

Resident Core Curriculum Vascular and Interventional Radiology

General Goals: The goals include objectives required for every level of training with graduated levels of supervision and responsibility. All aspects of angiography and interventional radiology are incorporated into the residency, including fluoroscopy, radiography, CT, ultrasound, and MRI. During every training rotation, the resident will read the required literature and study the teaching file in angiography and interventional radiology. An additional goal of the Interventional Radiology (IR) experience is to provide all diagnostic radiologists with an understanding of the role of Interventional Radiology in the diagnosis and management of patients with arterial disease, venous disease, biliary disease, urinary disease, and localized visceral tumors. The diagnosis requires a progressively increasing understanding of the imaging commonly used, and an understanding of the common clinical findings of the patients being considered for IR procedures. Developing an understanding of the management of these patients requires knowing the indications, contraindications, risks and outcomes of common IR procedures and of important alternative therapies. Residents should develop competence in patient evaluation for common IR procedures, gain credentials to perform conscious sedation at our hospital, and achieve competence in a variety of minimally invasive IR procedures.

Resident Daily Work Responsibilities (OVERALL BENCHMARKS/OBJECTIVES for Self-Evaluation)

1. Residents assigned to angiography and interventional imaging will be available for consultations by technologists, clinicians, and other health care providers, except during conference times, when the attending faculty will cover. Similarly, all residents are expected to develop a working relationship with clinicians.
2. Resident questions will be referred to the supervising faculty covering angiography and interventional radiology.
3. Resident review of cases with the supervising faculty will be conducted as many times in the day as necessary to keep an efficient workflow.
4. Resident examinations will be dictated by the end of every working day.
5. Residents will check and sign his/her reports prior to final verification by supervising faculty.
6. Residents must be familiar with the operation of all imaging equipment.
7. Residents must acquire knowledge of radiation protection and ways to reduce radiation exposure to both patients and hospital personnel. The resident will be supervised to assure that safe practices are followed.
8. Residents must develop an understanding of patient triage, patient selection, risks, indications, and contraindications for each procedure.
9. Residents will understand the importance of continuity of care.
10. Residents will learn vascular, biliary, and urinary anatomy and common pathology.
11. Residents will understand techniques for arterial, venous, biliary and urinary access as well as having the fundamental skills for vascular selective catheterizations for both access and maintenance. Examinations will be checked before the patient leaves the department if requested to do so by the supervising faculty.
12. Residents will acquire an understanding of the proper preparation of patients for examinations and appropriate follow-up afterward. At the start of every working day, the resident will be familiar with the patient schedule and anticipate need for any procedures. The resident will check requisitions for the next working day to evaluate for appropriateness of the requested procedure or if additional exams/protocols need to be performed. Absent clinical indication or

- seemingly inappropriate requests will be clarified and discussed with the referring physician.
13. Residents will be able to understand the role of angiography and interventional radiology in the diagnosis and treatment of patients with PAD, thromboembolic disease, biliary obstruction, urinary obstruction, and portal hypertension.
 14. Residents will be able to define the role of common angiographic interventional procedures in patient management.
 15. Residents will become knowledgeable about the basic interpretation skills for diagnostic angiography, venography, cholangiography, pyelography, and portography.
 16. Residents will become familiar with contrast injections and filming sequences as listed in the angiography procedure manual provided to all residents at the start of their first angiography/interventional rotation.
 17. Residents will do in-depth reading and study, along with a review of teaching file cases, to become knowledgeable about the normal anatomy and physiology of vascular, biliary, and urinary anatomy and the radiologic appearances of vascular diseases, and gain a general understanding of the disease entities, their clinical presentations, and certain modes of treatment.
 18. Residents will serve as a secondary consultant to referring physicians regarding angiography and interventional imaging. This will strengthen the confidence of the resident in the very important role every radiologist must perform throughout his/her career as a consultant to clinicians.
 19. Residents will become prepared to pass the certifying examination of the American Board of Radiology.
 20. Residents will teach and share knowledge to medical students, radiologic technologists, technology students, and junior residents.
 21. Residents will prepare one teaching file case per week. Each case will describe the angiographic findings, provide a practical differential diagnosis list, provide the diagnosis whenever possible and conclude with a brief discussion of the disease entity.
 22. Residents must maintain a case log during the rotation which records the procedure, patient, date, resident's involvement and any complications that occurred.

