RADIOLOGY LETTER

A Radiologist's Approach to Imaging Vistas — *Stony Brook University*

Spring 2004

Body MRI Enhances Expert Care at Stony Brook

By Hong Meng, M.D.
Assistant Professor of Clinical Radiology
Chief of Body MRI and Director of MRI Fellowship

The arrival of a new state-of-the-art Philips MR scanner in the Department of Radiology coincides with the university-wide celebration of Dr. Paul Lauterbur's Nobel Prize which recognizes the development of Magnetic Resonance Imaging (MRI). The Department of Radiology is proud to announce the ongoing installation of its third 1.5T MRI unit and preparations for installation of our first 3T magnet. We currently have a 1.5T GE magnet and two new Intera 1.5T Philip mobile magnets available for clinical use. The 3T magnet will certainly improve our clinical imaging and research imaging armamentarium. As stated in our last fall Radiology Letter, by Donald P. Harrington, M.D., Chairman of the Department of Radiology, "Stony Brook is leading the way for subspecialty imaging for the Long Island community."

Clinical MRI has become a critical non-invasive tool in medical diagnosis since its introduction in the mid-1980s. Few would dispute the enormous impact it has had on diagnosing pathologic conditions of the central nervous system and musculoskeletal system. Historically, the use of MR in body imaging has been neglected in many radiology practices due to slow image acquisition, image quality susceptible to artifacts generated by flow, and by peristaltic, cardiac and respiratory motion. With recent development of fast acquisition technique, dedicated coils and new time efficient artifact reduction techniques, many advantages of MRI have been harnessed in body applications. This includes high sensitivity and specificity, lack of ionizing radiation, exceedingly safe contrast agent gadolinium chelates, and cost effectiveness. At times and for many clinical situations, MR has become the preferred imaging modality.

Availability of state-of-the-art magnets optimized for body MRI has made it possible to broaden available clinical applications in thoracic, abdominal, pelvic, obstetric/fetal, and cardiovascular imaging. It provides greater opportunities for collaborative research between radiologists and other clinicians. The following paragraphs highlight clinical body MRI applications in use at Stony Brook and several of those under development.

Abdominal MRI *Liver & Pancreas* MRI is an excellent imaging modality for detection and characterization of both focal and diffuse liver disease. A large percentage of abdominal MRI exams involve the liver, typically performed to evaluate an incidental lesion found on another imaging modality, or when monitoring conditions that may lead to primary or secondary tumor development, such as liver cirrhosis and colon cancer. Differentiation of benign from malignant tumors is one of the most important applications. MRI is beneficial in follow-up exams of cancer patients after radiation, chemotherapy or RF ablation, allowing avoidance of the accumulated

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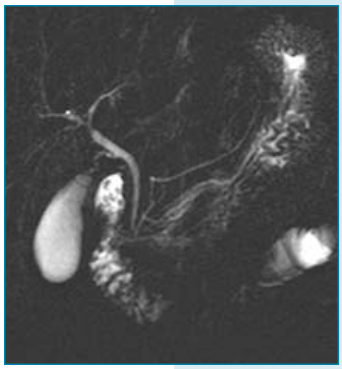

Fig 1. MRCP. Mild stricture at the hepatic duct confluence.

HIGHLIGHTS

CT Guided Drainage of Head and Neck Abscesses

Maisie L. Shindo, M.D.
Division of Otolaryngology, Department of Surgery

James V. Manzione, M.D.
Department of Radiology

Abscesses involving the head and neck may cause sepsis, airway obstruction and may spread to contiguous spaces of the neck, head, spine and chest. Early diagnosis and treatment are essential to prevent these life threatening complications. Computed tomography (CT) and magnetic resonance imaging (MRI) have played critically important roles in diagnosis and determining the extent of head and neck abscesses.

