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## Articles

# Common Carotid Intima-Media Thickness and Risk of Stroke and Myocardial Infarction

## The Rotterdam Study

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## Abstract

*Background* Noninvasive assessment of intima-media thickness (IMT) is widely used in observational studies and trials as an intermediate or proxy end point for cardiovascular disease. However, data showing that IMT predicts cardiovascular disease are limited. We studied whether common carotid IMT is related to future stroke and myocardial infarction.

*Methods and Results* We used a nested case-control approach among 7983 subjects aged  $\geq 55$  years participating in the Rotterdam Study. At baseline (March 1990 through July 1993), ultrasound images of the common carotid artery were stored on videotape. Determination of incident myocardial infarction and stroke was predominantly based on hospital discharge records. Analysis (logistic regression) was based on 98 myocardial infarctions and 95 strokes that were registered before December 31, 1994. IMT was measured from videotape for all case subjects and a sample of 1373 subjects who remained free from myocardial infarction and stroke during follow-up. The mean duration of follow-up was 2.7 years. Results were adjusted for age and sex. Stroke risk increased gradually with increasing IMT. The odds ratio for stroke per standard deviation increase (0.163 mm) was 1.41 (95% CI, 1.25 to 1.82). For myocardial infarction, an odds ratio of 1.43 (95% CI, 1.16 to 1.78) was found. When subjects with a previous myocardial infarction or stroke were excluded, odds ratios were 1.57 (95% CI, 1.27 to 1.94) for stroke and 1.51 (95% CI, 1.18 to 1.92) for myocardial infarction. Additional adjustment for several cardiovascular risk factors attenuated these associations: 1.34 (95% CI, 1.08 to 1.67) and 1.25 (95% CI, 0.98 to 1.58), respectively.

*Conclusions* The present study, based on a short follow-up period, provides evidence that an increased common carotid IMT is associated with future cerebrovascular and cardiovascular events.

**Key Words:** atherosclerosis • ultrasonics • risk factors

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## Introduction

Prospective follow-up studies have recently been initiated in which high-resolution B-mode ultrasonography of the carotid arteries is used to study atherosclerosis in populations at large.<sup>1 2 3 4 5 6</sup> Carotid B-mode ultrasonography provides for evaluation of lumen diameter, intima-media thickness, and presence and extent of plaques. An increased cross-sectional carotid intima-media thickness was associated with unfavorable levels of established cardiovascular risk factors,<sup>1 2 3 4 5 6 7</sup> prevalent cardiovascular disease,<sup>7 8 9</sup> and atherosclerosis elsewhere in the arterial system.<sup>10 11 12</sup> There is a growing belief that carotid intima-media thickness can be regarded as an indicator of generalized atherosclerosis<sup>13</sup> and that it may be used as an intermediate end point or proxy end point in observational studies and trials as a suitable alternative for cardiovascular morbidity and

mortality. Indeed, a limited number of intervention studies showed reduced progression of intima-media thickness in subjects treated with lipid-lowering drugs compared with a placebo group.<sup>14 15 16</sup> However, to apply these measurements with confidence, there is an urgent need for quantitative data to show that increased intima-media thickness and progression of intima-media thickness are related to future cerebrovascular and cardiovascular diseases. Presently, such information is very limited. So far, only one study has shown that an increased maximum common carotid intima-media thickness is related to an increased risk of myocardial infarction.<sup>17 18</sup>

In the present study, we set out to examine the association between common carotid intima-media thickness and incident stroke and myocardial infarction among men and women participating in the Rotterdam Study.

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## Methods

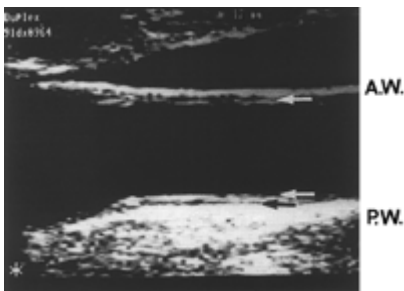
### Population

The Rotterdam Study is a single-center, prospective, follow-up study on disease and disability in the elderly in 7983 subjects aged  $\geq 55$  years living in the suburb of Ommoord in Rotterdam, Netherlands, as detailed elsewhere.<sup>19</sup> Baseline data for each subject were collected from March 1990 through July 1993 in a home interview and two visits at the research center. The overall participation rate of those invited for the study was 78%. The study was approved by the Medical Ethics Committee of Erasmus University, and written informed consent was obtained from all participants.

### Carotid Arteries

To measure carotid intima-media thickness, ultrasonography of the common carotid artery, carotid bifurcation, and internal carotid artery of the left and right carotid arteries was performed with a 7.5-MHz linear-array transducer (ATL UltraMark IV). On a longitudinal, two-dimensional ultrasound image of the carotid artery, the anterior (near) and posterior (far) walls of the carotid artery are displayed as two bright white lines separated by a hypoechoic space. The distance between the leading edge of the first bright line of the far wall (lumen-intima interface) and the leading edge of the second bright line (media-adventitia interface) indicates the intima-media thickness. For the near wall, the distance between the trailing edge of the first bright line and the trailing edge of the second bright line at the near wall provides the best estimate of the near-wall

intima-media thickness (Fig 1 ✦). In accordance with the Rotterdam Study ultrasound protocol,<sup>20</sup> a careful search was performed for all interfaces of the near and far walls of the distal common carotid artery. When an optimal longitudinal image was obtained, it was frozen on the R wave of the ECG and stored on videotape. This procedure was repeated three times for both sides. The actual measurements of intima-media thickness were performed off-line. From the videotape, the frozen images were digitized and displayed on the screen of a personal computer using additional dedicated software. This procedure has been described in detail previously.<sup>11 13 21</sup> In short, with a cursor, the interfaces of the distal common carotid artery were marked across a length of 10 mm. The beginning of the dilatation of the distal common carotid artery served as a reference point for the start of the measurement. The average of the intima-media thickness of each of the three frozen images was calculated. For each individual, the common carotid intima-media thickness was determined as the average of near- and far-wall measurements of both the left and right arteries. The readers of the ultrasound images from videotape were unaware of the case status of the subject. Results from a reproducibility study of intima-media thickness measurements among 80 participants of the Rotterdam Study who underwent a second ultrasound scan of both carotid arteries within 3 months of the first scan have been published elsewhere.<sup>22</sup> In short, mean differences (SD) in far-wall intima-media thickness of the common carotid artery between paired measurements of sonographers, readers, and visits were -0.005 mm (0.09), 0.060 mm (0.05), and -0.033 mm (0.12), respectively.



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**Figure 1.** Characteristic longitudinal, two-dimensional ultrasound image of the distal common carotid artery. A.W. indicates anterior (near) wall of the carotid artery; P.W., posterior (far) wall. Arrows from top to bottom indicate the leading edge of the intima-lumen interface at the near wall, the lumen-intima interfaces, and the media-adventitia interface at the far wall, respectively.

