real “Gold Dust” Twins
1975

Fred Lynn  Jim Rice
The Old “Gold Dust Twins”

Sanj

Peter
Ferrite Particles: A Superparamagnetic MR Contrast Agent for the Reticuloendothelial System

The potential of superparamagnetic ferrite particles as a contrast agent for magnetic resonance (MR) imaging was studied in vitro MR spectroscopy and in vivo MR imaging in laboratory animals. After intravenous administration of ferrite particles, MR spectroscopy showed greatly decreased T2 relaxation times of liver and spleen, with only minimally altered T1, and no changes in lung, kidney, or muscle. Effects occurred within 30 minutes of injection and persisted for more than 6 months. MR imaging with pulse sequences that provide T2-dependent contrast demonstrated that ferrite produced profound signal loss from liver, spleen, and bone marrow. Spleen isolation of ferrite particles in hepatic reticuloendothelial cells was confirmed by means of light and electron microscopy. Because ferrite has a potent effect on MR signal and exhibits tissue-specific localization, it warrants further study as a contrast agent for MR imaging of the reticuloendothelial system (liver, spleen, and bone marrow).

Index terms: Contrast media; effects • Magnetic resonance (MRI); contrast media • Magnetic resonance (MRI); experimental
Radiology 1987; 162:211-214

Figure 1. Enhanced detection of tumor after injection of ferrite (A and B). T2-weighted SE 1,500/60 transverse MR images of abdomen of nude rat. A Before injection, signal intensity from tumor (T) exceeds that from surrounding liver (L). B After injection, contrast between tumor and liver is increased because of ferrite-induced loss in signal intensity from normal hepatic parenchyma.

Figure 2. Electron micrograph of ferrite particle (M41725) image-filed 802,000 shows irregularly shaped structure approximately 1 μm in size. Particle shape and size are stabilized by coating a cluster of ferrite crystals with a hydrophilic polymer coat. Individual superparamagnetic ferrite crystals can also be seen.

Figure 3. In vivo MR images of rat liver (SE 300/32/4). A) Image obtained before administration of ferrite. B) After administration of ferrite, signal from liver (L) and signal from fat around the portal vein and in the porta hepatis (arrow) are maintained. S = stomach.
Superparamagnetic iron oxide (ferrihydrite) particles were evaluated as a contrast agent for magnetic resonance (MR) imaging. In this pilot study, doses ranging from 10 to 50 μmol/kg were administered intravenously to 15 patients. Ferrihydrite-enhanced images of the liver obtained with standard pulse sequence techniques significantly increased the number of hepatic lesions detected (P < 0.01) and reduced the threshold size for detection to 3 mm (P < 0.01). The improved clinical performance of ferrihydrite-enhanced images correlated with significant increases in measured contrast-to-noise ratios (P < 0.01). Degradation of superparamagnetic activity and/or clearance of ferrihydrite from the liver was demonstrated as early as 12 hours after injection, suggesting that the lack of chronic toxicity observed in animal studies may be reproduced in humans. These initial clinical results appear to confirm extensive preclinical data indicating that ferrihydrite administered at a dose of 20 μmol/kg has the potential to significantly improve the performance of abdominal MR imaging.

**Materials and Methods**

Iron Oxide

Superparamagnetic crystalline iron oxide prepared by a modification of the method of Whitwack et al. (16) was obtained from AMI-25 (by Advanced Magnetics, Inc., Cambridge, Mass.). Similar iron oxide particles have shown no toxicity (17) and have been effective MR contrast agents (18-23) in animal studies. The median diameter of particles used in the current study was 80 nm (range, 30-100 nm) as measured by laser light scattering, and in distilled water the particles formed a stable colloid. The concentration of iron was 0.2 M.

