Complete Summary

GUIDELINE TITLE

Follow-up of lower extremity arterial bypass surgery.

BIBLIOGRAPHIC SOURCE(S)

Casciani T, Bettmann MA, Gomes AS, Grollman JH, Holtzman SR, Polak JF, Sacks D, Schoepf J, Stanford W, Jaff M, Moneta GL, Expert Panel on Cardiovascular Imaging. Follow-up of lower extremity arterial bypass surgery. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [30 references]

GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: Hessel SJ, Levin DC, Bettmann MA, Gomes AS, Grollman J, Henkin RE, Higgins CB, Kelley MJ, Needleman L, Polak JF, Stanford W, Wexler L, Abbott W, Port S. Recurrent symptoms following lower extremity arterial bypass surgery. American College of Radiology. ACR Appropriateness Criteria. Radiology 2000 Jun;215(Suppl):89-93.

The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

COMPLETE SUMMARY CONTENT

SCOPE
METHODOLOGY - including Rating Scheme and Cost Analysis
RECOMMENDATIONS
EVIDENCE SUPPORTING THE RECOMMENDATIONS
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS
QUALIFYING STATEMENTS
IMPLEMENTATION OF THE GUIDELINE
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES
IDENTIFYING INFORMATION AND AVAILABILITY
DISCLAIMER

SCOPE

DISEASE/CONDITION(S)

Recurrent symptomatic or asymptomatic stenosis following lower extremity arterial bypass surgery

GUIDELINE CATEGORY

Diagnosis
Evaluation

CLINICAL SPECIALTY

Radiology
Surgery

INTENDED USERS

Health Plans
Hospitals
Managed Care Organizations
Physicians
Utilization Management

GUIDELINE OBJECTIVE(S)

To evaluate the appropriateness of initial radiologic examinations for recurrent symptomatic and asymptomatic stenosis following lower extremity arterial bypass surgery

TARGET POPULATION

Patients with recurrent symptomatic and asymptomatic stenosis following lower extremity arterial bypass surgery

INTERVENTIONS AND PRACTICES CONSIDERED

1. Physiologic noninvasive tests
2. Ultrasound (US), Duplex Doppler with color, arterial
3. Invasive (INV), digital subtraction angiography (DSA)
4. Magnetic resonance angiography (MRA)
5. Computed tomography angiography (CTA)
6. Ankle-brachial indices (ABI)

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 peer-reviewed medical journals, and the major applicable articles were identified and collected.

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

Weighting According to a Rating Scheme (Scheme Not Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not stated

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. The American College of Radiology (ACR) Appropriateness Criteria panels use a modified Delphi technique to arrive at consensus. 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 to 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 percent agreement is considered a

consensus. This modified Delphi technique enables individual, unbiased expression, is economical, easy to understand, and relatively simple to conduct.

If consensus cannot be reached by the Delphi technique, 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. If "No consensus" appears in the rating column, reasons for this decision are added to the comment sections.

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

COST ANALYSIS

The guideline developers reviewed a published cost analysis.

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) Committee on Appropriateness Criteria.

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

ACR Appropriateness Criteria®

Clinical Condition: Follow-up of Lower Extremity Arterial Bypass Surgery

Variant 1: Claudication/suprainguinal graft.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Physiologic noninvasive tests	9	
US, Duplex Doppler with color, arterial	8	Color Doppler with waveform evaluation of entire graft.
INV, angiography (DSA)	8	Indicated if noninvasive studies are abnormal. Not for screening.
MRA	6	

Radiologic Exam Procedure	Appropriateness Rating	Comments
CTA	5	Although not yet supported by studies, MDCTA is emerging as a widely used and reliable noninvasive study in this clinical setting.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 2: Claudication/infrainguinal vein graft.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Physiologic noninvasive tests	9	
US, Duplex Doppler with color, arterial	8	Color Doppler with waveform evaluation of entire graft.
INV, angiography (DSA)	8	Indicated if noninvasive studies are abnormal. Not for screening.
MRA	6	
CTA	5	Although not yet supported by studies, MDCTA is emerging as a widely used and reliable noninvasive study in this clinical setting.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 3: Claudication/infrainguinal prosthetic graft.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Physiologic noninvasive tests	9	