Treatment of an abscess involves antibiotics and surgical drainage. At times it may be difficult on the CT and MRI scan to distinguish between an abscess fluid collection vs. a region of phlegmon or cellulitis. The distinction is important since an abscess typically requires drainage whereas cellulitis or phlegmon is typically treated initially with antibiotics. Similarly, it may be difficult to distinguish lymphadenitis

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STONY BROOK
STATE UNIVERSITY OF NEW YORK

Chairman's Corner

by Donald P. Harrington, M.D., F.A.C.R.

I am pleased to write this particular commentary as we have great news for our referring physicians. Two new state-of-the-art Philips 1.5T short bore scanners with special coils and software to perform any exam have been acquired, totaling three MRI scanners in the Department. This will almost triple the number of patients that we can perform MRI studies on each day. We also have plans to replace the old GE 1.5 MRI unit with a new Philips 3.0 Tesla MRI, which will be the first in Suffolk County. This machine will greatly enhance our MRI capabilities and afford us the ability to visualize the body in far more detail than ever before. These new MRI scanners, along with our four state-of-the-art CT scanners gives us the ability to present the vast volume of detail in three dimensional formats, which is quickly becoming a part of our everyday imaging protocols.

I am also pleased to announce that we will have a dedicated Chest and Pulmonary service beginning July 2004. This dedicated service will allow our clinical referrals additional subspecialty care at Stony Brook. This newly dedicated service will be headed by Dr. William Moore who will be coming on board as an Attending in July.

A third benefit to our referring physicians is the installation of the PACS system. Once fully implemented, patient images can be viewed from anywhere in the hospital or from any internet connection. We can assure you that our connection and links are all HIPPA compliant to protect the rights of our patients. Only you and/or your practice will have access to your patients' images.

I would also like to take this opportunity to bid farewell to our radiology residents and fellows who are graduating this June. All of our graduating residents have exciting plans. Dr. Punit Aghera is staying on at Stony Brook as a fellow in Neuroradiology. Dr. Robert Ashton accepted a Neuroradiology fellowship position at Yale-New Haven Hospital in New Haven, Connecticut. Dr. Jean Delbrune accepted an Interventional Radiology fellowship position at Mt. Sinai Medical Center in New York, New York. Dr. William Moore is staying on at Stony Brook as an Attending and Thoracic radiologist. Dr. Moore recently completed a Chest/Thoracic Radiology fellowship at New York University.

Best wishes for a healthy, peaceful and joyful summer.

THE RADIOLOGY LETTER

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Donald P. Harrington, M.D.	*Chairman*
Michael J. Cortegiano	*Administrator*
Christine R. Hubbard	*Editor and Staff Writer*

It's a love match!

Stony Brook University medical students Electra Veson and Paul Kaloudis, who were married in April, celebrated their acceptance into residency programs at University Hospital at National Match Day on March 17. Veson will join the residency program in preliminary medicine and diagnostic radiology. Kaloudis will join the residency program in emergency medicine.

Managed Care Update

Aetna Healthcare

American Medical & Life

APA Partners
(formerly HHS)

BCE Emergis
(formerly Up and Up)

Beech Street

BC/BS Managed Care Network
(HMO, PPO, Federal Employees, SR Plan HMO, Indemnity, Child Health Plus, Out of State Empire Fed Emp. Empire Deluxe)

Cambridge

CIGNA
(HMO, Open Access PPO)

First Health

GHI
(HMO, PPO, EPO)

HealthFirst
(HMO, 1199, Medicaid, Child Health Plus, Family Health Plus, Health First NY, Health First 65 Plus)

HIP
(HMO, Healthcare Partners, Hip Select, VIP, Prime, Medicaid, Child Health Plus, Family Health Plus)

Horizon
(HMO, Vista, Vista Plus, PPO, Standard, Standard Plus)

Island Group Administrators

J.J. Newman

Local 1199 National Benefits Fund
(Members Choice)

Magna Care

MDNY
(Select, Value, LIA, Direct HMO/POS, Classic HMO/POS, Focus/Flex)