Off-line, the common carotid artery and the carotid bifurcation were evaluated from tapes for the presence (yes/no) of atherosclerotic lesions on both the near and far walls of the carotid arteries. Plaques were defined as a focal widening relative to adjacent segments, with protrusion into the lumen composed either of only calcified deposits or a combination of calcification and noncalcified material. The size or extent of the lesions was not quantified. A reproducibility study on the assessment of plaques in the carotid bifurcation among 166 participants revealed a  $\kappa$  of 0.59 for the left carotid artery, 0.65 for the right carotid artery, and 0.60 for plaques on either side, indicating moderate agreement.<sup>23</sup>

### **Cerebrovascular and Cardiovascular Risk Indicators**

A history of myocardial infarction and stroke at baseline was assessed on the basis of answers to the questions "Did you ever suffer from a myocardial infarction for which you were hospitalized?" and "Did you ever suffer from a stroke, diagnosed by a physician?". A subject's smoking status was classified as current, former, or never smoker. At the research center, height and weight were measured and body mass index ( $\text{kg}/\text{m}^2$ ) was calculated. Sitting blood pressure was measured at the right upper arm with a random-zero sphygmomanometer. The average of two measurements obtained on one occasion, separated by a count of the pulse rate, was used in the present analysis. Hypertension was defined as a systolic blood pressure  $\geq 160$  mm Hg, a diastolic blood pressure  $\geq 95$  mm Hg, or current use of antihypertensive drugs for the indication of hypertension. Diabetes mellitus was considered present when subjects currently used oral blood glucose-lowering drugs or insulin.

A nonfasting venipuncture was performed with the use of a 21-gauge butterfly needle with tube (Surflo winged infusion set, Terumo).<sup>24</sup> Serum total cholesterol was determined by use of an automated enzymatic procedure.<sup>25</sup> HDL cholesterol was measured similarly, after precipitation of the non-HDL fraction with phosphotungstate magnesium.

### **Incident Cerebrovascular and Cardiovascular Disease**

In the Rotterdam Study, information on incident fatal and nonfatal events is obtained from the general practitioners (GPs) working in the study district of Ommoord. The GPs involved report all possible cases of both stroke and myocardial infarction to the Rotterdam research center. Events are presented as coded information according to the International Classification of Primary Care (ICPC).<sup>26</sup> The ICPC codes for acute myocardial infarction and cerebrovascular accidents are K75 and K90, respectively. With respect to the vital status of the participants, information is obtained at regular intervals from the municipal authorities in Rotterdam, and death of a participant is reported as code A96 by GPs. The GPs whose practices are computerized send ICPC codes of participants of the Rotterdam Study on computer file to the Rotterdam Study data center on a regular basis. Follow-up data on computer file encompass  $\approx 85\%$  of the Rotterdam Study cohort. When an event or death has been reported, additional information is obtained by interviewing the GP and scrutinizing information from hospital discharge records in case of admittance or referral. After consideration of all available information, some of the stroke events and myocardial infarctions initially suspected and reported by the GPs were not classified as such. For example, GPs are instructed to report cases of subdural hematoma (K90), which is not considered a stroke by a neurologist. Also, some subjects were reported to have died of a possible cerebrovascular accident, although a cardiac cause could not be excluded according to the GP. Understandably, some reported myocardial infarctions proved to be cases of angina pectoris, whereas others were eventually diagnosed as congestive heart failure.

A myocardial infarction was considered to have occurred when (1) the event led to a hospitalization, and the hospital discharge record comprised a diagnosis of a new myocardial infarction based on signs and symptoms, ECG recordings, and repeated laboratory investigations during hospital stay (definite myocardial infarction) or (2) a subject died within 1 hour after onset of symptoms (sudden death) without having been hospitalized, and the GP reported a cardiac source as the most likely cause of death (probable myocardial infarction).

Because 25% to 30% of subjects who suffer an acute stroke are not hospitalized in The Netherlands,<sup>27</sup> all suspected cerebrovascular events reported by the GPs were submitted for review to a neurologist (P.J.K.). On the basis of all information, including symptoms and signs obtained by interviewing the GP or, in case of hospital referral, by reviewing hospital data, the neurologist classified the events as definite, probable, or possible stroke. The present analysis is restricted to outcomes in which a stroke most likely did occur in the opinion of the neurologist. For the present analysis, an incident stroke was considered to have occurred when one of the following criteria was met: (1) the event led to a hospitalization, and the hospital discharge record indicated a diagnosis of a new stroke, such clinical diagnosis being based on signs and symptoms as well as neuroimaging investigations during hospital stay (definite stroke); (2) in case of no hospitalization, signs and symptoms associated with the event obtained from the GP records and interview were highly suggestive of a stroke according to the neurologist (P.J.K.) (probable stroke); or (3) in case of out-of-hospital death, the GP reported that the cause of death was a cerebrovascular accident, and a cardiac cause was judged by the GP to be highly unlikely (probable stroke).

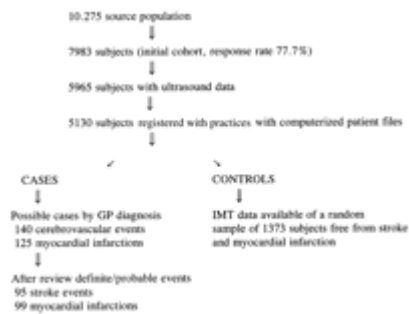
### **Selection of Case Subjects and Sampling of Control Subjects**

Ultrasonography of the carotid arteries was performed in 5965 of the 7983 subjects. In particular, for subjects who had their baseline Rotterdam Study examination at the end of 1992 or in 1993, ultrasonography could not always be performed due to the restricted availability of ultrasonographers. For reasons of availability and completeness of information on cardiovascular events, we restricted the present study to follow-up events registered by GPs who had computerized follow-up procedures (coverage of nearly 85% of the cohort). This resulted in a cohort of 5130 subjects from which the case and control subjects were drawn. The mean duration of follow-up was 2.7 years. Participants who were registered with GPs who had a computerized follow-up procedure were on average 5 years older than those associated with GPs without computerized follow-up procedures. Sex, systolic and diastolic blood pressures, total and HDL cholesterol levels, presence of diabetes mellitus, and history of angina pectoris, stroke, or myocardial infarction did not differ significantly between the two groups.

A total of 140 subjects with an incident cerebrovascular accident and 125 subjects with myocardial infarction were reported by the GPs. After review of all available information, 103 strokes were considered to be definite or probable strokes, whereas 101 myocardial infarctions were found to be definite or probable events. For these subjects only, intima-media thickness was quantified from the stored images. Data on intima-media thickness could be obtained from the stored images on videotape of 99 subjects with a myocardial infarction and 95 subjects with a stroke (71 definite and 24 probable strokes).

At the time of the present analysis, intima-media thickness had been quantified for a random sample of 1715 of the 5965 subjects who underwent a carotid ultrasonography. Several cross-sectional analyses from the Rotterdam Study based on these data have been reported.<sup>11 23 28</sup> The measurement of intima-media thickness from stored images is an ongoing process. Control subjects were drawn from this random sample of 1715 subjects. A subject was eligible as a control if (1) he/she was registered with a GP with computerized patient files, (2) he/she remained free from myocardial infarction or stroke during follow-up, and (3) images of common

carotid intima-media thickness were available on videotape for the subject. The total number of control subjects was 1373 (Fig 2+).



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**Figure 2.** Schematic presentation of the selection of case and control subjects. GP indicates general practitioner; IMT, intima-media thickness.