Radiologic Exam Procedure	Appropriateness Rating	Comments
US, Duplex Doppler with color, arterial	8	Color Doppler with waveform evaluation of entire graft.
INV, angiography (DSA)	8	Indicated if noninvasive studies are abnormal. Not for screening.
MRA	6	
CTA	5	Although not yet supported by studies, MDCTA is emerging as a widely used and reliable noninvasive study in this clinical setting.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 4: Threatened limb/suprainguinal graft.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Ankle-brachial indices (ABI)	9	
INV, angiography (DSA)	9	Indicated if noninvasive studies are abnormal. Not for screening.
US, Duplex Doppler with color, arterial	8	Color Doppler with waveform evaluation of entire graft.
Other physiologic noninvasive tests	4	
MRA	4	
CTA	3	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 5: Threatened limb/infrainguinal vein graft.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Ankle-brachial indices (ABI)	9	
INV, angiography (DSA)	9	Indicated if noninvasive studies are abnormal. Not for screening.
US, Duplex Doppler with color, arterial	8	Color Doppler with waveform evaluation of entire graft.
MRA	6	In selected cases, to determine patency of distal vessels.
Other physiologic noninvasive tests	4	
CTA	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 6: Threatened limb/infrainguinal prosthetic graft.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Ankle-brachial indices (ABI)	9	
INV, angiography (DSA)	9	Indicated if noninvasive studies are abnormal. Not for screening.
US, Duplex Doppler with color, arterial	8	Color Doppler with waveform evaluation of entire graft.
MRA	6	In selected cases, to determine patency of distal vessels.
Other physiologic noninvasive tests	4	
CTA	2	
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Variant 7: Asymptomatic/infrainguinal vein graft.

Radiologic Exam Procedure	Appropriateness Rating	Comments
Physiologic noninvasive tests	8	
US, Duplex Doppler with color, arterial	8	Color Doppler with waveform evaluation of entire graft.
CTA	5	Although not yet supported by studies, MDCTA is emerging as a widely used and reliable noninvasive study in this clinical setting.
MRA	4	Limited data available. Inherent limitations caused by artifact clips.
INV, angiography (DSA)	3	Indicated if noninvasive studies are abnormal. Not for screening.
Appropriateness Criteria Scale 1 2 3 4 5 6 7 8 9 1 = Least appropriate 9 = Most appropriate		

Note: Abbreviations used in the tables are listed at the end of the "Major Recommendations" field.

Lower extremity arterial bypass surgery can be broadly categorized as suprainguinal or infrainguinal, and when infrainguinal as autologous vein, or artificial graft. The postsurgical evaluation previously was limited to clinical observation of recurring symptoms and measurement of ankle-brachial indices (ABI) and segmental volume recordings. Over the past two decades, routine duplex US for asymptomatic patients following infrainguinal bypass has gained much acceptance. Regardless of the category of bypass, symptoms recur or an asymptomatic stenosis is detected, further imaging may be warranted prior to open surgical or endovascular intervention. Conventional (catheter) angiography and, more recently, MRA and CTA may provide needed information regarding the severity and character of stenoses and the quality of the native vessels proximal and distal to the graft. Even in the setting of an acutely threatened limb after bypass graft failure, these studies may be warranted prior to rapid intervention.

The natural history of lower extremity bypass surgery with vein conduit is the development of stenoses within or adjacent to the graft and ultimately thrombosis. Early failures are usually secondary to a technical imperfection such as a retained valve or a kink in the conduit during tunneling. Late failures are usually due to intimal hyperplasia within the graft or at either anastomosis, or progression of atherosclerosis in the inflow or outflow arteries. During the first

postoperative year, up to 30% of venous grafts develop stenoses. There is evidence suggesting that repair of these stenoses, by either surgical or endovascular means, extends the patency of venous bypass grafts. In addition, patency following revision of a thrombosed vein graft is inferior to patency following of revision of a stenotic graft prior to thrombosis.