Supervising Faculty Responsibilities:

1. Supervising faculty will be available at all times for any questions or consultations needed by the resident.
2. Supervising faculty will review all cases with the residents before the end of the day.
3. Supervising faculty will provide the resident with constructive feedback in any problem areas encountered during the rotation.
4. Supervising faculty will verify resident-generated reports in a timely manner and inform the resident of any major changes made.

Educational Goals and Objectives (First/Second Year Residents):

Patient Care and Technical Skills:

PCTS1: Consultant

- Demonstrate knowledge of ACR guidelines and technical standards for interventional procedures
- Interact with clinicians when reviewing cases involving radiographs and angiography imaging studies and show ability to provide preliminary readings, follow up with attending

radiologists, formulate a plan of complex cases, and communicate any changes to referring clinicians

PCTS2: Competence in Procedures

- Understand the importance of continuity of care by pre and post procedure assessments
- Understand patient triage, patient selection, risks, indications, and contraindications for each procedure as well as the indications for and contraindications to use of intravenous radiographic contrast, and be able to monitor its administration
- Understand the role of venous access procedures in the treatment of patients
- Define the role of common interventional procedures in the management of patients
- Complete online courses for conscious sedation as well as performing required number of cases needed to obtain hospital privileges for conscious sedation (5 cases, see #1)
- Understand techniques for arterial, and venous access
- Learn the fundamentals of interventional radiology workups and consents (5 venous and 5 general workups) (see #2-3)
- Develop temporary venous access and NT/PTBD drain maintenance procedure skills (see #4-10)
- Spend two days a week performing inpatient/SDA evaluation and workup (triage). Rotate with the physician assistants on venous access triage and with the nurse practitioners on procedure triage one day a week during the first six week interventional rotation
- Share with other residents on service the Sunday and weekday evening triage once credentialed (items #2-3)
- Familiarity with venous access IR procedures (competency book)
- Develop conscious sedation competency

Medical Knowledge:

MK1: Protocol Selection and Optimization of Images

- Demonstrate the ability to recommend additional imaging studies as appropriate to better assess findings on angiography and interventional imaging studies
- Explain the impact of the radiology findings on patient care, including what imaging studies may/may not be appropriate

MK2: Interpretation of examinations

- Develop basic interpretation skills for diagnostic angiography, venography, cholangiography, and pyelography
- Learn vascular, biliary, and urinary anatomy and common pathology
- Develop skills to dictate all cases involved with (power normals are available for most procedures)

System-Based Practice:

SBP1: Quality Improvement (QI)

- Familiarity with departmental procedures, contrast safety, and sedation required in the performance of examinations
- Make suggestions to improve methods and systems utilized in radiology whenever appropriate

SBP2: Health Care Economics

- Demonstrate knowledge of ACR appropriateness criteria and cost effective imaging evaluation of common disorders
- Show ability to interact with clinicians regarding cost effective and streamlined evaluation for differing clinical entities
- Develop an awareness of the venous access devices used, their cost, and alternatives

Practice-Based Learning and Improvement:

PBLI1: Patient safety: contrast agents; radiation safety; MR safety; sedation

- Aware of the basic principles of radiation protection in order to reduce as much as possible the radiation dose to the patient and reduce exposure to healthcare providers
- Recognize and treat reactions to intravenous contrast
- Understand the indications and contraindications to the different types of contrast, dosages, side effects, and the differences and relative merits of single and double contrast studies.
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PBLI2: Self-Directed Learning