Medichoice

Metropolitan Empire

Multiplan

Oxford
(Liberty, Freedom, Oxford USA)

Sierra

Suffolk Health Plan

United Healthcare

USI

Vytra
(HMO, Suffolk County Vytra, East End Health Plan, Direct Access HMO, Central Suffolk Hospital, Southampton Hospital, Southside Hospital, Suffolk Employees School Health Plan)

Welcome New Faculty

Marlene Zawin, M.D. joined the faculty staff as Chief of Computed Tomography. Her interim appointment is an Assistant Professor of Clinical Radiology in the Division of Cross-sectional Imaging. Dr. Zawin received her medical degree from the Autonomous University of Guadalajara School of Medicine in Guadalajara, Jalisco, Mexico, followed by a Diagnostic Radiology residency at Stony Brook and a Thoracic Radiology fellowship and a Body Imaging fellowship at the Yale University School of Medicine in New Haven, Connecticut. Dr. Zawin comes to us from Yale-New Haven Hospital in New Haven, Connecticut, where she was Chief of Computed Tomography and previously Chief of Thoracic Radiology at the West Haven VA Medical Center. Dr. Zawin is Board Certified in Radiology. She is a member of the Radiological Society of North America, Connecticut Chapter of the American College of Radiology, Society of Magnetic Resonance Imaging and Association of American Women Radiologists.

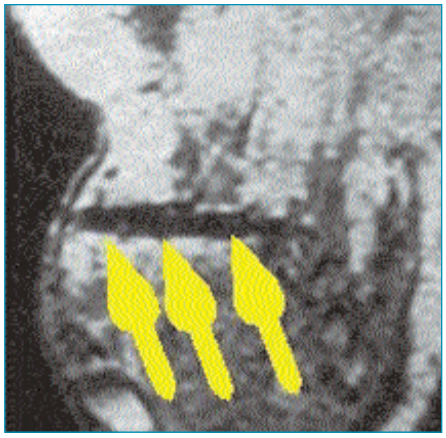
Laurette Sauter, M.D., M.B.A. joined the faculty staff as an Assistant Professor of Clinical Radiology in the Division of Breast Imaging. Dr. Sauter received her medical degree from the University of South Florida College of Medicine, followed by a Diagnostic Radiology internship at the Medical College of Virginia Hospitals in Richmond, Virginia, and a Diagnostic Radiology residency at the Medical College of Georgia Hospital and Clinics in Augusta, Georgia. She also completed a Breast Imaging and Intervention fellowship at the Johns Hopkins Hospital and was appointed to the faculty of the Johns Hopkins University School of Medicine and the Russell H. Morgan Department of Radiology in Baltimore, Maryland. Dr. Sauter's previous appointment was at the Memorial Hermann Hospital in Houston, Texas. Dr. Sauter is Board Certified in Diagnostic Radiology. She is a member of the American College of Radiology, American Roentgen Ray Society, Radiological Society of North America and Society of Breast Imaging.

MRI Guided Core Biopsy at Stony Brook

By Paul Fisher, M.D.

The Department of Radiology at Stony Brook is pleased to announce that we will soon offer percutaneous core biopsies for breast lesions seen only on MRI. This state of the art procedure is currently offered only at a handful of institutions nationwide, and only one in the Greater New York Region. MRI is a very sensitive tool for detecting Breast Cancer, and their use in finding and characterizing breast lesions has been growing over the past few years. However, once a lesion has been located and identified on Breast MRI, performing a biopsy has been problematic. At Stony Brook, we offered the first clinical service for MRI guided needle localized surgical excision of such lesions, but this remains cumbersome, as well as being expensive and uncomfortable. With the-state-of the-art Vacora Biopsy Device, we can now offer needle biopsies of suspicious lesions without surgery, sutures, or anesthesia. In most cases, lesions will be proven benign, and the women will be spared any surgical intervention. For lesions confirmed to be malignant on core biopsy, a small metallic clip will mark the site of the lesion and will greatly facilitate the surgical treatment of the cancer.