**Patients**

The study protocol was approved by the Human Studies Research Subcommittee of the two institutions. Informed consent was obtained from all subjects. Fifteen patients (eight men, seven women; 24-68 years of age) were selected for this study, ten in the United States and five in Mexico. All patients had hepatic metastases proved by liver biopsy or biopsy of the primary cancer (six had colorectal adenocarcinomas, three had breast adenocarcinomas, two had melanomas, one had carcinoma, and one each had renal, adrenal, and breast adenocarcinomas) and by demonstration of multiple hepatic lesions with CT or sonography. All patients were observed for 2 hours following drug administration and were recomanned 1 day later. Follow-up interviews, physical examinations, routine laboratory studies, and review of medical records 3-6 months after injection was conducted for all 15 patients.

**MR Imaging**

Imaging was performed with a superconducting magnet imaging system (Technicare, Solon, Ohio) operating at 2.5 T (21.3 MHz) or a permanent magnet imaging system (Fonar, Malverne, NY) operating at 0.3 T (13.3 MHz). Images with relative T1-dependent (weighted) contrast were obtained with a spin-echo (SE) pulse.

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### Table 1: Quantitative MR Image Analysis: C/N and S/N

<table>
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<th>Pulse Sequence</th>
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<td>+3.4±3.8</td>
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*P < 0.01; ferrihydrite-enhanced values are significantly different from unenhanced values.

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**Figure 4:** Metastatic colon cancer. Nondenhanced (a) and iodine-enhanced (b) CT scans show no lesion. (c) SE 260/14 MR image at a level identical to that of the CT scans shows normal hepatic vessels. No lesion is seen. On ferrihydrite-enhanced SE 1500/60 image (d) and gradient-echo (GE 125/11, flip angle 75°, 16-second acquisition) image (e) tumor can be seen (arrow), but there is potential difficulty in distinguishing tumor from millimeter-sized blood vessels.

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Focal Nodular Hyperplasia of the Liver: MR Findings in 35 Proved Cases

Michael J. Lee1
Barnd Hartn2
Mathias Taupitz3
Peter F. Hahn4
Eric Santorelli6
Joseph T. Ferrucci5

MR images of 38 patients with 35 lesions of hepatic focal nodular hyperplasia were reviewed to determine the frequency of findings considered typical of this condition. Twenty-two patients had T1-weighted images, and 17 had T2-weighted images with a homogeneous signal intensity. Fifteen lesions were imaged at 1.5 T with T1- and T2-weighted spin-echo (SE) pulse sequences. Twenty lesions were imaged at 1.5 T with T1-weighted SE and gradient-echo pulse sequences and 26 lesions were imaged at 0.5 T with T1- and T2-weighted SE pulse sequences. Diagnosis of focal nodular hyperplasia was made pathologically in 25 patients, with nuclear scintigraphy in four, and with follow-up imaging in six. Only seven lesions (20%) were iso-intense relative to normal liver on both T1- and T2-weighted images. On T1-weighted SE images, 21 lesions (63%) were isointense relative to normal liver, 12 (35%) were hypointense, and two (6%) were hyperintense. On T2-weighted SE images, 21 lesions (63%) were hyperintense and 23 (68%) were hypointense relative to normal liver. A central scar was present in 17 lesions (49%) and was hypointense relative to the lesion on T1-weighted images and hyperintense on T2-weighted images. Twenty lesions (57%) were of homogeneous signal intensity throughout the lesion, except for the presence of a central scar. All 35 lesions demonstrated characteristic features in the T2-weighted images.

We conclude that hepatic focal nodular hyperplasia has a wide range of signal intensity on MR imaging.

AJR 156:317-320, February 1991

Recently, a number of smaller series have been published detailing the MR appearances of hepatic focal nodular hyperplasia (HFN) [1-4]. The largest of these [3] concluded that HFN has a fairly consistent MR appearance: (1) isointensity on T1- and T2-weighted sequences; (2) a central scar, which is hypointense on T2-weighted sequences, and (3) homogeneous signal intensity except for the presence of a central scar. However, using improved pulse sequence timing parameters that provide better lesion liver contrast than those used in previous studies, we noticed more variable signal intensities in our MR images. Therefore, we decided to analyze the MR findings in our patients with HFN by performing a retrospective analysis of 35 hepatic HFN lesions, imaged at high and low field, to determine the prevalence and clinical usefulness of the aforementioned MR characteristics.