- Show evidence of independent study using textbooks from reading list
- Demonstrate appropriate follow up of interesting cases
- Research interesting cases as directed by faculty
- Identify, rectify, and learn from personal errors
- Incorporate feedback into improved performance
- Efficiently use electronic and print sources to access information
- Maintain a log of all cases involved in and those cases received while on call using the Hi-IQ database system which will be reviewed by an angiography attending. The log will include the procedure, patient, date, resident's involvement and any complications that occurred.
- Obtain an attending's signature for assisting and performing a certain number of cases for procedures #1-6 in the competency book while striving to get signed off on as many of the procedures listed in the log book as possible.
- Prepare one teaching file case per week describing the angiographic findings, a practical differential diagnosis list, the diagnosis whenever possible and a brief discussion of the disease entity.
- Able and willing to participate in clinical conferences in which imaging studies are used to guide patient care/evaluations and be able to demonstrate understanding of how imaging relates to the clinical care of the patient

Professionalism:

PROF1: Professional Values and Ethics

- Demonstrate respect for patients, families, and all members of the healthcare team and be able to discuss significant radiology findings
- Respect patient confidentiality at all times
- Present oneself as a professional in appearance and communication
- Demonstrate a responsible work ethic with regard to work assignments
- Develop skills for evaluating and consenting patients with attention to their needs

Interpersonal and Communication Skills:

ICS1: Effective Communication with Patients, Families, and Care Givers

- Communicate with the patient at all times during the examination to ensure that patient

remains comfortable

ICS2: Effective Communication with Members of the Health Care Team

- Communicate effectively with all members of the health care team (technologists, medical students, fellows, residents, allied health providers, support staff, and attending physicians/radiologists)
- Call results to the referring physicians and show ability to interact with referring physicians
- Develop a working relationship with clinicians that refer patients
- Adequately explain each examination to the patient in order to ensure that the patient feels comfortable and to provide patient care that is compassionate, appropriate, and effective
- Use the PACS, voice recognition systems, and hospital information systems to become proficient in dictating reports of significant radiographic findings in a concise and clear manner

Monitoring and Assessment of Resident Performance

The resident's progress will be monitored by the faculty on the service. Written evaluations, organized by the core competencies, will be conducted in consensus by all IR faculty at the end of each rotation. Deficiencies or substandard performance will be discussed personally and privately with the resident and will be brought to the attention of the Residency Program Director by the attending radiologist. Resident performance is also evaluated through direct observation, case logs, multi-source professional evaluations, structured case discussion, review of patient outcomes, completion of the competency booklet handed out at the beginning of the first rotation, participation in the monthly M&M, and feedback by faculty physicians and fellows on oral presentations given at morning case planning conference. Additional evaluations of performance include oral testing at morning case-planning conference on Thursday and Friday mornings, interaction with faculty during patient evaluation, procedures, and patient follow-up, attendance at required conferences, reviewing of case log in Hi-IQ, quality of teaching files, evaluations by nurses and technologists, and other performance evaluation methods as determined.

Educational Goals and Objectives (Third Year Residents):

The objectives for Years 1 and 2 above, as well as the following:

Patient Care and Technical Skills:

PCTS1: Consultant

- Demonstrate knowledge of ACR practice guidelines and technical standards for angiography/interventional procedures
- Familiarity with available medical records and how to access them for the purposes of patient care
- Round in the morning on the "big cases" where resident is primary operator
- Act as a consultant in angiography and interventional radiology to the clinical services

PCTS2: Competence in Procedures

- Familiarity with most common IR procedures (competency book)
- Continue to improve skills for performing interventional examinations, and tailor

examinations to answer all questions being asked by the clinician; anticipate those questions that should have been asked but were not