This development is coupled with the ongoing plans for a new Cancer Center, which will house the Breast Center in a lot adjacent to the main Hospital, and an Outpatient Imaging Center to be located on campus adjacent to the Ambulatory Surgery Center. Under current plans, an MRI magnet will be dedicated to breast cancer evaluations, making Stony Brook University Hospital one of the leading institutions in the nation for this exciting new modality.



A Breast MRI with a biopsy needle sheath in place. Once the location of the sheath is established, a core biopsy can be safely performed.

News

Zvi H. Oster, M.D.

recipient of 2003 Radiology Editor's Recognition Award for reviewing with "Special Distinction"

Vijay Venkatesh, M.D.

elected Chief Resident for 2004-2005.

Body MRI

(Continued from Cover)

radiation of multiple CT scans. Newer MRI techniques allow image quality of pancreas sufficient to detect and characterize focal mass lesions smaller than 1 cm and to evaluate diffuse pancreatic disease. MRI aids in establishing a diagnosis of unresectable adenocarcinoma and in characterizing neuroendocrine tumors and cystic neoplasm of the pancreas. MRI is the preferred choice for pre- and post-transplant work-up.

MR cholangiopancreatography (MRCP) As a non-invasive alternative to endoscopic retrograde cholangiopancreatography (ERCP), MRCP is becoming more popular with the development of new and faster imaging sequences that are capable of demonstrating the biliary and pancreatic ductal systems with excellent image quality, sharpness, and resolution (fig1). MRCP can detect the level of an obstructive mass in patients with suspected pancreatic cancer and show the classic double duct sign of dilatations of both CBD and pancreatic duct in patients with obstructive jaundice. MRCP is a great non-invasive imaging tool for diagnosis of pancreatic divisum. The advantages of MRCP over ERCP include the facts that it is non-invasive and no anesthesia is required; there is no need for intraductal or intravenous contrast agent or ionizing radiation; visualization of ducts proximal to an obstruction is superior to that achieved by ERCP. MRCP can be successfully performed in the presence of biliary-enteric anastomoses. In combination with conventional MR sequences, MRCP is helpful in evaluating duct walls and extraductal disease. In many institutions, MRCP is becoming the primary imaging modality for diagnostic purpose with ERCP reserved for therapeutic interventions.

Kidney & Adrenal Gland The combined use of in-phase and out-phase MRI technique has been routinely used reliably to distinguish between benign adenomas and malignancy (metastasis) in the adrenal glands, as well as in distinguishing adrenal from renal tumors. MRI is particularly effective at detecting pheochromocytomas. Renal MRI is an excellent imaging tool to further characterize incidental masses found on CT or ultrasound allowing differentiation of simple from hemorrhagic cyst, and complex cysts from cystic masses. MRI is the preferred imaging choice for patients with renal insufficiency or who are renal transplant recipients. It is helpful for presurgical renal cancer staging and post-nephrectomy follow-up. MR renal angiography (MRA) reproducibly demonstrates main renal artery disease. MR urography (MRU) can be obtained using technique similar to MRCP and effectively elucidate causes of a dilated renal collecting system. The ability to generate such diverse imaging information makes MRI a comprehensive diagnostic modality for investigating renal disease. The lack of ionizing radiation and avoidance of nephrotoxicity from iodine based contrast agents makes it safer for patients.

GI Tract Endorectal coil imaging permits differentiation of the anatomic layers of the rectal wall and is well-established for local staging of rectal carcinoma and identifying recurrent tumor. Various studies of the GI tract are being researched and diagnosis protocols are under development. Abdominal MRA provides a non-invasive alternative for the diagnosis of mesenteric ischemia.