Materials and Methods

Twenty-eight patients, 16 men and 22 women, 26-85 years old (mean, 37 years), with 35 liver lesions detected by CT or scintigraphy underwent MR imaging for the purpose of tissue characterization. In 12 patients with 15 lesions, MR imaging was performed with a 0.5-T superconducting imaging system (Nikonon Medical Systems, Milwaukee, WI); with the 0.6-T unit, T1-weighted spin-echo (SE) images, 272/14 (TR/TE), and multi-echo T2-weighted SE images, 2020/60/180, were acquired. Sixteen patients with 20 lesions were imaged on a 1.5-T superconducting system (Siemens Magnetom, Erlangen, Germany) with T1-weighted SE E00/15 and gradient-echo pulse 100/60/180 (TR/TE/flip angle) pulse sequence. The lesions were imaged at 1.5 T with T1- and T2-weighted SE pulse sequences.

Received May 28, 1991. Accepted for publication March 8, 1991. Reprint requests to J. Fumai.

Hepatocellular Adenoma: MR Imaging Features with Pathologic Correlation

Keel Y. Chung1
William W. Mayo-Smith1
Sanjay Santi2
Alain Ramjunt3
Mondher Gofli2
Didier Mathieu4

OBJECTIVE. The purpose of this study was to describe the MR imaging characteristics of hepatic adenomas and to correlate these features with pathologic findings.

Materials and Methods. Sixteen patients with 21 hepatic adenomas underwent MR imaging with T1- and T2-weighted pulse sequences at 1.5 T. Dynamic gadolinium-enhanced gradient-echo recalled-echo (GRE) MR imaging was done in eight patients with 16 lesions. Twenty-three lesions in 15 patients were confirmed by surgical excision. MR images were retrospectively reviewed by three experienced radiologists for signal intensity of lesions relative to liver, heterogeneity, contrast enhancement, and presence of signs of histopathologic correlation. These imaging findings were then compared with histopathologic findings.

RESULTS. Ninety-six (96%) of 21 lesions; hepatocellular adenomas showed heterogeneous signal intensity on MR images. Most (90/96) were predominantly hyperintense on proton density- or T2-weighted images; the predominant signal intensity on T1-weighted images varied. Thirteen of 21 lesions showed early arterial enhancement relative to liver on dynamic GRE MR images. MR imaging was most successful in showing intratumoral hemorrhage (10 of 12 histopathologically proven lesions), large intratumoral vessels (five of five), fatty change (three of six), and calcification (three of three). In two lesions, capsules (one of five) and central scars (one of three) were detected.

CONCLUSION. Hepatocellular adenomas have a highly variable appearance on MR images because of their varied histologic appearances. Although no definitive MR imaging signal or structural characteristics can be identified, tumor heterogeneity, particularly when related to hemorrhage, and early arterial enhancement can suggest a diagnosis of hepatocellular adenoma in the proper patient population.

AJR 1995; 165:323-308

Hepatocellular adenomas are primary neoplasms of the liver that have been linked to oral contraceptive use, estrogen therapy, and glycogen-storage diseases. They are most common in young women, with the majority occurring during or after oral contraceptive use. The risk of hepatocellular adenoma is important because of the associated risk of life-threatening hemorrhage. The purpose of this study was to describe the characteristics of hepatocellular adenomas on MR images in a large series of patients and to correlate these findings with histopathologic examination.

Materials and Methods. The study group consisted of 16 patients with 21 hepatocellular adenomas from four institutions seen between 1989 and 1992. Twelve patients had a solitary adenoma. Four patients had multiple lesions, one had eight, one had five, one had four, and one had two. The mean age was 34.6 years (range, 19-60 years). Seventeen patients were female. Five patients with lesions...
Diverse materials with varying physical and magnetic properties have been evaluated as gastrointestinal contrast agents for magnetic resonance (MR) imaging. Uniform marking of the small bowel remains the greatest challenge. Ferrites are magnetically active iron oxide particles that are miscible with water and cause loss of signal on MR images. The decrease in MR signal intensity produced by ferrites occurs with a wide range of iron concentrations (0.1–10 mM) and with both T1- and T2-weighted pulse sequences. These effects of ferrites are explained by predominant T2 shortening with negligible T1 effects. The ferrite preparation used in this study was stable in vitro, with little iron solubilized by acid. Intragastric administration of ferrite (5 mg of iron per kg in 6 ml) routinely marked the small bowel of rats. The authors conclude that ferrites represent a promising new class of contrast agents for gastrointestinal MR imaging.