- Refine diagnostic examination techniques and be very skilled and efficient in performing and interpreting all diagnostic and interventional procedures
- Develop confidence in performing permanent venous access procedures (see #11-15)
- Demonstrate techniques for arterial, venous, biliary and urinary access and continue to develop skills in vascular selective catheterizations
- Know and understand the uses for the array of devices, wires, catheters, needles, etc., used in interventional procedures
- Scrub in on the whole breadth of IR procedures as much as possible
- Gain exposure to fistulography, IVC filter placement, and arterial access (see #16-18)
- Develop an understanding of complex patient triage, with focus on the risks, indications, and contraindications for complex procedures
- Observe interventional procedures and assist more senior residents and faculty as needed
- Know the proper preparation of patients for diagnostic and interventional procedures and the appropriate follow-up afterwards
- Rotate with first rotation residents on Sunday and weekday evening triage

Medical Knowledge:

MK1: Protocol Selection and Optimization of Images

- Recommend the appropriate study based on the clinical scenario and understand the relative strengths of each modality
- Protocol cases, in consultation with the attending, to ensure that the examination is appropriate and of sufficient quality to address the clinical concerns of the patient and referring physician
- Develop a working knowledge of the natural history, prognosis, and need for therapy in patients with common acute and chronic vascular disease
- Demonstrate knowledge of indications for the examinations requested (when the reason for the examination is not clear, the resident will effectively communicate with the patient and referring physician until clarified)
- List appropriate indications and contraindications for those studies performed in the interventional section

MK2: Interpretation of Examination

- Given appropriate images, demonstrate a thorough knowledge and confidence of the arterial and venous anatomy of the vascular system and procedures
- Review all studies with the supervising faculty attending
- Identify common pathology in order to interpret routine studies with accuracy appropriate to the level of training when presenting to the attending
- Become proficient in detecting abnormalities on plain radiographs and interventional studies while in progress
- Distinguish between normal and abnormal vascular, biliary, and urinary anatomy to level of training when presenting to the attending and demonstrate improvement compared to the prior rotation
- Detect abnormalities while the interventional procedures are in progress, such as 1) disease recognition skills will continue to increase on angiography plain radiographs and contrast studies, and 2) develop a meaningful differential diagnoses for the pathology that is found

- Develop advanced interpretation skills for diagnostic angiography, venography, cholangiography, and pyelography
- Demonstrate an ability to accurately interpret angiograms and pressure measurements to recognize vascular pathology and discuss treatment options
- Understand the physiology and clinical impact of noninvasive procedures
- Relate the imaging findings to the clinical condition and its pathology
- Understand the clinical management of the conditions encountered

Systems-Based Practice:

SBP1: Quality Improvement (QI)

- Familiarity with departmental procedures, contrast safety, and sedation required in the performance of examinations
- Make suggestions to improve methods and systems utilized in radiology whenever appropriate

SBP2: Health Care Economics

- Demonstrate knowledge of ACR appropriateness criteria and cost-effective imaging evaluation
- Develop an awareness of the venous access devices used, their cost, and alternatives

Practice-Based Learning and Improvement:

PBLI1: Patient safety: contrast agents; radiation safety; MR safety; sedation

- Understand the physics of radiation protection and how to apply it to routine studies

PBLI2: Self-Directed Learning

- Identify, rectify and learn from personal errors
- Incorporate feedback into improved performance
- Demonstrate evidence of independent reading and learning through use of printed and electronic resources
- Follow up on abnormal or interesting cases through personal communication with the referring physician or patient medical records
- Define the role of most interventional procedures in the management of patients
- Understand the role of interventional radiology in the diagnosis and treatment of patients

Professionalism:

PROF1: Professional Values and Ethics

- Demonstrate respect for patients and all members of the healthcare team (technologists, nurses, and other healthcare workers)
- Respect patient confidentiality at all times
- Further develop skills for evaluating and following patients on the floor with attention to their needs
- Present oneself as a professional in appearance and communication
- Demonstrate a responsible work ethic in regard to work assignments
- Observe ethical principles when recommending further work-up
- Promptness and availability at work are required of every resident
- Dress appropriately for work

Interpersonal and Communication Skills:

ICS1: Effective Communication with Patients, Families, Care Givers

- Appropriately obtain informed consent
- Obtain consent for more complex procedures and answer all questions the patient may have
- Explain the nature of the examination or findings in an examination to patients and their families when needed

ICS2: Effective Communication with Members with the Health Care Team

- Communicate effectively with all members of the healthcare team
- Communicate effectively the results of studies to referring clinicians whenever needed (for emergent studies, this will be accomplished in a timely manner)
- Effectively convey the findings of examinations through accurate dictation of reports
- Assist with supervision and teaching of medical and radiology technologist students
- Develop a working relationship with clinicians that refer patients
- Produce concise reports that include all relevant information
- Provide preliminary reports to all referring clinicians if needed before the final review of cases (when there is a significant discrepancy between the preliminary reading and final reading, the resident will notify the referring clinician immediately)
- Share with other residents on the service the weekday and Sunday triage
- Use appropriate language in communicating to clinicians through reports or consultations so proper management decisions can be made
- Thorough dictations will be made with indications, techniques, findings, and conclusions
- Dictate and correct reports in a timely fashion to avoid delay in patient disposition
- Competent in using PACS, voice recognition systems, and the hospital patient information systems in the daily accomplishment of the workload and instruct others in their use

Monitoring and Assessment of Resident Performance

The resident's progress will be monitored by the faculty on the service. Written evaluations, organized by the core competencies, will be conducted in consensus, by all IR faculty at the end of each rotation. Deficiencies or substandard performance will be discussed personally and privately with the resident and will be brought to the attention of the Residency Program Director by the attending radiologist. Resident performance is also evaluated through direct observation, case logs, multi-source professional evaluations, structured case discussion, review of patient outcomes, completion of the competency booklet handed out at the beginning of the first rotation, participation in the monthly M&M, and feedback by faculty physicians and fellows on oral presentations given at morning case planning conference. Additional evaluations of performance include oral testing at morning case-planning conference on Thursday and Friday mornings, interaction with faculty during patient evaluation, procedures, and patient follow-up, attendance at required conferences, reviewing of case log in Hi-IQ, quality of teaching files, evaluations by nurses and technologists, and other performance evaluation methods as determined by the program.

Reading List for All Rotations

1. Karim Valji. *Vascular and Interventional Radiology*. Saunders, 2nd Edition, 2006.

Supplemental Reading for All Rotations

1. J. Kauffman. *Interventional Radiology Essentials*. 2005
2. Herbert L. Abrams. *Abram's Angiography: Vascular and Interventional Radiology*. 4th Ed., Vol I-III, Little Brown and Co., 2003.

Other Requirements/Expectations

Learning Resources

1. Competency booklet handed out at start of rotation
2. Bibliography (books available for check out in radiology library and daily reading in IR reading room)
3. Core curriculum lectures given at noon given throughout the year and the Wednesday morning lectures and case conference lectures during IR rotation
4. Teaching file cases
5. Review of all cases in which the resident was involved. Familiarity with references and current literature is expected.

Required Conferences

1. Vascular conference held every Monday from 7:00 – 7:45 am in the IR reading room.
2. Device review, Tuesday morning 7:15 am - 7:45 am.
3. Divisional conference held every Wednesday in the Interventional Radiology reading room from 7:30 am - 8:30 am.
4. Morning interesting case conference, Thursday, and Friday 7:15 am - 7:45 am.
5. Attend 12:15 conference whenever possible. The list of the 24 month noon-lecture series is attached (Appendix I)
6. Attend weekly, 3pm, Liver Tumor Board Conference

Case Sign-off

Residents will be given a log book to record signatures of assisting and performing a certain number of patient evaluations, conscious sedation and procedures. They must get signed off on the patient evaluations and conscious sedation DURING THE FIRST ROTATION. They should strive to get sign-off on as many of the procedures listed in the log book as possible.

Teaching Files

Each resident is required to prepare one teaching file cases per week. Each case will describe the angiographic findings, provide a practical differential diagnosis list, provide the diagnosis whenever possible and conclude with a brief discussion of the disease entity. This information is recorded at

I:\angioTF. Instructions are available on the radiology intranet.