Duplex US has been used as a method of vein graft surveillance for more than 20 years. The technique involves the sequential study of a graft from proximal to distal anastomosis, with measurement of peak systolic flow velocity (PSFV) and comparison of areas of increased velocity to nearby regions of low velocity to create a peak systolic flow velocity ratio (PSFVR). There is evidence to suggest that the PSFVR is the most sensitive indicator of a graft stenosis. A PSFVR of more than 2.5 is often considered representative of a significant stenosis, although there are reports suggesting a higher value of 3.0 or 3.5 as the appropriate threshold for intervention. Another value that may signify a significant stenosis is a PSFV >200 cm/sec at any point in the graft. A midgraft PSFV <45 cm/sec may indicate high resistance, suggesting stenosis in the outflow arteries. However, low PSFV may be seen normally in large caliber vein grafts.

There have been two prospective randomized trials comparing duplex US surveillance versus clinical follow-up of lower extremity bypass grafts with opposite conclusions. One study showed no difference in assisted primary or secondary patency for 185 vein grafts at 1 year. In another study, 165 grafts did show a significant benefit in assisted primary and secondary patency for vein grafts at 3 years, but no benefit in patency for the surveillance of polytetrafluoroethylene (PTFE) grafts. A European randomized control trial of 1,200 patients is pending. A nonrandomized study of 615 bypasses found significant improvement in secondary patency and limb salvage for grafts followed by duplex US and ankle-brachial index compared to clinical surveillance (return of preoperative symptoms).

Arguments against the use of duplex US surveillance include the expense of the machine and the technologist and the lack of a definitive study showing that detectable stenosis will lead to graft failure. However, there is evidence as to the cost effectiveness of such surveillance.

There is strong evidence that using duplex US during the creation of the graft reduces early graft failures. In fact, the most sensitive predictor of subsequent graft stenosis formation was an abnormal duplex US during initial surgery.

Regardless of the indications for re-intervention in a bypass graft, many surgeons obtain arteriography before repair, mainly for evaluating the inflow and outflow vessels. In recent years, MRA, specifically contrast-enhanced MRA, has shown increasing ability to properly evaluate inflow and outflow vessels, as well as bypass grafts. Though less well-studied, CTA with multislice scanner technology has begun to emerge as another alternative to conventional arteriography.

Abbreviations

- CTA, computerized tomography angiography
- DSA, digital subtraction angiography
- MDCTA, multidetector CTA

- MRA, magnetic resonance angiography
- US, ultrasound

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

Selection of appropriate radiologic imaging procedures to aid in differential diagnosis of patients with recurrent symptomatic and asymptomatic stenosis following lower extremity arterial bypass surgery

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.

IMPLEMENTATION TOOLS

Personal Digital Assistant (PDA) Downloads

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

Getting Better
Living with Illness

IOM DOMAIN

Effectiveness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Casciani T, Bettmann MA, Gomes AS, Grollman JH, Holtzman SR, Polak JF, Sacks D, Schoepf J, Stanford W, Jaff M, Moneta GL, Expert Panel on Cardiovascular Imaging. Follow-up of lower extremity arterial bypass surgery. [online publication]. Reston (VA): American College of Radiology (ACR); 2005. 6 p. [30 references]

ADAPTATION

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

DATE RELEASED

1998 (revised 2005)

GUIDELINE DEVELOPER(S)

American College of Radiology - Medical Specialty Society

SOURCE(S) OF FUNDING

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

GUIDELINE COMMITTEE

Committee on Appropriateness Criteria, Expert Panel on Cardiovascular Imaging

COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Panel Members: Thomas Casciani, MD; Michael A. Bettmann, MD; Antoinette S. Gomes, MD; Julius H. Grollman, MD; Stephen R. Holtzman, MD; Joseph F. Polak, MD, MPH; David Sacks, MD; Joseph Schoepf, MD; William Stanford, MD; Michael Jaff, MD; Gregory L. Moneta, MD

FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

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The appropriateness criteria are reviewed annually and updated by the panels as needed, depending on introduction of new and highly significant scientific evidence.

GUIDELINE AVAILABILITY

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

ACR Appropriateness Criteria® Anytime, Anywhere™ (PDA application). Available from the ACR Web site.

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

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- ACR Appropriateness Criteria®. Background and development. Reston (VA): American College of Radiology; 2 p. Electronic copies: Available in Portable

Document Format (PDF) from the American College of Radiology (ACR) Web site.

PATIENT RESOURCES

None available

NGC STATUS

This summary was completed by ECRI on February 20, 2001. The information was verified by the guideline developer on March 14, 2001. This summary was updated by ECRI on March 29, 2006.

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