Index terms: Contrast media, effects, 70.1276
Intestines, MR studies, 70.1214
• Iron • Magnetic resonance (MR) contrast media, 70.1279

Radiology 1987, 164:37-41

Ferrite Particles for Bowel Contrast in MR Imaging: Design Issues and Feasibility Studies

The need for a bowel contrast agent for magnetic resonance (MR) imaging has been apparent since the earliest experience with abdominal MR imaging. However, initial investigations (1, 2) failed to identify a material with the necessary combination of high potency, low toxicity, and reliable bowel marking. We have previously evaluated the properties of the ferrimagnetic Fe3O4 as an intravenous MR contrast agent producing increased signal. Ferrites are miscible and particulate with physical properties similar to barium suspensions already widely used in CT.

The purpose of the research reported here is to study the potential use of ferrites as gastrointestinal contrast agents for MR imaging. To that end, we present preliminary stability and potency data, evaluation of bowel marking in laboratory animals after gastric ferrite administration, and a preliminary in vitro study comparing intestinal loop contrast with various doses of intravenous Fe3O4. 

GastroMARK® (ferumoxsil) is AMAG Pharmaceuticals’ oral gastrointestinal (GI) imaging agent for delineation of the bowel. Images of organs and tissues in the abdomen using MRI without contrast agents can be difficult to read because the abdominal organs and tissues cannot be easily distinguished from the contents of the bowel. GastroMARK® flows through and darkens the bowel when ingested. By more clearly identifying the intestinal loops, GastroMARK® enhances the ability to distinguish the bowel from adjacent tissues and organs in the upper gastrointestinal tract. 

GastroMARK® is marketed in the United States by Covidiem, Ltd. (formerly Tyco Healthcare, Ltd. and Mallinckrodt, Inc.) For more information regarding GastroMARK® please contact Covidiem, Ltd. at (888) 744-1414. GastroMARK® is marketed in Western Europe and Brazil by Guerbet S.A. under the tradename Lumirem™. In Europe GastroMARK® is approved for rectal administration to delineate the lower intestinal tract.

1 From the Department of Radiology, Massachusetts General Hospital and Harvard Medical School, 32 Pierce St., Boston, MA 02114 (P.F.H., D.D.S., S.S., J.W., I.F.P.) and Advanced Magnetics, Inc., Cambridge, Mass. (J.M.L.). Received December 12, 1986; revision received March 36; accepted March 18. Supported in part by grants from Advanced Magnetics, Inc. Address reprint requests to P.F.H.
2 RSNA, 1987

Products

GastroMARK®

GastroMARK® is marketed in the United States by Covidiem, Ltd. (formerly Tyco Healthcare, Ltd. and Mallinckrodt, Inc.) For more information regarding GastroMARK® please contact Covidiem, Ltd. at (888) 744-1414. GastroMARK® is marketed in Western Europe and Brazil by Guerbet S.A. under the tradename Lumirem™. In Europe GastroMARK® is approved for rectal administration to delineate the lower intestinal tract.
The New “Gold Dust Twins”

Dushyant

Mukesh
Differentiation of Liver Hemangiomas from Metastases and Hepatocellular Carcinoma at MR Imaging Enhanced with Blood-Pool Contrast Agent Code-7227

PURPOSE: To evaluate differentiation of liver lesions at magnetic resonance (MR) imaging enhanced with Code-7227.

MATERIALS AND METHODS: Thirty-five patients with 38 proved liver lesions (15 hemangiomas, 17 metastases, 5 hepatocellular carcinomas [HCCs]) underwent T1-weighted gradient-echo and T2-weighted fast-spin-echo MR imaging at 1.5 T before and after intravenous administration of Code-7227 (1.1 mg iron per kilogram of body weight).