Case Log

Each resident is required to maintain a case log during the rotation which records the procedure, patient, date, resident's involvement and any complications that occurred. The log will be maintained in Hi-IQ database system. The Hi-IQ data will be reviewed halfway through the first rotation and at each rotation after the first rotation with an angio attending.

Schedule

Schedule of first rotation:

Week 1: Spend the first 2 days observing procedures to get an overview of area. Then spend two days doing venous access IR triage and one day doing general IR triage

Week 2-6: Triage with NPs (1 day a week) perform vascular access cases whenever possible with guidance from PA's, Fellows, and attendings

Otherwise follow a general daily schedule of attending the morning conference, present the venous access and tube maintenance patients at case planning conference, perform venous access procedures, and get dictations completed prior to leaving for the day.

Duties to be completed prior to first rotation:

1. Make sure you and the other resident on service have a schedule for Sunday workup coverage
2. Epic, PACS access
3. Obtain Hi-IQ login from Anita Bell
4. On-line training on confidentiality and conscious sedation
5. BLS, ACLS certification, as deemed necessary (on-line and a class in radiology)
6. Read the fellow's manual, especially parts on triage and venous access procedures.

Tasks to complete the first two days of first rotation

1. Have sterile technique in-service
2. General rotation overview by attending
3. Find a "visitor lead" apron that fits and put your name on it.
4. Get HI-IQ orientation from fellow or attending
5. Watch as many cases as possible

Schedule of second rotation:

Week 7-12: Triage duties after 4:00 PM and Sunday evenings shared with other residents on service
Otherwise follow a general daily schedule of rounding on your "big" cases, attending morning conference, present your share at case planning conference, perform procedures, and completing dictations prior to leaving for the day.

Resident Daily Responsibilities:

1. During the first rotation residents spend 2 days a week performing inpatient/SDA evaluation and workup (triage). Rotate with the physician assistants on venous access triage and with the nurse practitioners on procedure triage 1 day a week during the first six week IR rotation.

- a. You will learn of additional requests not yet on the schedule by getting paged by the front desk. They will hand you a new request for procedure.
 - b. See all inpatients immediately when a procedure request arrives.
 - c. Review chart, check labs, get an EKG if needed, obtain consent, write the pre-procedure note and place pre-procedure orders.
 - d. Scheduling of cases, or add-on cases, should be referred to triage NP, PA, fellow or the attending of the day
2. Sunday – Thursday evening the ‘short call resident’ should do the following:
1. Go to printer (and office door) to collect requests for potential cases for the next day
 2. There should be 2 copies-both are needed
 3. On one copy, stamp with “copy” (stamp is by printer)
 4. The nurses will get the “copy” request along with the H&P, consent, and blood form (if necessary). You may also leave the consent in the chart: but only if you can communicate that a signed consent is in the patient’s chart on the paperwork left at the nurses’ station (there is a check box for this on the form).
 5. After the work up is complete, the unstamped copy goes to the front desk with a handwritten “done, worked up, go” or whatever message of choice you wish to convey to the people up front that you worked up a patient as much as possible. If it is after hours leave it in the bin outside the door.
 6. When you are finished, if you have any question, call the upper level resident or the fellow
 7. Do not type anything in the scheduling system (Hi-IQ).
 8. Females of childbearing age need to have a qualitative beta HcG, unless tubal ligation or hysterectomy
 9. If labs are pending the evening before the procedure, find the results before 7:30 a.m. the day of the procedure. If necessary make sure labs are run stat. If there are going to be delays, make note of these issues on the request left at the nurses station.
 10. Most patient have been seen here before and have prior work ups from us on care cast under the documents header with the specific link titled Flowsheet with RAD ANGIO written in the adjacent column. These are very helpful.
 11. There are simplified workup forms for PICCs or Hohns that won’t need conscious sedation.
 12. Prior workups may be available in the on-line medical record.
 13. After completing evening “sign-up” of patients for the next day, discuss the patients with the on-call fellow so the first cases of the next day can be planned. Page the on-call fellow if necessary prior to leaving for the day.
3. Residents should arrive on time to round on any patients they are following.
4. Procedures:
- e. Check for old studies.
 - f. Perform procedures with supervision by Fellow/attending. There must be an attending present before starting the cases.
 - g. A physician or nurse must be present in the procedure room at all times. No patient can have conscious sedation without a physician in attendance.
 - h. Fill out post note, enter post-orders into Epic, and call referring physician if no fellow involved in case.
 - i. Review your cases with an attending, and then dictate and bill cases.
 - j. All direct referrals for procedures from outside physicians need copies of films (CD or

