

Superficial Femoral Artery Plaque and Functional Performance in Peripheral Arterial Disease

Walking and Leg Circulation Study (WALCS III)

Mary M. McDermott, MD,*† Kiang Liu, PhD,† Timothy J. Carroll, PhD,‡‡
Lu Tian, ScD,§§ Luigi Ferrucci, MD, PhD,¶¶ Debiao Li, PhD,‡ James Carr, MD,‡
Jack M. Guralnik, MD, PhD,## Melina Kibbe, MD,§¶ William H. Pearce, MD,||¶
Chun Yuan, PhD,** Walter McCarthy, MD,# Christopher M. Kramer, MD,‡‡‡
Huimin Tao, MS,† Yihua Liao, MS,† Elizabeth Talley Clark, MD,††
Dongxiang Xu, PhD,††† Jarett Berry, MD,§§§ Jennifer Orozco, MMS, PA,**
Leena Sharma, MD,* Michael H. Criqui, MD, MPH|||

Chicago and Evanston, Illinois; Stanford and San Diego, California;

Bethesda and Baltimore, Maryland; Seattle, Washington; Charlottesville, Virginia; and Dallas, Texas

OBJECTIVES We studied associations of magnetic resonance imaging measurements of plaque area and relative percent lumen reduction in the proximal superficial femoral artery with functional performance among participants with peripheral arterial disease.

BACKGROUND The clinical significance of directly imaged plaque characteristics in lower extremity arteries is not well established.

METHODS A total of 454 participants with an ankle brachial index <1.00 underwent magnetic resonance cross-sectional imaging of the proximal superficial femoral artery and completed a 6-min walk test, measurement of 4-m walking velocity at usual and fastest pace, and measurement of physical activity with a vertical accelerometer.

RESULTS Adjusting for age, sex, race, body mass index, smoking, statin use, comorbidities, and other covariates, higher mean plaque area (1st quintile [least plaque]: 394 m, 2nd quintile: 360 m, 3rd quintile: 359 m, 4th quintile: 329 m, 5th quintile [greatest plaque]: 311 m; p trend <0.001) and smaller mean percent lumen area (1st quintile [greatest plaque]: 319 m, 2nd quintile: 330 m, 3rd quintile: 364 m, 4th quintile: 350 m, 5th quintile: 390 m; p trend <0.001) were associated with shorter distance achieved in the 6-min walk test. Greater mean plaque area was also associated with slower usual-paced walking velocity (p trend = 0.006) and slower fastest-paced 4-m walking velocity (p trend = 0.003). Associations of mean plaque area and mean lumen area with 6-min walk distance remained statistically significant even after additional adjustment for the ankle brachial index and leg symptoms.

CONCLUSIONS Among participants with peripheral arterial disease, greater plaque burden and smaller lumen area in the proximal superficial femoral artery are associated independently with poorer functional performance, even after adjusting for the ankle brachial index and leg symptoms. (J Am Coll Cardiol Img 2011;4:730–9) © 2011 by the American College of Cardiology Foundation

High-resolution magnetic resonance imaging (MRI) has emerged as a promising modality for direct atherosclerotic plaque imaging (1,2). However, little is known about associations of MRI-measured plaque area or lumen area with functional impairment in peripheral arterial disease (PAD). We used MRI to directly image cross sections of the superficial femoral artery (SFA) (Fig. 1). We studied associations of plaque area and percent lumen area in the SFA with functional impairment in PAD. We hypothesized that greater plaque area and smaller percent lumen area in the SFA would be associated with greater functional impairment, independently of age, comorbidities, and other potential confounders. We also hypothesized that significant associations of more adverse plaque characteristics with greater functional impairment would be eliminated after additional adjustment for the ankle brachial index (ABI).