RESULTS: In hemangiomas, the mean contrast-to-noise ratio on precontrast and postcontrast images, respectively, increased from -4.3 ± 2.7 to 5.3 ± 3.0 on T1-weighted images and decreased from 14.7 ± 7.7 to 6.4 ± 5.1 on T2-weighted images. In comparison, metastases remained hypointense to liver on T1-weighted images (15.0 ± 7.6 to 7.8 ± 6.9) and hyperintense on T2-weighted images (from 8.0 ± 5.6 to 12.8 ± 6.1). Although HCC enhanced more than metastases, they also remained hypointense to liver on T1-weighted images (from 4.87 ± 3.1 to -1.79 ± 8.37) and hyperintense on T2-weighted images (from 10.12 ± 7.5 to 8.7 ± 6.4). The degree of enhancement on T1-weighted images and of signal intensity drop on T2-weighted images were significantly lower in malignant liver masses than in hemangiomas (P < .001).

CONCLUSION: Distinctly different enhancement patterns with Code-7227 helped accurate differentiation of liver lesions.

MATERIALS AND METHODS

Subjects

This study was performed as part of a multinational phase I/II clinical trial of Code-7227 in patients with known or suspected liver lesions. The clinical trial was reviewed and approved by the investigational review boards of each institution, and informed consent was obtained from each patient. Among the 72 patients enrolled in the study, a subset of 35 patients with proved hemangiomas and/or malignant liver lesions (metastases and HCCs) who underwent 1.5-T MR imaging were selected for this analysis by a study coordinator (M.C.H.), who was not involved in image analysis. Lesion detection was not a focus of this investigation.

The study group of 35 patients included 29 men and six women, aged 27-66 years (mean, 46 years). Three patients had more than one type of proved lesion; therefore, a total of 38 lesions (15 hemangiomas, 17 metastases, and six HCCs) were evaluated. Lesions ranged in size from 1 cm to 15 cm in diameter. Histopathologic proof was used to classify 24 lesions (five hemangiomas, 15 metastases [from primary malignancies in colon (n = 10), breast (n = 2), pancreas (n = 2), and thyroid (n = 1)], and four HCCs). For the remaining 14 lesions, classification was based on established radiologic criteria at Code-7227-enhanced computed tomography (CT), ultrasound, and clinical follow-up of at least 6 months.

Index terms: Angioma, gastrointestinal tract, CT, HCCs, liver metastases, MR, metastatic and hepatocellular carcinoma; signal intensity

Abbreviations: Code-7227 = Code-7227 ultrasmall superparamagnetic iron oxide agent, USPIO = ultrasmall superparamagnetic iron oxide

Radiology 1997; 204:697-701
Dual-Contrast MR Imaging of Liver Cancer in Rats

Ralph Weissleder1, Sanjay Saini, David D. Stark, Jack Wittenberg, Joseph T. Ferrucci

Dual-Contrast MR Imaging of Liver Cancer in Rats

MR contrast agents increase hepatic tumor conspicuity, as measured in terms of contrast-to-noise (C/N) ratios. With an animal model of hepatic metastases from breast cancer, 1.5% gadolinium diethylene triamine pentaacetic acid (Gd-DO3A-peg) shows a biphasic time response, transiently increasing the signal intensity of liver relative to tumor, with C/N ratio magnitudes increasing from $-5.7$ to $-16.3$ (SE $500/20$) after a delay, the signal intensity of tumor increases relative to liver with a reveal of the C/N sign from negative to positive and an increase in the C/N magnitude to $>0.56$. A delay of arterial bolus injection (1.56 mmol/kg) shows a monophasic time response, increasing signal intensity of tumor relative to liver from $-1.5$ to $+49.5$ (SE $500/20$). When both contrast agents were administered together (dual-contrast technique), the tumor-liver C/N magnitude reached a maximum of $+15.6$ (SE $500/20$) 12 minutes after drug injection. Analysis of individual contrast and noise factors contributing to this technique revealed a strong correlation between the signal intensity of liver and the signal intensity of contrast agents, which increase with administration of Gd-DO3A (n = 28) and decrease after administration of ferumoxides (n = 19).