## Data Analysis

Linear regression analysis was applied to evaluate the association between common carotid intima-media and potentially confounding cardiovascular risk indicators such as age, sex, body mass index, smoking, systolic and diastolic blood pressures, hypertension, total and HDL cholesterol levels, diabetes mellitus, and previous history of stroke and myocardial infarction. The association between common carotid intima-media thickness and incident myocardial infarction and stroke was evaluated by use of a logistic regression model. Analyses were performed with common carotid intima-media thickness used as a continuous variable (per SD) and as a categorized variable (based on quintile cutoff points of the distribution). Because the number of events in the lowest quintile was too limited, the lowest two categories were combined and used as a reference category. Whether the association differed with age or sex was evaluated by entering interaction terms into the model. The interaction terms did not reach statistical significance in the analyses for either myocardial infarction or stroke (probability values ranged from .17 to .76). Separate analyses were performed excluding subjects with a history of myocardial infarction or stroke. When not specified, all presented associations are adjusted for age and sex with corresponding 95% CIs.



## Results



Table 1 describes general characteristics of the study subjects. Significant positive associations with common carotid intima-media thickness were found for age, male sex, body mass index, systolic blood pressure, hypertension, total cholesterol, diabetes mellitus, and a previous history of myocardial infarction or stroke. A significant inverse association was found for HDL cholesterol. The association with smoking was positive but did not reach the level of statistical significance ( $P=.09$ ).

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**View this table:** **Table 1.** Baseline Characteristics of the Study Population  
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The risk of stroke increased gradually with increasing common carotid intima-media thickness. The odds ratio for stroke per SD increase (0.163 mm) was 1.41 (95% CI, 1.25 to 1.82). In men, the odds ratio per SD increase (0.172 mm) was 1.81 (95% CI, 1.30 to 2.51) and in women, an odds ratio of 1.33 (95% CI, 1.03 to 1.71) per 0.155-mm SD increase was observed. When subjects with a previous history of myocardial infarction or stroke were excluded, the odds ratios were 1.57 (1.27 to 1.94) for all subjects, 1.89 (95% CI, 1.29 to 2.77) for men, and 1.37 (95% CI, 1.02 to 1.83) for women. When differences in risk factors were allowed for, the associations were attenuated: 1.34 (95% CI, 1.08 to 1.67), 1.47 (1.08 to 2.02), and 1.14 (0.85 to 1.54), respectively. The associations with stroke in categories of common carotid intima-media thickness are presented in detail in Table 2.

**View this table:** **Table 2.** Association [Odds Ratio (95% CI)] of Intima-Media Thickness With Myocardial Infarction and Stroke<sup>1</sup>  
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The risk of myocardial infarction increased 43% per SD increase in common carotid intima-media thickness (odds ratio, 1.43; 95% CI, 1.16 to 1.78). Exclusion of subjects with a history of myocardial infarction and stroke revealed an odds ratio of 1.51 (95% CI, 1.18 to 1.78). The associations for first incident event were similar for men and women: 1.56 (95% CI, 1.12 to 2.18) and 1.44 (95% CI, 1.00 to 2.08), respectively. Additional adjustment for cardiovascular risk factors attenuated the magnitude of the associations and their statistical significance. Odds ratios were 1.25 (95% CI, 0.98 to 1.58) for all subjects, 1.25 (95% CI, 0.91 to 1.72) for men, and 1.26

(95% CI, 0.89 to 1.79) for women. The association between intima-media thickness and risk of myocardial infarction did not show a clearly linear pattern (Table 2  $\clubsuit$ ). The risk was particularly increased in subjects with an intima-media thickness in the upper quintile of the distribution (0.908 mm) relative to the risk in the reference category (0.75 mm); the odds ratio for first myocardial infarction was 2.32 (95% CI, 1.17 to 4.64).

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## ► Discussion

The findings in the present study indicate that an increased common carotid intima-media thickness is associated with future cerebrovascular and cardiovascular events in older subjects. These associations were independent of age, sex, and history of myocardial infarction or stroke. As expected, additional adjustment for cardiovascular risk factors attenuated the associations. It is important to realize that these levels of common carotid intima-media thickness do not reflect the presence of arterial stenosis in the common carotid artery and that arterial blood flow in the common carotid artery in these subjects is virtually normal.

Several aspects of the present study need to be addressed. Several biases that might affect the validity of the findings in our nested case-control study were excluded. First, exposure was measured without knowledge of the case-control status of the participant. Second, the outcome events were based to a large extent on documented medical information, which limits the extent of misclassification of the diagnosis. However, if such misclassifications are still present, the observed associations most likely represent an underestimation of the true associations because misclassification is likely to be nondifferential. Similarly, inclusion of subjects with silent myocardial infarctions or silent strokes in the control group might lead to attenuation of the associations with intima-media thickness. Third, validation studies in which ultrasonographically measured intima-media thickness was compared with histologically determined intima-media thickness showed that ultrasound is capable of accurately measuring intima-media thickness.<sup>21 29</sup> Whether increased common carotid intima-media thickness itself reflects local atherosclerosis is still a subject of debate. It may merely reflect an adaptive response of the vessel wall to changes in shear stress, tensile stress, and blood flow and subsequent changes in lumen diameter, as has been suggested in particular for intima-media thickness  $<90 \mu\text{m}$ .<sup>30</sup> Atherosclerosis is a disorder of the intima, and ultrasound imaging cannot discriminate between the intimal and medial layers of the vessel wall.<sup>31</sup> The question is whether it matters very much if common carotid intima-media thickness does not represent local atherosclerosis.<sup>13</sup> Several cross-sectional studies have

shown that increased common carotid intima-media thickness may be of use as a marker of atherosclerosis elsewhere in the arterial system,<sup>10 11 12</sup> and the present findings show that an increased common carotid intima-media thickness confers an increased risk of cerebrovascular and cardiovascular diseases.

The present analyses have been restricted to common carotid intima-media thickness measurements. This is because recording on videotape and quantification of intima-media thickness of the carotid bifurcation and internal carotid artery in the Rotterdam Study started at a later stage. Ultrasound images including intima-media thickness of the carotid bifurcation and internal carotid artery have been stored only after approximately the first 1500 subjects were enrolled in the study. Thus, the question of whether the results differ by arterial segment cannot be answered with the present analyses.

Unfavorable levels of cardiovascular risk factors have been associated with increased common carotid intima-media thickness and with stroke and myocardial infarction. In the present analyses, adjustment for cardiovascular risk factors reduced the magnitude of the associations between common carotid intima-media thickness and incident stroke and myocardial infarction. This may be expected because common carotid intima-media thickness, as an indicator of atherosclerosis, may be considered an intermediate factor in the causal pathway leading to stroke or myocardial infarction. In a strict sense, these risk factors should therefore not be considered as confounding variables of the association and in principle should not be controlled for in the analyses. However, when the main interest is to assess whether common carotid intima-media thickness predicts stroke and myocardial infarction independently of these risk factors, one may want to additionally adjust for these factors.

