Complete Summary

GUIDELINE TITLE

ACR Appropriateness Criteria™ for acute chest pain - suspected aortic dissection.

BIBLIOGRAPHIC SOURCE(S)

Gomes AS, Bettmann MA, Boxt LM, Grollman J, Henkin RE, Higgins CB, Kelley MJ, Needleman L, Pagan-Marin H, Polak JF, Stanford W. Acute chest pain--suspected aortic dissection. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):1-5. [28 references]

COMPLETE SUMMARY CONTENT

SCOPE

DISEASE/CONDITION(S)

Acute chest pain, suspected aortic dissection

GUIDELINE CATEGORY

Diagnosis

CLINICAL SPECIALTY

Cardiology
Emergency Medicine
Family Practice
Internal Medicine
Radiology

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for imaging and treatment decisions for acute chest pain, suspected aortic dissection.

TARGET POPULATION

Patients with acute chest pain, suspected aortic dissection.

INTERVENTIONS AND PRACTICES CONSIDERED

1. Chest radiography
2. Computed tomography with contract, including spiral computed tomography and ultrafast electron beam computed tomography
3. Magnetic resonance imaging/magnetic resonance angiography
4. Angiography
5. Transesophageal echocardiography
6. Transthoracic echocardiography
7. Intravascular ultrasound

MAJOR OUTCOMES CONSIDERED

Utility of radiologic examinations in differential diagnosis.

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

The guideline developer performed literature searches of recent peer-reviewed medical journals, primarily using the National Library of Medicine's MEDLINE database. The developer identified and collected the major applicable articles.

NUMBER OF SOURCE DOCUMENTS

The total number of source documents identified as the result of the literature search is not known.

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus (Delphi Method)
Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review with Evidence Tables

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

One or two topic leaders within a panel assume the responsibility of developing an evidence table for each clinical condition, based on analysis of the current literature. These tables serve as a basis for developing a narrative specific to each clinical condition.

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus (Delphi)

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Since data available from existing scientific studies are usually insufficient for meta-analysis, broad-based consensus techniques are needed to reach agreement in the formulation of the Appropriateness Criteria. Serial surveys are conducted by distributing questionnaires to consolidate expert opinions within each panel. These questionnaires are distributed to the participants along with the evidence table and narrative as developed by the topic leader(s). Questionnaires are completed by the participants in their own professional setting without influence of the other members. Voting is conducted using a scoring system from 1-9, indicating the least to the most appropriate imaging examination or therapeutic procedure. The survey results are collected, tabulated in anonymous fashion, and redistributed after each round. A maximum of three rounds is conducted and opinions are unified to the highest degree possible. Eighty (80) percent agreement is considered a consensus. If consensus cannot be reached by this method, the panel is convened and group consensus techniques are utilized. The strengths and weaknesses of each test or procedure are discussed and consensus reached whenever possible.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

METHOD OF GUIDELINE VALIDATION

Internal Peer Review

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Criteria developed by the Expert Panels are reviewed by the American College of Radiology (ACR) Commitee on Appropriateness Criteria and the Chair of the ACR Board of Chancellors.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria™

Clinical Condition: Acute Chest Pain, Suspected Aortic Dissection

Radiologic Exam Procedure	Appropriateness Rating	Comments
Chest Film	9	
Computed Tomography with Contrast including spiral computed tomography and Ultrafast Electron Beam computed tomography	9	
Magnetic Resonance Imaging/Magnetic Resonance Angiography	8	
Angiography	8	
Transesophageal Echocardiography	8	If skilled operator readily available.
Transthoracic Echocardiography	4	
Intravascular ultrasound	3	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1=Least appropriate 9=Most appropriate		

Imaging studies in the evaluation of suspected thoracic dissection should be directed toward confirmation of the presence of dissection, determination of

whether the dissection is type A or B, assessment of entry and reentry sites, identification of thrombus in the false lumen, assessment of aortic valve competency, detection of the presence or absence of aortic branch involvement, and determination of the presence of pericardial and pleural effusions.