Dual-contrast imaging shows a synergistic addition of contrast and suppression of noise from contrast agents, maximizing the C/N and increasing the conspicuity of focal liver lesions.

Abdominal MR Imaging is becoming an important diagnostic tool in the detection [1-3] and differential diagnosis [4-7] of focal liver lesions. MR contrast agents have been used to increase tumor-liver contrast and enhance lesion conspicuity [8-11]. The main contrast mechanisms are paramagnetic, predominantly short T1 relaxation times of perfused tissue [12, 13], and are best imaged with T1-weighted pulse sequences [14]. Unfortunately, gadolinium-DTPA (Gd-DTPA) nonselectively enhances the signal intensity of both liver and tumor in a time-dependent fashion and may obscure liver metastases, as commonly used iohexol contrast agents do [8, 12]. Ferumoxides are superparamagnetic and predominantly shorten T2 relaxation times [15, 16]. Therefore, T2-weighted pulse sequences with longer TRs and TE times are best suited to ferumoxides-enhanced MR [17]. Ferumoxides are cleared from the blood by macrophages of the reticuloendothelial system (RES), RES-containing tissues such as liver, spleen, and bone marrow show a profound signal loss after administration of ferumoxides, whereas tumor signal intensity is not affected.

We sought to determine whether the complementary pharmacologic and magnetic properties of these two contrast agents would be synergistic to enhance detection of focal liver lesions.

Materials and Methods

Animal Model

A rat model of liver cancer resembling human breast cancer metastases to the liver was used in this investigation [17]. Pat. 11 metastasized adenocarcinoma (PI 3230 AD. E.G.A) was transplanted in two different animal models, one with a 310 mg dose and the other with a 50 mg dose. The animals were imaged using a dedicated rat MR scanner (Siemens Avanto 7 T) equipped for diffusion-weighted imaging and phase-sensitive imaging. T1-weighted, T2-weighted, and diffusion-weighted images were acquired at multiple time points post injection of Gd-DTPA and ferumoxides. The imaging protocols included a three-point Dixon sequence for T1 and T2 measurements, a diffusion-weighted imaging sequence, and a phase-sensitive imaging sequence.

Results

The images showed a significant increase in T1 and T2 signal intensities in the liver lesions post injection of both contrast agents. The T1weighted images showed a higher signal intensity in the liver lesions compared to the normal liver tissue, while the T2-weighted images showed a lower signal intensity. The diffusion-weighted images demonstrated an increase in diffusion coefficient in the liver lesions, indicating a possible change in the microvascular architecture.

Conclusion

The results suggest that dual-contrast MR imaging can enhance the detection of focal liver lesions with higher specificity and sensitivity. The use of Gd-DTPA and ferumoxides in combination provides a complementary approach to improve the diagnostic accuracy of MR imaging in the evaluation of liver lesions.

Key words: iron oxide, gadolinium, liver, MRI, signal intensity.

Since multi-phase dynamic liver imaging after a bolus intravenous injection of extracellular gadolinium chelates is the preferred technique for liver lesion characterization [1, 9-12], a potential limitation of iron oxide enhanced liver MRI is that lesions seen only on post-contrast images may be inadequately characterized. We hypothesized that sequential use of iron oxide and gadolinium may be an effective way of resolving this potential limitation [13]. Since, ideally the lesion characterization protocol should be performed after the lesion detection protocol, the purpose of this study was to determine if dual contrast liver imaging was possible within a single MRI session.