Pelvic MRI *Bladder & Pelvic Floor* Staging of transitional cell carcinoma is the most common indication for bladder MRI. Since urine has distinct T1 and T2 relaxation times compared to that of bladder wall tissues, it serves as a natural contrast agent utilized in virtual MR cystoscopy. Ongoing clinical research collaboration between Radiology and Urology will hopefully show it to be an effective noninvasive tool for bladder cancer detection. Dynamic studies of female pelvic floor are commonly performed for evaluation of pelvic floor prolapse and stress incontinence.

Male Pelvis The greatest role for MRI in male pelvis has been in the staging of prostate cancer because of high intrinsic soft tissue contrast resolution, high spatial resolution, and mutiplanar imaging achievable with endorectal coils especially when combined with pelvis phase-array coil imaging. Developing MR spectroscopy (MRS) will be a particularly useful adjunct to the MR evaluation of prostate cancer. Surface coil imaging of testes provides excellent images for assessing testicular disease although it is commonly reserved as problem-solving modality.

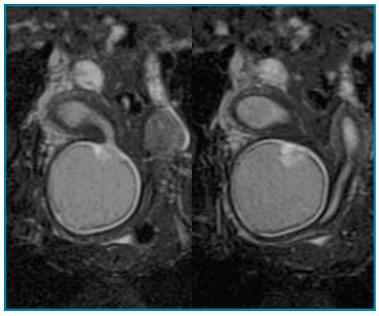


Fig 2. Uterine didelphus. Right side obstruction with hematocolpos and mild hematometra

Female Pelvis A number of benign female pelvic conditions are referred routinely to MRI for analysis, such as leiomyoma, endometriosis, adenomyosis, congenital uterine anomaly (fig2). MRI helps the analysis of the complex ovarian cyst, dermoid or fibroma. It is excellent at staging malignant disease, especially for the preoperative assessment of endometrial and cervical carcinoma.

Fig 3. Fetal abdominal wall defect with herniated intestines.

Pregnancy & Fetal Imaging Since MRI does not employ ionizing radiation, there is no evidence of teratogenic or other adverse effects on fetus. The technique is thus well suited for imaging pregnant women for assessment of maternal complications and fetal abnormalities (fig3).

Thoracic MRI *Heart & Great Vessel* A recent NIH study indicates that cardiac MRI provides faster and accurate detection of heart attack in assessing patients with acute coronary syndrome in the emergency room. The study suggests that MRI could help more quickly to triage patients to appropriate life-saving treatment, and reduce the time such patients spend in the hospital for long-term EKG and enzyme monitoring. In our institution, cardiac MRI has been performed mainly for evaluation of cardiac morphology and analysis of aorta and great vessels (fig.4/5). The new 1.5T Philips scanner is equipped with a dedicated cardiac imaging software package, cardiac surface coil and vector ECG-gating capability. A pilot project is being proposed with cardiology collaboration to assess stable patient with chest pain for cardiac wall motion, perfusion and viability. The emergence of managed care and fiscal constraint has led to the search for comprehensive imaging evaluations using a single modality. Cardiovascular MRI offers an alternative to the time-consuming diagnostic pathway of echocardiogram, nuclear imaging and diagnostic catheterization. By replacing several procedures with one, the comprehensive cardiac MR exam will allow patients to get treatment sooner at a lower cost while substantially reducing the expense of diagnosis associated with the traditional diagnostic pathway. In the near future, we will be able to perform the following on an outpatient basis: 1) to evaluate cardiac morphology; 2) analyze cardiac function; 3) visualize and quantify blood flow; 4) determine ventricular and heart function, at rest and under stress; 5) assess cardiac perfusion; 6) examine the myocardium viability; 7) and visualize the main coronary arteries. Pulmonary MRA due to its non-invasiveness and non-nephrotoxicity may prove important in diagnosing thromboembolic disease (fig6).

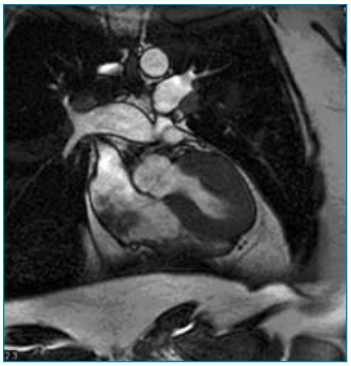


Fig 4. Right atrial mass.