Plain Films

A chest radiograph should be obtained in all patients suspected of having an aortic dissection. Although occasionally, the findings in a single chest radiograph may raise a high level of suspicion for aortic dissection, a single plain film chest radiograph is rarely diagnostic of aortic dissection. In most cases, the plain film findings in aortic dissection are nonspecific, and all of the changes seen in aortic dissection may be secondary to other conditions. Comparison with previous films, however, may reveal changes in the aortic contour that are nearly pathognomonic for aortic dissection. Nonspecific findings on a chest radiograph when studied in conjunction with the clinical history, can be significant and provide supporting evidence for dissection. Widening of the superior mediastinum may be difficult to evaluate because most patients with suspected dissection are examined with portable radiography. Displacement of aortic wall calcification is a finding of limited value and may be misleading if the location of the calcification and the location of the lateral border of the aorta are not at the same body level. Calcification of a mural thrombus or thickening of the aortic wall secondary to atherosclerosis or aortitis may result in a false positive diagnosis. Almost 20% of patients with dissection may have negative chest x-ray findings. Nonetheless, a chest radiograph is indicated to help to rule out other pathology.

Aortography and Angiography

Aortography has long been considered the gold standard for diagnosis of aortic dissection. The sensitivity of aortography has been found to be 88% and the specificity 94%, with positive and negative predictive values of 96% and 84% respectively. The diagnostic accuracy of angiography approaches 98% in some series. Angiography is well tolerated by critically ill patients and has the advantage of allowing evaluation of the aortic valve and aortic branch vessel involvement. Currently, arterial digital subtraction angiography with a large field of view image intensifier and rapid filming is used most frequently. The high frame rates of arterial digital subtraction angiography facilitate identification of the intimal tear and the degree of aortic insufficiency. If large field of view digital subtraction angiography is unavailable, standard cut film radiography, which has higher resolution than intraarterial digital subtraction angiography may be used. Cineangiography has been used, but the field of view is usually limited. Intravenous digital subtraction angiography, because of misregistration artifacts that obscure the aortic root and ascending aorta, is not indicated. False negative arteriograms may occur when the false lumen is not opacified, when there is simultaneous opacification of the true and false lumen, and when the intimal flap is not seen.

Disadvantages of angiography are that it is invasive, iodinated contrast material is required, and there is typically a delay in implementing the procedure. Nonetheless, of all the imaging techniques used in the diagnosis of aortic dissection, angiography provides the best visualization of the thoracic and abdominal branch vessels and flow patterns.

Computed Tomography (CT) Scanning

Computed tomography with contrast injection is indicated in the diagnosis of aortic dissection. Computed tomography is less invasive, faster, safer, cheaper, and less resource intensive than aortography. Most larger hospitals now have in-house computed tomography technologists available 24 hours a day for emergency studies. CT angiography affords high quality thin axial sections that demonstrate mural changes, extraluminal pathologic conditions, spatial relationships and status of adjacent organs, high contrast resolution, high sensitivity for detection of calcified lesions on precontrast images, and demonstration of extrinsic causes of vascular compromise. This allows exclusion of other causes of mediastinal widening, detection of intraluminal and periaortic thrombus, and diagnosis of pericardial and pleural effusions. Factors reducing the diagnostic accuracy of computed tomography angiography are poor opacification of the aorta due to inadequate contrast injection or improper bolus timing, failure to identify the intimal flap because of motion artifacts, and misinterpretation of streak artifacts or motion artifacts as an intimal flap. When the false lumen does not opacify, differentiation from a thrombus filled atherosclerotic aneurysm or intramural hematoma may be difficult. Other limitations of computed tomography include the need for administration of iodinated contrast medium, inability to detect aortic insufficiency, and coronary artery involvement.

Numerous studies evaluating the efficacy of computed tomography scanning in diagnosing aortic dissection have demonstrated a sensitivity of 90%-100%, but lower specificity (87%) than magnetic resonance imaging or transesophageal echocardiography. However these studies compared conventional computed tomography, which has largely been supplanted by fast computed tomography scanning with helical or electron beam computed tomography. Fast computed tomography scanning (computed tomography angiography) represents a significant advance in computed tomography imaging. It permits breath-hold volumetric acquisitions eliminating ventilatory misregistration. Narrow collimation results in improved through-plane resolution with improved visualization of vascular structures as compared with conventional computed tomography. With shorter imaging times, better bolus tracking is accomplished and more images are obtained during peak contrast enhancement, resulting in improved visualization of vascular structures as compared with conventional computed tomography. Fast computed tomography angiography provides exquisite detail on the intimal flap and branch vessel involvement. The value of three dimensional (3D) reconstructions of the data set is under evaluation. Recent studies show similar sensitivities for computed tomography angiography, transesophageal echocardiography and magnetic resonance imaging in the detection of aortic dissection.