Specifically, we wanted to determine if an extracellular gadolinium-chelate enhanced dynamic liver lesion characterization study can be performed immediately after an iron oxide enhanced liver lesion detection examination.
Magnetic Resonance Imaging

Experimental Lymph Node Metastases: Enhanced Detection with MR Lymphography

Magnetic resonance (MR) lymphography with superparamagnetic iron oxide (AMI-25) as a contrast agent was performed in an animal model with tumor-bearing lymph nodes. After intravital administration of 20 μmol of iron per kilogram of body weight into the footpads of rats, the T2 of pedicled and paraaortic lymph nodes decreased from 67 msec ± 6.2 to 9.5 msec ± 0.9 and 19.3 msec ± 0.9, respectively. T2 relaxation times of lymph nodes containing metastases showed a significantly higher value (61 msec ± 6.2, P < 0.005) after intravital administration of the contrast agent. Intravenous administration of AMI-25 did not produce enhancement of normal or metastatic lymph node relaxation times. The signal intensity of normal lymph nodes decreased profoundly on spin-echo MR images (repetition time of 500 msec, echo time of 50 msec) after intravital administration, whereas lymph nodes with metastases showed no significant change in signal intensity. Experimental results indicate that MR lymphography may potentially increase the sensitivity of MR imaging in the detection of lymphatic malignancy.

Index terms: Lymphatic system, MR studies, 99:2299; Lymphatic system, lymphography, 99:35; Magnetic resonance (MR) contrast enhancement

Radiology 1998; 171:835-839

Benign Lymphadenopathy

Noninvasive Detection of Clinically Occult Lymph-Node Metastases in Prostate Cancer

Mukherji S, Hartsough, M.D., Jelle Barentsz, M.D., Ph.D., Esero Fuh, M.D., Ph.D., Willem N. Desmouliere, M.D., Shahin Tabatabaei, M.D., Christine Hulsbergen van de Kaa, M.D., Ph.D., Jean de la Rosette, M.D., Ph.D., and Ralph Weissleder, M.D., Ph.D.
Noninvasive Detection of Clinically Occult Lymph-Node Metastases in Prostate Cancer

Harisinghani et al; Neoplasia 2007

Harisinghani, Weissleder PLOS Medicine 2004

MacDonald et al; IJROBP 2009

Shih et al; IJROBP 2005


Sahani D V et al. Radiology 2004;233:345-352
THE TEAM

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Seminal Papers on Renal Radiofrequency Ablation

Radiofrequency Ablation of Renal Cell Carcinoma: Part I, Indications, Results, and Role in Patient Management over a 6-Year Period and Ablation of 100 Tumors

OBJECTIVE. The objectives of our article are to review our experience with radiofrequency ablation of renal cell carcinoma and to assess size and location as predictors of the ability to achieve complete necrosis by imaging criteria.

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Radio-frequency Ablation of Renal Cell Carcinoma: Early Clinical Experience

PURPOSE: To report the authors' early experience with radio-frequency (RF) ablation of renal cell carcinoma.

MATERIALS AND METHODS: Twenty-four percutaneous RF ablation treatments for nine tumors were performed in eight patients with renal cell carcinoma. Indica-
RF Ablation of RCC: Tumor Classification by Location
Gervais Classification

Exophytic
Parenchymal
Central
Mixed

*Gervais, et al.*
Research Goal
To define the best roles for imaging services in cancer care

Project Topics and Methods
- Management of Renal Tumors
- Imaging-Guided Therapy (RFA)
- Advanced Techniques for Nodal Imaging
- Decision Analysis
- Cost-Effectiveness Analysis
- Computer Simulation Modeling

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MRI, CT, and PET/CT for Ovarian Cancer Detection and Adnexal Lesion Characterization

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OBJECTIVE. The purpose of this article is to describe the role of MR, CT, and PET/CT in the detection of ovarian cancer and the evaluation of adnexal lesions.

CONCLUSION. The goal of imaging in ovarian cancer detection is to expeditiously
Radiology Utilization Rounds of the Massachusetts General Hospital: A Win-Win Situation

Susanna I. Lee, MD, PhD
More than T1 and T2
What’s New in Abdominal Interventional Radiology?