Data to show that common carotid intima-media thickness relates to future cerebrovascular and cardiovascular events are limited. Salonen and Salonen,<sup>17</sup> in the one available study to date performed in a random sample (n=1257) of middle-aged Finnish men, reported that an increase of 0.1 mm in maximum common carotid intima-media thickness was associated with an 11% (95% CI, 6% to 16%) increase in the risk of myocardial infarction. Our results are in line with the Finnish findings, although direct quantitative comparison of the findings between studies is not possible due to differences in presentation of exposure measures. A recent report from Kuller and coworkers<sup>32</sup> showed a considerably increased risk of cardiovascular morbidity and mortality for subjects with subclinical disease compared with subjects with no signs of subclinical disease. Subclinical disease was defined by a combination of ankle-brachial blood pressure, carotid artery stenosis, carotid wall thicknesses, ECG and echocardiography abnormalities, and the Rose questionnaire. These results are in accordance with our finding that among subjects free from symptomatic cerebrovascular and cardiovascular diseases, an increased intima-media thickness is associated with incident stroke and myocardial infarction.

We found a graded association of common carotid intima-media thickness with stroke but not with myocardial infarction. No clear explanation for this apparent difference can be given. The differences between heart and brain might influence the presence and extent of atherosclerotic lesions that give rise to symptoms. Symptomatic myocardial infarction may generally be caused by advanced large-vessel atherosclerosis. Atherosclerotic abnormalities in small coronary arteries may not lead to typical symptoms and may therefore remain undetected. Stroke, however, may be

due to large-vessel atherosclerosis, but atherosclerotic changes in small cerebral arteries (for example, due to elevated blood pressure) may also lead to symptoms suggestive of a stroke. This notion remains speculative, however, and needs to be confirmed in future studies.

The noninvasive assessment of common carotid intima-media thickness appears to provide a promising method to study atherosclerosis directly, at the level of the vessel, in populations at large. Intervention studies on the efficacy of lipid-lowering regimens in reducing progression of atherosclerosis have further shown the feasibility of application of these measurements in trials. The use of carotid intima-media thickness measurements as an indicator of generalized atherosclerosis is conditioned on the view that its measurement reflects cardiovascular disease risk. The present study lends support to this view and provides supportive evidence for the use of intima-media thickness measurements as an intermediate or proxy end point in observational and intervention studies as an alternative to the use of cardiovascular disease or death as an end point. At present, the clinical and therapeutic relevance of an increased carotid intima-media thickness measurement in an individual may be limited for that individual. However, observational studies and trials on the efficacy of certain treatment regimens using intima-media thickness as a primary outcome measure may yield important results that may have major implications for clinical practice.

In conclusion, the present study, based on a short follow-up period, shows that an increased common carotid intima-media thickness relates to future cardiovascular and cerebrovascular events. This study provides supportive evidence for the use of intima-media thickness measurements as an intermediate or proxy end point in observational studies and trials.

## **Acknowledgments**

The Rotterdam Study is supported in part by the NESTOR program for geriatric research in The Netherlands (Ministry of Health and Ministry of Education), the Municipality of Rotterdam, the Netherlands Heart Foundation, the Netherlands Organization for Scientific Research (NWO), and the Rotterdam Medical Research Foundation (ROMERES). The contribution to the data collection by the field workers, ultrasound technicians, computer assistants, and laboratory technicians is gratefully acknowledged. We are indebted to the general practitioners of the Ommoord area (M. Bikker, F.M. Braams, A.J. Bras, M.T. Breijer, M.D. Derksen, C.J. Esser, C.P. Gerretsen, C.M.A. Grimbergen, J.A. Ham, J. Heeringa, J.W.H.A.M. Hopmans, G.M. Foppe, F. Keizer, J.T. Mooij, P. van der Rijst, A.T. van der Schoot-van Venrooy, W.T. Smid, and H. Vervat) for providing information on incident cardiovascular and cerebrovascular diseases.

Received January 6, 1997; revision received March 26, 1997; accepted April 8, 1997.

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## ▶ **References**


1. Heiss G, Sharett AR, Barnes R, Chambless LE, Szklo M, Alzola C, and the ARIC Investigators. Carotid atherosclerosis measured by B-mode ultrasound in populations: associations with cardiovascular risk factors in the ARIC study. *Am J Epidemiol.* 1991;134:250-256.[\[Abstract/Free Full Text\]](#)
  
2. Wendelhag I, Olov G, Wikstrand J. Arterial wall thickness in familial hypercholesterolemia: ultrasound measurement of intima-media thickness in the common carotid artery. *Arterioscler Thromb.* 1992;12:70-77.[\[Abstract/Free Full Text\]](#)
  
3. Salonen R, Salonen JT. Determinants of carotid intima-media thickness: a population-based ultrasonography study in eastern Finnish men. *J Intern Med.* 1991;229:225-231.[\[Medline\]](#) [\[Order article via Infotrieve\]](#)
  
4. Bots ML, Hofman A, de Bruyn AM, de Jong PTVM, Grobbee DE. Isolated systolic hypertension and vessel wall thickness of the carotid artery: the Rotterdam Study. *Arterioscler Thromb.* 1993;13:64-69.[\[Abstract/Free Full Text\]](#)
  
5. Psaty BM, Furberg CD, Kuller LH, Borhani NO, Rautaharju PM, O'Leary DH. Isolated systolic hypertension and subclinical cardiovascular disease in the elderly: initial findings from the Cardiovascular Health Study. *JAMA.* 1992;268:1287-1291.[\[Abstract/Free Full Text\]](#)
  
6. Bonithon-Kopp C, Scarabin P, Taquet A, Touboul P, Malmejac A, Guize L. Risk factors for early carotid atherosclerosis in middle-aged French women. *Arterioscler Thromb.* 1991;11:966-972.[\[Abstract/Free Full Text\]](#)
  
7. O'Leary DH, Polak JF, Wolfson SK, Bond MG, Bommer W, Sheth S, Psaty BM, Sharett AR, Manolio TA, on behalf of the CHS Collaborative Group. Use of sonography to evaluate carotid atherosclerosis in the elderly: the Cardiovascular Health Study. *Stroke.* 1991;22:1155-1163.[\[Abstract/Free Full Text\]](#)
  
8. Bots ML, Hofman A, Grobbee DE. Common carotid intima-media thickness and cardiovascular disease in the Rotterdam Study: a cross-sectional analysis. In: Koenig W, Hombach V, Bond MG, Krams DM, eds. *Progression and Regression of Atherosclerosis.* Vienna, Austria: Blackwell Scientific Publishers; 1995:118-123.