film sheet) to go with the patient. The patient is instructed to deliver these films to their doctor at their next visit.

- k. See in-house patients after all **procedures** for follow up and write note in chart later that same day. Report any problems to the fellow or attending on call.
 - l. Round on them every morning until discharge. If you go off-service make sure one of the other residents or fellows picks up the case.
5. Attend AM conferences. (see under fellow section for schedule)
 6. Complete an angio teaching file each week. These should be reviewed with an attending.
 7. Keep a case log of all cases you are involved in while on your angio rotation and while on call using the HiQ system.
 8. Review the competence log bi-weekly with an attending during the first rotation
 9. Keep "Resident diary" updated.

Appendix I:

Core Knowledge Presentation Topics (Two-Year Lecture Series)

Abdominal Trauma

- Liver and splenic Lacerations—when to intervene
- Mesenteric pseudoaneurysms—diagnosis and treatment
- Renal and other visceral dissection
- Pelvic fracture

Thromboembolic Disease and Filters

- Diagnosis
- Filter indications and contraindications
- Identifying complications on CT

Peripheral Vascular Disease—Inflow Disease

- Operative options
- Outcomes

Peripheral Vascular Disease —Infrainguinal Disease

- Indications for treatment
- Case selection
- Outcomes

Renal Artery Disease (AHM)

- Imaging and clinical evaluation
- Evaluation of HTN and insufficiency
- Role of angiography and PTA

Endocrine Imaging and Role of Sampling

- Adrenal
- Pancreatic
- Pituitary
- Ovarian
- Parathyroid

Extremity Venous Thrombolysis

- Current indications
- Risks and benefits

Acute and Chronic Mesenteric Ischemia

- Current imaging methods
- Operative and percutaneous treatment

Liver Transplant Intervention

- Duplex and MRA for diagnosis and follow-up
- Treatment options

AV Fistula Duplex and Intervention

Duplex screening role
PTA
Thrombectomy

Vascular Malformations

MRI findings
Intervention

Gastrointestinal Bleeding

Role of NM and angiography
Treatment with vasoactive infusions
Arterial embolization

Intravascular Foreign Bodies

Imaging findings—normal or abnormal?
Retrieval techniques

Central Venous Access

Indications and contraindications
Technique and outcomes

TIPS

Pre-procedure imaging evaluation
Follow-up duplex findings

Arterial Thrombolysis

Clinical evaluation and triage
Technique
Outcome
Risk factors

Urologic Non-Vascular Intervention

Contact lithotripsy
Ureteral strictures
Stone retrieval
Ureteral occlusion

PTC and Biliary Intervention

Biliary duct dilatation
Stents
Chemodissolution of stones
Percutaneous stone removal

Gastrointestinal Non-Vascular Intervention (

Percutaneous cholecystostomy
Gastrojejunostomy
Foreign Body retrieval

Strictures of bowel

Reproductive Intervention

Fallopian recanalization

Impotence

Testicular venous embolization

HCC

Imaging findings in liver cancer

TACE indications and contraindications

TACE outcomes

Imaging the post-TACE liver

Liver Metastatic Disease

RFA

Y90

Portal vein embolization for resection