Magnetic Resonance Imaging

Magnetic resonance imaging allows the noninvasive visualization of the thoracic and abdominal aorta in multiple projections without the use of contrast agents or ionizing radiation. A variety of pulse sequences is available. Electrocardiogram triggered spin echo images provide exquisite anatomic detail of the heart and aorta. Cine magnetic resonance imaging and other gradient echo techniques allow visualization of flowing blood, facilitating the differentiation of slow flowing blood and clot, and determination of the presence of aortic insufficiency. The double

lumen and intimal flap are readily identified. The sensitivity and specificity of magnetic resonance imaging for the diagnosis of aortic dissection has recently been reported to be 100%. For identifying the site of entry, sensitivity was 85% and specificity 100%, and for identifying thrombus and the presence of a pericardial effusion, sensitivity and specificity were both 100%. Newer gadolinium-enhanced 3-dimensional magnetic resonance angiography techniques permit rapid acquisition of magnetic resonance angiograms of the thoracic and abdominal aorta and their branch vessels. The technique allows coverage of large volumes with and without breath-holding. The three dimension (3D) data sets may be reconstructed. Three dimension (3D) magnetic resonance angiography permits easy identification of both the true and false lumen, enables identification of the type of dissection and assessment of patency of the false lumen. Although magnetic resonance has the potential to provide information about the coronary arteries, currently it cannot rapidly and routinely do so. Limitations of magnetic resonance imaging/magnetic resonance angiography are longer examination times compared with computed tomography, and limited access to the patient. Further, patients with cardiac pacemakers, ferromagnetic aneurysm clips and ocular or otologic implants cannot undergo magnetic resonance imaging. Studies may be suboptimal in patients with cardiac arrhythmias, limited in unstable patients, and motion artifact in uncooperative patients can result in nondiagnostic images. Magnetic resonance imaging is currently more expensive than other imaging techniques, and currently may not be routinely available in emergencies. Magnetic resonance imaging is, however, extremely well suited for the study of patients with stable or chronic dissection and there is growing consensus that it will become the gold standard in defining the anatomy in such patients. Faster scanning times may extend its use in unstable patients.

Echocardiography

In the diagnosis of aortic dissection, echocardiography has the advantage of being readily available and easily performed at the bedside. Transthoracic echocardiography has been found to have a sensitivity of 59%-85% and a specificity of 93%-96%. It is useful in the diagnosis of dissection involving the ascending aorta, but is of limited value in the diagnosis of distal dissections. It is also limited by the availability of echocardiography windows. Transesophageal echocardiography overcomes many of these limitations, and can image almost the entire thoracic aorta. Transesophageal echocardiography is also useful for detecting coronary artery involvement with the dissection. Transesophageal echocardiography has sensitivity similar to magnetic resonance imaging and x-ray computed tomography for detecting dissection. With single plane units the sensitivity of transthoracic echocardiography , and transesophageal echocardiography is lower than x-ray computed tomography and magnetic resonance imaging mainly as a result of false positive findings in the ascending aorta. Biplane units allow improved visualization of the ascending aorta. Multiplane transesophageal echocardiography permits a three dimensional (3D) understanding of the condition of the aorta, and these units are becoming more widely available. The additional views provided by multiplanar transesophageal echocardiography considerably reduce the blind spot of monoplanar transesophageal echocardiography leaving only a small portion between the ascending aorta and proximal aortic arch that is suboptimally shown. A limitation of transesophageal echocardiography is the lack of visualization of the abdominal aorta and the strong dependence on the investigator's experience. Nonetheless, in

most cases of acute dissection, transesophageal echocardiography provides immediate, sufficient information for the decision to perform surgery, obviating the need for angiography, and is indicated. In descending aortic dissection, angiography, computed tomography, and magnetic resonance imaging/magnetic resonance angiography have a larger role, because they allow evaluation of branch vessel involvement and assessment of the distal extension of the aneurysm, parameters not well evaluated by transesophageal echocardiography .