9. Burke GL, Evans GW, Riley WA, Sharrett AR, Howard G, Barnes RW, Rosamond W, Crow RS, Rautaharju PM, Heiss G, for the ARIC Study Group. Arterial wall thickness is associated with prevalent cardiovascular disease in middle-aged adults: the Atherosclerosis Risk in Communities (ARIC) study. *Stroke*. 1995;26:386-391. [[Abstract/Free Full Text](#)]
10. Bots ML, Witteman JCM, Grobbee DE. Carotid intima-media wall thickness in elderly women with and without atherosclerosis of the abdominal aorta. *Atherosclerosis*. 1993;102:99-105. [[Medline](#)] [[Order article via Infotrieve](#)]
11. Bots ML, Hofman A, Grobbee DE. Common carotid intima-media thickness and lower extremity arterial atherosclerosis: the Rotterdam Study. *Arterioscler Thromb*. 1994;14:1885-1891. [[Abstract/Free Full Text](#)]
12. Polak JF, O'Leary DH, Kronmal RA, Wolfson SK, Bond MG, Tracy RP, Gardin JM, Kittner SJ, Price TR, Savage PJ. Sonographic evaluation of the carotid artery atherosclerosis in the elderly: relationship of disease severity to stroke and transient ischemic attack. *Radiology*. 1993;188:363-370. [[Abstract/Free Full Text](#)]
13. Grobbee DE, Bots ML. Carotid intima-media thickness as an indicator of generalized atherosclerosis. *J Intern Med*. 1994;236:567-573. [[Medline](#)] [[Order article via Infotrieve](#)]
14. Blankenhorn D, Selzer RH, Crawford DW, Barth JD, Liu C, Liu C, Mack WJ, Alaupovic P. Beneficial effects of colestipol-niacin therapy on the common carotid artery: two- and four-year reduction of intima-media thickness measured by ultrasound. *Circulation*. 1993;88:20-28. [[Abstract/Free Full Text](#)]
15. Furberg CD, Adams HP, Applegate WB, Byington RP, Espeland MA, Hartwell T, Hunningshake DB, Lefkowitz DS, Probstfield J, Riley WA, Young B. Effect of lovastatin on early carotid atherosclerosis and cardiovascular events. *Circulation*. 1994;90:1679-1687. [[Abstract/Free Full Text](#)]
16. Crouse JR III, Byington RP, Bond MG, Espeland MA, Craven TE, Sprinkle JW, McGovern ME, Furberg CD. Pravastatin, lipids, and atherosclerosis in the carotid arteries (PLAC-II). *Am J Cardiol*. 1995;75:455-459. [[Medline](#)] [[Order article via Infotrieve](#)]
17. Salonen JT, Salonen R. Ultrasound B-mode imaging in observational studies of atherosclerotic progression. *Circulation*. 1993;87(suppl II):II-56-II-65.
18. Salonen JT, Salonen R. Ultrasonographically assessed carotid morphology and the risk of coronary heart disease. *Arterioscler Thromb*. 1991;11:1245-1249. [[Abstract/Free Full Text](#)]
19. Hofman A, Grobbee DE, de Jong PTVM, VandenOuweland FA. Determinants of disease and disability in the elderly: the Rotterdam Elderly Study. *Eur J Epidemiol*. 1991;7:403-422. [[Medline](#)] [[Order article via Infotrieve](#)]

20. Bots ML, van Meurs JCHM, Grobbee DE. Assessment of early atherosclerosis: a new perspective. *J Drug Res.* 1991;16:150-154.
21. Wendelhag I, Gustavsson T, Suurkula M, Berglund G, Wikstrand J. Ultrasound measurement of wall thickness in the carotid artery: fundamental principles, and description of a computerized analyzing system. *Clin Physiol.* 1991;11:565-577. [[Medline](#)] [[Order article via Infotrieve](#)]
22. Bots ML, Mulder PGH, Hofman A, van Es GA, Grobbee DE. Reproducibility of carotid vessel wall thickness measurements: the Rotterdam Study. *J Clin Epidemiol.* 1994;47:921-930. [[Medline](#)] [[Order article via Infotrieve](#)]
23. Bots ML, Hofman A, de Jong PTVM, Grobbee DE. Common carotid intima-media thickness as an indicator of atherosclerosis at other sites of the carotid artery: the Rotterdam Study. *Ann Epidemiol.* 1996;6:147-153. [[Medline](#)] [[Order article via Infotrieve](#)]
24. van der Bom JG, Bots ML, de Bruijn AM, Hofman A, Grobbee DE. Measurement of beta-thromboglobulin in the elderly: findings from the Rotterdam Study. *Fibrinolysis.* 1994;8(suppl 2):157-159.
25. Vangent CM, Vandervoort HA, de Bruyn AM, Klein F. Cholesterol determinations: a comparative study of methods with special reference to enzymatic procedures. *Clin Chem Acta.* 1977;75:243-251. [[Medline](#)] [[Order article via Infotrieve](#)]
26. Lamberts H, Wood M, Hofmans-Okkes I. *The International Classification of Primary Care in the European Community.* London, UK: Oxford University Press; 1991.
27. Bots ML, Looman SJ, Koudstaal PJ, Hofman A, Hoes AW, Grobbee DE. Prevalence of stroke in the general population: the Rotterdam study. *Stroke.* 1996;27:1499-1501. [[Abstract/Free Full Text](#)]
28. Bots ML, Witteman JCM, Hofman A, de Jong PTVM, Grobbee DE. Low diastolic blood pressure and atherosclerosis in the elderly: the Rotterdam Study. *Arch Intern Med.* 1996;156:843-848. [[Abstract/Free Full Text](#)]
29. Wong M, Edelstein J, Wollman J, Bond MG. Ultrasonic-pathological comparison of the human arterial wall: verification of intima-media thickness. *Arterioscler Thromb.* 1993;13:482-486. [[Abstract/Free Full Text](#)]
30. Glagov S, Zarins C, Giddens DP, Ku DN. Hemodynamics and atherosclerosis: insights and perspectives gained from studies of human arteries. *Arch Pathol Lab Med.* 1988;112:1018-1031. [[Medline](#)] [[Order article via Infotrieve](#)]
31. Sary HC, Blankenhorn DH, Chandler B, Glagov S, Insull W, Richardson M, Rosenfeld ME, Schaffer SA, Schwartz CJ, Wagner WD, Wissler RG. A definition of the intima of human arteries and of its atherosclerosis-prone regions. *Arterioscler Thromb.* 1992;12:120-134. [[Free Full Text](#)]

32. Kuller LH, Shemanski L, Psaty BM, Borhani NO, Gardin J, Haan MN, O'Leary DH, Savage PJ, Tell GS, Tracy R. Subclinical disease as an independent risk factor for cardiovascular disease. *Circulation*. 1995;92:720-726. [[Abstract](#)/[Free Full Text](#)]

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**The TRIB3 R84 variant is associated with increased carotid intima-media thickness in vivo and with enhanced MAPK signalling in human endothelial cells**

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### **2010 ACCF/AHA Guideline for Assessment of Cardiovascular Risk in Asymptomatic Adults: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines**

Circulation, December 21, 2010; 122(25): e584 - e636.

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### **2010 ACCF/AHA Guideline for Assessment of Cardiovascular Risk in Asymptomatic Adults: A Report of the American College of Cardiology Foundation/American Heart Association Task Force on Practice Guidelines Developed in Collaboration With the American Society of Echocardiography, American Society of Nuclear Cardiology, Society of Atherosclerosis Imaging and Prevention, Society for Cardiovascular Angiography and Interventions, Society of Cardiovascular Computed Tomography, and Society for Cardiovascular Magnetic Resonance**

J. Am. Coll. Cardiol., December 14, 2010; 56(25): e50 - e103.

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### **Associations of Carotid Artery Intima-Media Thickness (IMT) With Risk Factors and Prevalent Cardiovascular Disease: Comparison of Mean Common Carotid Artery IMT With Maximum Internal Carotid Artery IMT**

J. Ultrasound Med., December 1, 2010; 29(12): 1759 - 1768.

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## Arteriosclerosis, Thrombosis, and Vascular Biology

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### **Coronary Artery Disease-Related Genetic Variant on Chromosome 10q11 Is Associated With Carotid Intima-Media Thickness and Atherosclerosis**

Arterioscler Thromb Vasc Biol, December 1, 2010; 30(12): 2678 - 2683.