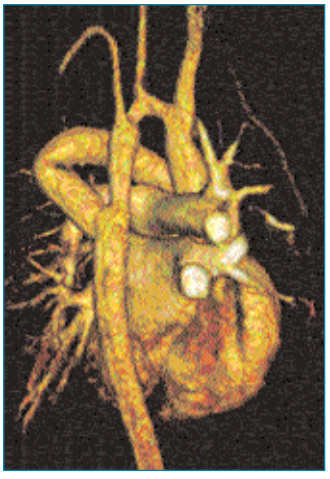


Fig 5. Aorta coarctation post Graft repair (posterior view)

Fig 6. Pulmonary MRA and aortogram show ascending aortic aneurysm

Chest Wall & Mediastinum MRI is frequently used for further characterization of direct invasion of chest wall and mediastinal structure by lung cancer or metastasis. MRI is also an excellent imaging modality for evaluation of brachial plexus.

MR Angiography Contrast-enhanced MRA is the most widely accepted non-invasive method for evaluating thoracic, abdominal and pelvic blood vessels. Availability of fast imaging techniques, advanced software and hardware has made contrast enhanced MRA run-off a reality in Stony Brook. Using BolusTrak technique, the 3D MRA acquisition is synchronized to the arterial arrival of an intravenously injected bolus of contrast by means of a 2D fluoroscopic preview scan which displays the contrast arrival in real time. The automatic sliding table moves the patient through three stations of contrast chasing (fig7). Imaging acquisition per station can be accomplished within a single breath-hold. Interpretation accuracy is aided by excellent image quality and contrast resolution using subtraction technique and post-processing multiple-projection-reformatting. Non-contrast and contrast enhanced MR venography (MRV) can be used to evaluate for venous thrombosis, tumor invasion or in search of venous access prior to in-dwelling catheter placement in oncology or pediatric patients.

Fig 7. Aorta-iliac-leg. MRA run-off

Appointments can be made by calling 631-444-6919, and Dr. Meng can be reached at 631-444-8192.

All images shown were obtained on Intera 1.5T Philips scanner.

CT Guided Drainage

(Continued from Cover)

from a necrotic lymph node or abscess within a node. As a result, there have been occasions when subsequent surgical exploration failed to demonstrate an abscess indicating the imaging findings merely represented phlegmon or cellulitis which could have potentially been treated without surgical intervention.

Recognizing this problem, members of the Departments of Radiology and Otolaryngology have collaborated to develop new approaches and protocols to assess and treat patients with suspected head and neck abscesses.

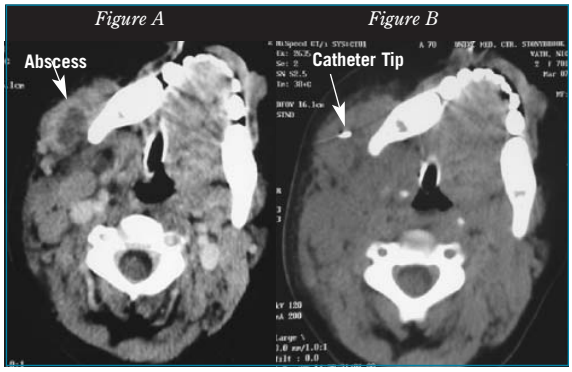
Once the diagnosis is suspected, a contrast enhanced CT scan of the head and neck is performed (if contrast is contraindicated, an MRI scan or a noncontrast CT scan would be substituted). If an abscess is identified, a drainage catheter is then placed into the collection under CT guidance. The abscess contents are drained and specimens are sent for various bacterial stains and cultures. The cavity is then irrigated with an antibiotic solution. The catheter is then fixed to the skin. A subsequent CT scan is obtained to determine if the collection is completely drained. If a secondary area remains, an additional small catheter is typically placed to complete the drainage. In the situation where it is unclear whether the patient has an abscess vs. a region of phlegmon or cellulitis or a necrotic or abscessed lymph node vs. lymphadenitis, a needle is placed into the region. The needle is positioned under CT guidance to confirm appropriate positioning. If purulent material is obtained, the diagnosis of an abscess or infected fluid collection is made and a catheter is subsequently placed for drainage under CT guidance.