METHODS

Subjects. Participants were identified from among consecutive PAD patients in the noninvasive vascular laboratories at Northwestern Memorial Hospital and 3 other Chicago-area medical centers. Participants were also identified from among lists of consecutive patients with a diagnosis of PAD in the vascular surgery, cardiology, endocrinology, general medicine, and geriatric practices at Northwestern Medical Faculty Foundation and in the vascular surgery practice at the Jesse Brown VA Medical Center. A small number of participants were identified from among men and women age 70 years and older in Northwestern's largest general internal

medicine practice who were screened with the ABI and found to have an ABI <1.00 (Fig. 2). To maximize comparability with participants with previously established PAD, a minimum age of 70 years was required for participants identified in general medicine. The protocol was approved by the Institutional Review Boards of Northwestern University Feinberg School of Medicine and all participating sites. Participants gave written informed consent.

Inclusion criteria. The inclusion criterion was an ABI <1.00. This inclusion criterion was selected because truly normal ABI values are 1.10 to 1.40 (3–5) and because including participants with ABI <1.00 ensured a broad range of severity of lower extremity atherosclerosis. Presence of intermittent claudication was not an inclusion criterion.

Exclusion criteria. Potential participants with dementia and those with a Mini-Mental Status Examination score <23 (6) were excluded. Nursing home residents, wheelchair-bound patients, and patients with foot or leg amputations were excluded because of their severely impaired functioning. Non-English-speaking patients were excluded because investigators were not fluent in non-English languages. We excluded potential participants who required oxygen therapy, had contraindications to MRI testing, stopped the 6-min walk test due to shortness of breath, had recent major surgery, or had severe knee osteoarthritis. Severe arthritis was defined based on the presence of radiograph-measured osteoarthritis Kellgren-Lawrence score of 4 among participants who reported pain in or around

ABBREVIATIONS AND ACRONYMS

ABI = ankle brachial index

BMI = body mass index

MRI = magnetic resonance imaging

PAD = peripheral arterial disease

SFA = superficial femoral artery

Northwestern University Feinberg School of Medicine, Chicago, Illinois; §Department of Surgery, Northwestern University Feinberg School of Medicine, Chicago, Illinois; ||Division of Vascular Surgery, Northwestern University Feinberg School of Medicine, Chicago, Illinois; ¶Surgical Services, Jesse Brown Veterans Affairs Medical Center, Chicago, Illinois; #University Cardiovascular Surgeons, Rush University Medical Center, Chicago, Illinois; **Department of Vascular Surgery, Rush University Medical Center, Chicago, Illinois; ††Department of Surgery, Mount Sinai Hospital, Chicago, Illinois; ‡‡Department of Biomedical Engineering and Radiology, Northwestern University, Evanston, Illinois; §§Department of Health Research and Policy, Stanford University School of Medicine, Stanford, California; |||Department of Family and Preventive Medicine, University of California at San Diego, San Diego, California; ¶¶Longitudinal Studies Section, Clinical Research Branch, National Institute on Aging, Bethesda, Maryland; ##Department of Epidemiology and Public Health, University of Maryland School of Medicine, Baltimore, Maryland; ***Department of Radiology, Electrical Engineering, and Bioengineering, University of Washington, Seattle, Washington; †††Department of Radiology, University of Washington School of Medicine, Seattle, Washington; ‡‡‡Department of Radiology and Medicine, University of Virginia Health System, Charlottesville, Virginia; and the §§§Department of Medicine, University of Texas Southwestern Medical Center, Dallas, Texas. Dr. Li is currently affiliated with the Department of Radiology and Bioengineering, Cedars Sinai Medical Center, Los Angeles, California. Supported by funding from the National Heart, Lung, and Blood Institute (R01-HL083064), by the Intramural Research Program of the National Institute on Aging, and by the Jesse Brown VA Medical Center. Dr. Yuan receives research support from VP Diagnostics and from Philips Healthcare. Dr. Kramer receives research support from Siemens Healthcare. Dr. Xu is a technical consultant for VP Diagnostics and owner of Imaging Biomarker Solutions. All other authors have reported that they have no relationships to disclose. Eike Nagel, MD, PhD, served as Guest Editor for this article.

Manuscript received October 29, 2010; revised manuscript received March 29, 2011, accepted April 7, 2011.

Download English Version:

<https://daneshyari.com/en/article/2938858>

Download Persian Version:

<https://daneshyari.com/article/2938858>

[Daneshyari.com](https://daneshyari.com)