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## Europace

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Europace, December 1, 2010; 12(12): 1774 - 1777.

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## Radiology

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**Carotid Artery Hemodynamics: Observing Patient-specific Changes with Amlodipine and Lisinopril by Using MR Imaging Computation Fluid Dynamics**

Radiology, December 1, 2010; 257(3): 662 - 669.

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## Angiology

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**Slightly Elevated High-Sensitivity C-Reactive Protein (hsCRP) Concentrations Are Associated With Carotid Atherosclerosis in Women With Varying Degrees of Glucose Tolerance**

Angiology, November 1, 2010; 61(8): 793 - 801.

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## THE JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM

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**Low-Grade Albuminuria Is Associated with Carotid Intima-Media Thickness in Chinese Type 2 Diabetic Patients**

J. Clin. Endocrinol. Metab., November 1, 2010; 95(11): 5122 - 5128.

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## Clinical Journal of the American Society of Nephrology

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### **A Randomized, Double-Blind, Placebo-Controlled Trial of Spironolactone on Carotid Intima-Media Thickness in Nondiabetic Hemodialysis Patients**

Clin. J. Am. Soc. Nephrol., August 1, 2010; 5(8): 1380 - 1387.

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## Stroke

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D. D. Adraktas, N. Brasic, A. D. Furtado, S.-C. Cheng, K. Ordovas, K. Chun, J. D. Chien, S. Schaeffer, and M. Wintermark

### **Carotid Atherosclerosis Does Not Predict Coronary, Vertebral, or Aortic Atherosclerosis in Patients With Acute Stroke Symptoms**

Stroke, August 1, 2010; 41(8): 1604 - 1609.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Hypertension

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Hypertension, August 1, 2010; 56(2): 240 - 246.

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## European Heart Journal

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D. H. O'Leary and M. L. Bots

### **Imaging of atherosclerosis: carotid intima-media thickness**

Eur. Heart J., July 2, 2010; 31(14): 1682 - 1689.

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### **Serum glucose and insulin are associated with QTc and RR intervals in nondiabetic elderly**

Eur. J. Endocrinol., February 1, 2010; 162(2): 241 - 248.

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Arterioscler Thromb Vasc Biol, February 1, 2010; 30(2): 182 - 185.  
[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Stroke

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### **Segment-Specific Associations of Carotid Intima-Media Thickness With Cardiovascular Risk Factors: The Coronary Artery Risk Development in Young Adults (CARDIA) Study**

Stroke, January 1, 2010; 41(1): 9 - 15.

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## Angiology

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### **Carotid Intima-Media Thickness in Asymptomatic Patients With Arterial Hypertension Without Clinical Cardiovascular Disease: Relation With Left Ventricular Geometry and Mass and Coexisting Risk Factors**

Angiology, December 1, 2009; 60(6): 705 - 713.

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Y. Plantinga, S. Dogan, D. E. Grobbee, and M. L. Bots

### **Carotid intima-media thickness measurement in cardiovascular screening programmes**

European Journal of Cardiovascular Prevention & Rehabilitation, December 1, 2009; 16(6): 639 - 644.

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Nephrol. Dial. Transplant., November 1, 2009; 24(11): 3474 - 3480.

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M. Eijgelsheim, C. Newton-Cheh, A. L. H. J. Aarnoudse, C. van Noord, J. C. M. Witteman, A. Hofman, A. G. Uitterlinden, and B. H. C. Stricker

### **Genetic variation in NOS1AP is associated with sudden cardiac death: evidence from the Rotterdam Study**

Hum. Mol. Genet., November 1, 2009; 18(21): 4213 - 4218.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Diabetes Care

► HOME

S. A. Kassem and I. Raz

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Diabetes Care, November 1, 2009; 32(suppl\_2): S337 - S341.

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## BMJ

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BMJ, October 27, 2009; 339(oct27\_4): b4170 - b4170.

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## Annals of Internal Medicine

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Ann Intern Med, October 6, 2009; 151(7): 496 - 507.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## European Journal of Endocrinology

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E Carmina, E Guastella, R A Longo, G B Rini, and R A Lobo

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Eur. J. Endocrinol., October 1, 2009; 161(4): 583 - 589.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Stroke

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M. O. Whipple, T. T. Lewis, K. Sutton-Tyrrell, K. A. Matthews, E. Barinas-Mitchell, L. H. Powell, and S. A. Everson-Rose

### **Hopelessness, Depressive Symptoms, and Carotid Atherosclerosis in Women: The Study of Women's Health Across the Nation (SWAN) Heart Study**

Stroke, October 1, 2009; 40(10): 3166 - 3172.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



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### **Baseline Values but Not Treatment-Induced Changes in Carotid Intima-Media Thickness Predict Incident Cardiovascular Events in Treated Hypertensive Patients: Findings in the European Lacidipine Study on Atherosclerosis (ELSA)**

Circulation, September 22, 2009; 120(12): 1084 - 1090.

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## Cardiovascular Research

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Cardiovasc Res, September 1, 2009; 83(4): 617 - 625.

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## Vascular Medicine

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M. Griffin, A. Nicolaides, T. Tyllis, N. Georgiou, R. M Martin, D. Bond, A. Panayiotou, C. Tziakouri, C. J Dore, and C. Fessas

### **Carotid and femoral arterial wall changes and the prevalence of clinical cardiovascular disease**

Vascular Medicine, August 1, 2009; 14(3): 227 - 232.

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## Journal of Infectious Diseases

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M. G. A. van Vonderen, E. A. M. Hassink, M. A. van Agtmael, C. D. A. Stehouwer, S. A. Danner, P. Reiss, and Y. Smulders

### **Increase in Carotid Artery Intima-Media Thickness and Arterial Stiffness but Improvement in Several Markers of Endothelial Function after Initiation of Antiretroviral Therapy**

The Journal of Infectious Disease, April 15, 2009; 199(8): 1186 - 1194.

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## Mayo Clinic Proceedings

▶ HOME

A. Adolphe, L. S. Cook, and X. Huang

### **A Cross-sectional Study of Intima-Media Thickness, Ethnicity, Metabolic Syndrome, and Cardiovascular Risk in 2268 Study Participants**

Mayo Clin. Proc., March 1, 2009; 84(3): 221 - 228.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Circulation

► HOME

J. Steinberger, S. R. Daniels, R. H. Eckel, L. Hayman, R. H. Lustig, B. McCrindle, and M. L. Mietus-Snyder

### **Progress and Challenges in Metabolic Syndrome in Children and Adolescents: A Scientific Statement From the American Heart Association Atherosclerosis, Hypertension, and Obesity in the Young Committee of the Council on Cardiovascular Disease in the Young; Council on Cardiovascular Nursing; and Council on Nutrition, Physical Activity, and Metabolism**

Circulation, February 3, 2009; 119(4): 628 - 647.

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## Stroke

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J. Rodes-Cabau, M. Noel, A. Marrero, D. Rivest, A. Mackey, C. Houde, E. Bedard, E. Larose, S. Verreault, M. Peticlerc, *et al.*

### **Atherosclerotic Burden Findings in Young Cryptogenic Stroke Patients With and Without a Patent Foramen Ovale**

Stroke, February 1, 2009; 40(2): 419 - 425.