The patient is continued on intravenous antibiotics which may be modified based on microbial stains and cultures. The criteria for catheter removal includes improvement in clinical symptoms, absent catheter drainage and evidence of successful drainage on subsequent CT. Typically, catheters are removed in 24 - 36 hours. Once the catheters are removed a full course of antibiotics is continued.

Example Case:

2 year old with fever, elevated WBC count, and neck pain. Figure A is initial CT scan of neck demonstrating region of low attenuation suspicious for abscess (arrow). A needle was placed into the collection under CT guidance and purulent fluid was obtained. A catheter was then placed for drainage. This is demonstrated in figure B.

CT Guided Drainage of Abscess Image



We are now performing CT guided drainage routinely for the treatment of head and neck abscesses, unless the patient has airway obstruction or a collection that can be drained transorally (i.e., retropharyngeal abscess). The advantages of this approach are rapid evacuation of the abscess collection at the time of diagnosis, avoidance of a surgical scar, and ability to perform the procedure under conscious sedation in many patients. In the treatment of children who often need general anesthesia, the diagnostic study and therapeutic intervention are performed under the same anesthetic. When a patient is being scanned under general anesthesia for a suspected abscess, the possibility of performing therapeutic drainage at the same time should be discussed and coordinated with the members of the patient's clinical service, radiology, otolaryngology and anesthesiology.

News from Medical Image Processing Lab

By Gene Gindi, Ph.D.

Prestigious Fellowship

Jorge Oldan, a medical student here at Stony Brook, received a prestigious fellowship from The Howard Hughes Medical Institute to take a year off from medical studies to conduct research with one of our faculty, Gene Gindi, in the Medical Image Processing Laboratory. Jorge is currently working on scientific aspects of human and mathematical observer study methodologies in nuclear medical imagery and in mammography.

Poster Award

Parry Khurd, a graduate student working in the Medical Image Processing Laboratory under Gene Gindi, won a "Best Poster" Award at the recent SPIE Medical Imaging Conference. The award was given in the category for "Image Perception and Performance" and the title was:"LROC Model Observers for Emission Tomographic Reconstruction" by P. Khurd and G. Gindi.

Evaluation Of Mirizzi Syndrome with Magnetic Resonance Cholangiopancreatography: A Word of Caution

David E. Rivadeneira, M.D.[1], Hong Meng, M.D.[2], and Martin S. Karpeh, M.D.[1]
From the Departments of Surgery[1] and Radiology[2]

Background

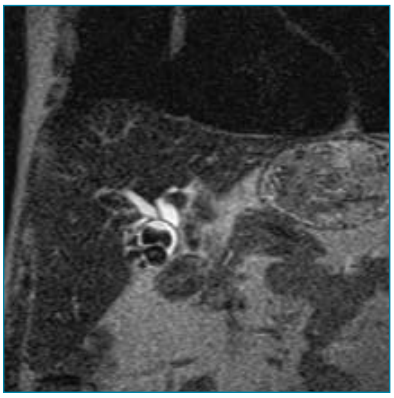
Mirizzi syndrome is a rare cause of bile duct obstruction secondary to extrinsic compression of the hepatic duct by stones impacted in the cystic duct or infundibulum of the gallbladder. Although it remains an uncommon cause of obstructive jaundice, it remains a clinically and surgically challenging dilemma. The recognition of this rare syndrome is crucial in developing the proper treatment approach. The diagnosis of Mirizzi syndrome primarily relies on invasive endoscopic and radiological modalities such as endoscopic retrograde cholangiopancreatography (ERCP) and percutaneous transhepatic cholangiography.