- 30 Non Vascular cases per day
- 1500 to 2000 cases per Quarter
- 6500 to 7000 cases per year
- Everything from ascites to biliary dilatation procedures
Vascular and Interventional Radiology

Nonvascular Interventional Procedures: Analysis of a 10-year Database Containing More than 21,000 Cases

**Purpose:** To analyze all procedures performed during 10 years in a nonvascular interventional practice.

**Materials and Methods:** Date, organ location, and type of all 21,324 procedures performed between October 1990 and September 2000 were recorded in a database; also included were patient age and inpatient or outpatient status. Because genitourinary procedures were not included during the first 4 years, nephrostomies were added retrospectively. Yearly interventional caseload was compared with the department caseload and the assignment of new medical record numbers. Trends in individual procedure location and type were analyzed, as well as patient age, inpatient status, daily caseloads, and day of the week the procedure was performed.

**Results:** Caseloads have increased 10.8% per year, exceeding increases in radiology department and hospital activity. Abdomen, outside of a specific organ, was the most common location; catheter deployment was the most common procedure. Abscess drainage, placement of chest tubes, and nephrostomies have increased, but biliary drains have decreased. Inpatients outnumbered outpatients in all years except 1995, but the trend was toward an increase in the proportion of outpatients. The average patient was 59.6 years old, with average age diminishing. Friday was the busiest day, but weekend procedures have increased.

**Conclusion:** Nonvascular interventional procedures have increased, with more currently being performed on weekends.

Index terms:
- Interventional procedures
- Radiology and radiologists
- Departmental management

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Radiology 2001; 220:730–736

Abbreviations:
FY = Fiscal year
GU = Genitourinary
MRN = Medical record number

1 From the Department of Radiology, Massachusetts General Hospital, White 270, 55 Fruit St, Boston, MA 02114. From the 2000 RSNA scientific assembly. Received November 21, 2000; revision requested January 2, 2001; revision received March 5; accepted April 6. Address correspondence to P.F.H. (e-mail: phahn@partners.org).
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ABDOMINAL DIVISION IR PROCEDURES BY YEAR

Addition of PAs
TRENDS IN INTERVENTION 2000-2010

- 50,000 procedures done 2000-2010 – more than twice as many as the previous decade
- 13,500 bx's - 4900 liver, 3650 thyroid
- 11,500 catheters placed for collections
- 1800 PCNs, 442 biliary, 500 chole, 2100 chest tubes, 2010 G-tubes
- 935 Ablations
- No Complications
Radiofrequency is Everywhere!!

However, league insiders believe Goodell was swayed by what he saw on the camera that was confiscated from a year-old in his fourth year with the team. Coming on the heels of similar allegations by the Packers, Lions, and other evidence has mounted.

There also are questions regarding the Patriots’ use of radio frequencies during the game.

“Where there’s smoke, there’s fire,” Steelers coach Mike Tomlin told reporters in Pittsburgh. “Those rumors are shocking, no.”

The competition committee is expected to address the issue, possibly with tougher rules for next season. It can’t
Adapt
Golf in PR 64
Yogism

“90% of the game is 50% mental”
1978

“Wide eyed and bushy tailed”
Grizzled Veteran
50142 cases Oct 1, 2000 through Sept 30, 2010
This is more than double the 23000 cases from the previous decade.

13532 biopsies (4438 positive for malignancy)

4926 liver biopsies (1013 showing chronic active hepatitis C and 1475 positive for malignancy)

3647 thyroid/neck biopsies (350 positive for malignancy)

11463 catheters left in (3519 deep abdominal collections, 1795 PCN's, 442 biliary drainages, 493 chole tubes, 2092 chest tubes, 2010 GT's, 14038 thora's, para's,
Thank You
On Sincerity and Truth

Monty Clark, Detroit Lions Coach on relating to today’s players

““ The key to this whole business is SINCERITY. Once you learn to FAKE that,
“There is a thin line between Service and Servitude”

James Thrall M.D.
FUN & GAMES
Message

Dr. Dong in pathology needs your help, autopsy on pt. Lemay 3761360 needs to do liver bx phone 4-1447 or page 19818 thanks

Lynda - Bessette, Lynda R
The Publications and Involvement in National and International Societies

1978 - 1990 - Many

1990 - 2010 - Many
Transverse contrast-enhanced CT scan of abdomen in 70-year-old man with abdominal pain.

Sahani D V et al. Radiology 2009;250:118-129