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## Peritoneal Dialysis International

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N. Prasad, S. Kumar, A. Singh, A. Sinha, K. Chawla, A. Gupta, R.K. Sharma, N. Sinha, and A. Kapoor

### **CAROTID INTIMAL THICKNESS AND FLOW-MEDIATED DILATATION IN DIABETIC AND NONDIABETIC CONTINUOUS AMBULATORY PERITONEAL DIALYSIS PATIENTS**

Perit. Dial. Int., February 1, 2009; 29(Supplement\_2): S96 - S101.

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S. Debette, N. Leone, D. Courbon, J. Gariépy, C. Tzourio, J.-F. Dartigues, K. Ritchie, A. Alperovitch, P. Ducimetiere, P. Amouyel, *et al.*

### **Calf Circumference Is Inversely Associated With Carotid Plaques**

Stroke, November 1, 2008; 39(11): 2958 - 2965.

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### **Review: Stroke in type 2 diabetes**

The British Journal of Diabetes & Vascular Disease, September 1, 2008; 8(5): 222 - 229.

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## Arteriosclerosis, Thrombosis, and Vascular Biology

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N. J. Samani, O. T. Raitakari, K. Sipila, M. D. Tobin, H. Schunkert, M. Juonala, P. S. Braund, J. Erdmann, J. Viikari, L. Moilanen, *et al.*

### **Coronary Artery Disease-Associated Locus on Chromosome 9p21 and Early Markers of Atherosclerosis**

Arterioscler Thromb Vasc Biol, September 1, 2008; 28(9): 1679 - 1683.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Stroke

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P. Prati, A. Tosetto, D. Vanuzzo, G. Bader, M. Casaroli, L. Canciani, S. Castellani, and P.-J. Touboul

### **Carotid Intima Media Thickness and Plaques Can Predict the Occurrence of Ischemic Cerebrovascular Events**

Stroke, September 1, 2008; 39(9): 2470 - 2476.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Nephrology Dialysis Transplantation

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M. Chonchol, H. Gnahn, and D. Sander

### **Impact of subclinical carotid atherosclerosis on incident chronic kidney disease in the elderly**

Nephrol. Dial. Transplant., August 1, 2008; 23(8): 2593 - 2598.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Angiology

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M. Genoud, V. Wietlisbach, F. Feihl, A. Mermod, D. Morin, R. Darioli, P. Nicod, V. Mooser, B. Waeber, D. Hayoz, *et al.*

### **Surrogate Markers for Atherosclerosis in Overweight Subjects With Atherogenic Dyslipidemia: The GEMS Project**

Angiology, August 1, 2008; 59(4): 484 - 492.

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## Journal of Endocrinology

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C. van Noord, W. M van der Deure, M. C J M Sturkenboom, S. M J M Straus, A. Hofman, T. J Visser, J. A Kors, J. C M Witteman, and B. H C. Stricker

### **High free thyroxine levels are associated with QTc prolongation in males**

J. Endocrinol., July 1, 2008; 198(1): 253 - 260.

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J. Aittokallio, O. Polo, J. Hiissa, A. Virkki, J. Toikka, O. Raitakari, T. Saaresranta, and T. Aittokallio

### **Overnight variability in transcutaneous carbon dioxide predicts vascular impairment in women**

Exp Physiol, July 1, 2008; 93(7): 880 - 891.

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## Arteriosclerosis, Thrombosis, and Vascular Biology

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C. J. O'Donnell, S. Demissie, M. Kimura, D. Levy, J. P. Gardner, C. White, R. B. D'Agostino, P. A. Wolf, J. Polak, L. A. Cupples, *et al.*

### **Leukocyte Telomere Length and Carotid Artery Intimal Medial Thickness: The Framingham Heart Study**

Arterioscler Thromb Vasc Biol, June 1, 2008; 28(6): 1165 - 1171.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Nephrology Dialysis Transplantation

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B. Dursun, E. Dursun, G. Suleymanlar, B. Ozben, I. Capraz, A. Apaydin, and T. Ozben

### **Carotid artery intima-media thickness correlates with oxidative stress in chronic haemodialysis patients with accelerated atherosclerosis**

Nephrol. Dial. Transplant., May 1, 2008; 23(5): 1697 - 1703.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## American Journal of EPIDEMIOLOGY

► HOME

M. A. Allison, M. J. Budoff, N. D. Wong, R. S. Blumenthal, P. J. Schreiner, and M. H. Criqui

### **Prevalence of and Risk Factors for Subclinical Cardiovascular Disease in Selected US Hispanic Ethnic Groups: The Multi-Ethnic Study of Atherosclerosis**

Am. J. Epidemiol., April 15, 2008; 167(8): 962 - 969.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## European Heart Journal

► HOME

J. J.P. Kastelein and E. de Groot

### **Ultrasound imaging techniques for the evaluation of cardiovascular therapies**

Eur. Heart J., April 1, 2008; 29(7): 849 - 858.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## THE JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM

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R. M. Martin, D. Gunnell, E. Whitley, A. Nicolaidis, M. Griffin, N. Georgiou, G. Davey Smith, S. Ebrahim, and J. M. P. Holly

### **Associations of Insulin-Like Growth Factor (IGF)-I, IGF-II, IGF Binding Protein (IGFBP)-2 and IGFBP-3 with Ultrasound Measures of Atherosclerosis and Plaque Stability in an Older Adult Population**

J. Clin. Endocrinol. Metab., April 1, 2008; 93(4): 1331 - 1338.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Stroke

▶ HOME

H. Sourij, I. Schmoelzer, P. Dittrich, B. Paulweber, B. Iglseider, and T. C. Wascher

### **Insulin Resistance as a Risk Factor for Carotid Atherosclerosis: A Comparison of the Homeostasis Model Assessment and the Short Insulin Tolerance Test**

Stroke, April 1, 2008; 39(4): 1349 - 1351.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Hypertension

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A. L. Berends, C. J.M. de Groot, E. J. Sijbrands, M. P.S. Sie, S. H. Benneheij, R. Pal, R. Heydanus, B. A. Oostra, C. M. van Duijn, and E. A.P. Steegers

### **Shared Constitutional Risks for Maternal Vascular-Related Pregnancy Complications and Future Cardiovascular Disease**

Hypertension, April 1, 2008; 51(4): 1034 - 1041.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Lupus

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R. Telles, C. Lanna, G. Ferreira, A. Souza, T. Navarro, and A. Ribeiro

### **Carotid atherosclerotic alterations in systemic lupus erythematosus patients treated at a Brazilian university setting**

Lupus, February 1, 2008; 17(2): 105 - 113.