Current experience suggests that in skilled hands the accuracy of transesophageal echocardiography, fast computed tomography, and magnetic resonance imaging/magnetic resonance angiography will be nearly identical. Because patients with acute dissection are critically ill and potentially in need of emergency operation, the selection of a given modality will depend on clinical circumstances and availability. In centers where experienced cardiologists are available to perform state-of-the-art transesophageal echocardiography in the emergency room, transesophageal echocardiography may be the preferred first-line imaging because it can provide sufficient information to determine whether emergency surgery is needed. However, fast computed tomography angiography is likely to be more readily available on a 24-hour basis and can provide information on branch vessel involvement. Although it does not provide information regarding aortic insufficiency, this can be obtained with transthoracic echocardiography or transesophageal echocardiography while the operating room is being prepared. When information about branch vessel involvement is required by the surgeon and not provided by fast computed tomography angiography, aortography will be definitive. Magnetic resonance imaging may be sufficient to replace angiography in stable patients, and those with chronic dissection, or uncertain diagnoses. Faster imaging sequences may extend its use to unstable patients. Use of three dimensional (3D) reconstruction algorithms with fast computed tomography and magnetic resonance imaging/magnetic resonance angiography may provide additional useful information in treatment planning.

CLINICAL ALGORITHM(S)

Algorithms were not developed from criteria guidelines.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The recommendations are based on analysis of the current literature and expert panel consensus.

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate selection of radiologic exam procedures for rapid and accurate diagnosis of aortic dissection.

POTENTIAL HARMS

Not stated

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

An American College of Radiology (ACR) Committee on Appropriateness Criteria and its expert panels have developed criteria for determining appropriate imaging examinations for diagnosis and treatment of specified medical condition(s). These criteria are intended to guide radiologists, radiation oncologists and referring physicians in making decisions regarding radiologic imaging and treatment. Generally, the complexity and severity of a patient's clinical condition should dictate the selection of appropriate imaging procedures or treatments. Only those exams generally used for evaluation of the patient's condition are ranked. Other imaging studies necessary to evaluate other co-existent diseases or other medical consequences of this condition are not considered in this document. The availability of equipment or personnel may influence the selection of appropriate imaging procedures or treatments. Imaging techniques classified as investigational by the U.S. Food and Drug Administration (FDA) have not been considered in developing these criteria; however, study of new equipment and applications should be encouraged. The ultimate decision regarding the appropriateness of any specific radiologic examination or treatment must be made by the referring physician and radiologist in light of all the circumstances presented in an individual examination.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Gomes AS, Bettmann MA, Boxt LM, Grollman J, Henkin RE, Higgins CB, Kelley MJ, Needleman L, Pagan-Marin H, Polak JF, Stanford W. Acute chest pain--suspected

aortic dissection. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):1-5. [28 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

1995 (revised 1999)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

The American College of Radiology (ACR) provided the funding and the resources for these ACR Appropriateness Criteria™.

GUIDELINE COMMITTEE

American College of Radiology (ACR) Appropriateness Criteria™ Committee, Expert Panel on Cardiovascular Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Names of Panel Members: Antoinette S. Gomes, MD; Michael A. Bettmann, MD; Lawrence M. Boxt, MD; Julius Grollman, MD; Robert E. Henkin, MD; Charles B. Higgins, MD; Michael J. Kelley, MD; Laurence Needleman, MD; Heriberto Pagan-Marin, MD; Joseph F. Polak, MD, MPH; William Stanford, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline. It is a revision of a previously issued version (Appropriateness criteria for chest pain – suspected aortic dissection. Reston [VA]: American College of Radiology [ACR]; 1995. 5 p. [ACR Appropriateness Criteria™]).

The ACR Appropriateness Criteria™ are reviewed after five years, if not sooner, depending upon introduction of new and highly significant scientific evidence. The next review date for this topic is 2004.

GUIDELINE AVAILABILITY

Electronic copies: Available (in Portable Document Format [PDF]) from the American College of Radiology (ACR) Web site.

Print copies: Available from ACR, 1891 Preston White Drive, Reston, VA 20191. Telephone: (703) 648-8900.

AVAILABILITY OF COMPANION DOCUMENTS

None available

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on October 26, 2000. The information was verified by the guideline developer on December 14, 2000.

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