Magnetic resonance cholangiopancreatography (MRCP) is a non-invasive imaging method for examining the biliary and pancreatic ducts. Several recent reports have demonstrated a possible value in using MRCP for the diagnosis of Mirizzi syndrome.

Patient Presentation

A sixty year old male presented to our institution with right upper quadrant pain and jaundice. Liver function tests were consistent with a biliary obstructive pattern.

Ultrasound demonstrated gallbladder distention, wall thickening and large stones in the infundibulum.

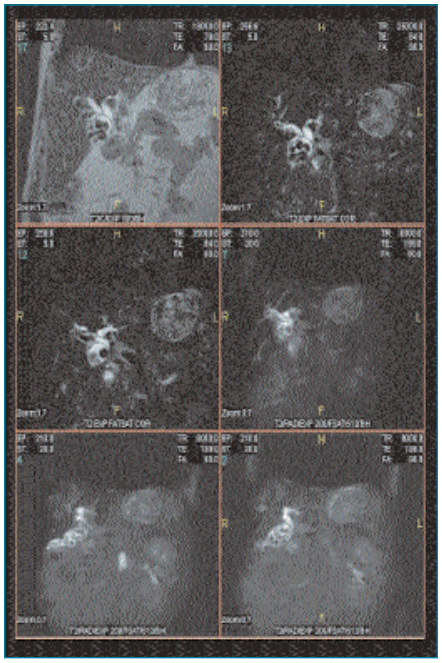


Compression of bile duct by suspected stones

MRCP was performed using heavily T2-weighted imaging. This method produces high signals from bile and other static fluids by virtue of their long T2 time, while suppressing background signal.

Findings were suggestive of Mirizzi syndrome.

MRCP Results

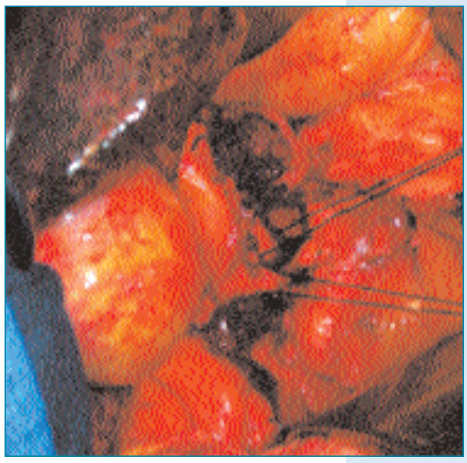


Operative & Pathology Results

Patient was found to have an extensive gallbladder carcinoma. He underwent a radical hepatic and bile duct resection.

Conclusion

MRCP is an extremely valuable noninvasive technique in evaluating biliary tract pathology. However, its use in differentiating Mirizzi syndrome from malignant pathology should be interpreted with caution.



Extensive gallbladder carcinoma

Clinical Trial Study on Non-Invasive Vascular Imaging

A grant for approximately $100,000 was received from Berlex Laboratories for SUNY Stony Brook to participate in a multi-center clinical trial on contrast enhanced magnetic resonance angiography of the lower extremity in patients with known or suspected disease of the calf and/or pedal arteries. Dr. Hong Meng is the principal investigator of the project. Co-investigators include Dr. John Ferretti, Dr. Paul Vitulli and Dr. James Manzione (interventional radiologists), Dr. AnnRose Thomas (MRI fellow) and Dr. Terry Button (physicist) from the Department of Radiology and Dr. Kara Kvilekval and Dr. Antonios Gasparis (vascular surgeons) and Dr. Humair Mirza (cardiologist). Susan Aiello, N.P. is the study coordinator and can be reached at 444-2426 for patient referral or any questions regarding the study.

RADIOLOGY LETTER

A Radiologist's Approach to Imaging Vistas ▪ State University of New York at Stony Brook

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