[\[Abstract\]](#) [\[PDF\]](#)



## JAMA

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M. J. Bos, M. J. E. van Rijn, J. C. M. Witteman, A. Hofman, P. J. Koudstaal, and M. M. B. Breteler

### **Incidence and Prognosis of Transient Neurological Attacks**

JAMA, December 26, 2007; 298(24): 2877 - 2885.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Stroke

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S. Sabeti, O. Schlager, M. Exner, W. Mlekusch, J. Amighi, P. Dick, G. Maurer, K. Huber, R. Koppensteiner, O. Wagner, *et al.*

### **Progression of Carotid Stenosis Detected by Duplex Ultrasonography Predicts Adverse Outcomes in Cardiovascular High-Risk Patients**

Stroke, November 1, 2007; 38(11): 2887 - 2894.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Stroke

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S. H. Johnsen, E. B. Mathiesen, O. Joakimsen, E. Stensland, T. Wilsgaard, M.-L. Lochen, I. Njolstad, and E. Arnesen

### **Carotid Atherosclerosis Is a Stronger Predictor of Myocardial Infarction in Women Than in Men: A 6-Year Follow-Up Study of 6226 Persons: The Tromso Study**

Stroke, November 1, 2007; 38(11): 2873 - 2880.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## JOURNAL OF NEUROLOGY, NEUROSURGERY, AND PSYCHIATRY

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M J E van Rijn, M J Bos, A Isaacs, M Yazdanpanah, A Arias-Vasquez, B H C. Stricker, O H Klungel, B A Oostra, P J Koudstaal, J C Witteman, *et al.*

### **Polymorphisms of the renin angiotensin system are associated with blood pressure, atherosclerosis and cerebral white matter pathology**

J. Neurol. Neurosurg. Psychiatry, October 1, 2007; 78(10): 1083 - 1087.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Diabetes Care

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R. R. Rodriguez, R. A. Gomez-Diaz, J. T. Haj, F. J. A. Garnica, E. R. Soriano, E. N. Meguro, C. A. Aguilar-Salinas, and N. H. Wacher

### **Carotid Intima-Media Thickness in Pediatric Type 1 Diabetic Patients**

Diabetes Care, October 1, 2007; 30(10): 2599 - 2602.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



▶ HOME

### **Chapter 1: Introduction**

European Journal of Cardiovascular Prevention & Rehabilitation, September 1, 2007; 14(2\_suppl): S2 - S113.

[\[Full Text\]](#) [\[PDF\]](#)



## Stroke

► HOME

M. J. Bos, P. J. Koudstaal, A. Hofman, J. C.M. Witteman, and M. M.B. Breteler

### **Transcranial Doppler Hemodynamic Parameters and Risk of Stroke: The Rotterdam Study**

Stroke, September 1, 2007; 38(9): 2453 - 2458.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Circulation

► HOME

S. Sen, A. Hinderliter, P. K. Sen, J. Simmons, J. Beck, S. Offenbacher, E. M. Ohman, and S. M. Oppenheimer

### **Aortic Arch Atheroma Progression and Recurrent Vascular Events in Patients With Stroke or Transient Ischemic Attack**

Circulation, August 21, 2007; 116(8): 928 - 935.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Journal of the American College of Cardiology

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E. Mahmud, J. J. Cavendish, and A. Salami

### **Current Treatment of Peripheral Arterial Disease: Role of Percutaneous Interventional Therapies**

J. Am. Coll. Cardiol., August 7, 2007; 50(6): 473 - 490.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Vascular Medicine

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T. W. Rooke

### **Controversies in vascular screening art versus science**

Vascular Medicine, August 1, 2007; 12(3): 235 - 242.

[\[Abstract\]](#) [\[PDF\]](#)



## EUROPEAN JOURNAL OF PUBLIC HEALTH

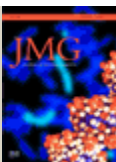
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M Rosvall, G Engstrom, L Janzon, G Berglund, and B Hedblad

### **The role of low grade inflammation as measured by C-reactive protein levels in the explanation of socioeconomic differences in carotid atherosclerosis**

Eur J Public Health, August 1, 2007; 17(4): 340 - 347.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## JOURNAL OF MEDICAL GENETICS

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J. Dumont, M. Zureik, D. Cottel, M. Montaye, P. Ducimetiere, P. Amouyel, and T. Brousseau

### **Association of arginase 1 gene polymorphisms with the risk of myocardial infarction and common carotid intima media thickness**

J. Med. Genet., August 1, 2007; 44(8): 526 - 531.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Circulation

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J. J. Cao, A. M. Arnold, T. A. Manolio, J. F. Polak, B. M. Psaty, C. H. Hirsch, L. H. Kuller, and M. Cushman

### **Association of Carotid Artery Intima-Media Thickness, Plaques, and C-Reactive Protein With Future Cardiovascular Disease and All-Cause Mortality: The Cardiovascular Health Study**

Circulation, July 3, 2007; 116(1): 32 - 38.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Circulation

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A.-J. L.H.J. Aarnoudse, C. Newton-Cheh, P. I.W. de Bakker, S. M.J.M. Straus, J. A. Kors, A. Hofman, A. G. Uitterlinden, J. C.M. Witteman, and B. H.C. Stricker

### **Common NOS1AP Variants Are Associated With a Prolonged QTc Interval in the Rotterdam Study**

Circulation, July 3, 2007; 116(1): 10 - 16.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



► HOME

P. Raggi and A. Bellasi

### **Review: Imaging to assess effect of medical therapy in patients with diabetes mellitus**

The British Journal of Diabetes & Vascular Disease, July 1, 2007; 7(4): 157 - 164.

[\[Abstract\]](#) [\[PDF\]](#)



## European Heart Journal

► HOME

Authors/Task Force Members:, G. Mancia, G. De Backer, A. Dominiczak, R. Cifkova, R. Fagard, G. Germano, G. Grassi, A. M. Heagerty, S. E. Kjeldsen, *et al.*

### **2007 Guidelines for the Management of Arterial Hypertension: The Task Force for the Management of Arterial Hypertension of the European Society of Hypertension (ESH) and of the European Society of Cardiology (ESC)**

Eur. Heart J., June 11, 2007; (2007) ehm236v1.

[\[Full Text\]](#) [\[PDF\]](#)



## The American Journal of CLINICAL NUTRITION

► HOME

J. A. Nettleton, L. M Steffen, M. B Schulze, N. S Jenny, R G. Barr, A. G Bertoni, and D. R Jacobs Jr

### **Associations between markers of subclinical atherosclerosis and dietary patterns derived by principal components analysis and**

**reduced rank regression in the Multi-Ethnic Study of Atherosclerosis (MESA)**

Am J Clin Nutr, June 1, 2007; 85(6): 1615 - 1625.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



**American Journal of Neuroradiology**

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E.J. Lee, H.J. Kim, J.M. Bae, J.C. Kim, H.J. Han, C.S. Park, N.H. Park, M.S. Kim, and J.A. Ryu

**Relevance of Common Carotid Intima-Media Thickness and Carotid Plaque as Risk Factors for Ischemic Stroke in Patients with Type 2 Diabetes Mellitus**

AJNR Am. J. Neuroradiol., May 1, 2007; 28(5): 916 - 919.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



**QJM**

▶ HOME

H. Yanai, H. Yoshida, Y. Tomono, and N. Tada

**Atherosclerosis imaging in statin intervention trials**

QJM, May 1, 2007; 100(5): 253 - 262.

[\[Full Text\]](#) [\[PDF\]](#)



**Journal of the American College of Cardiology**

▶ HOME

I. J. Kullo and A. R. Malik

**Arterial Ultrasonography and Tonometry as Adjuncts to Cardiovascular Risk Stratification**

J. Am. Coll. Cardiol., April 3, 2007; 49(13): 1413 - 1426.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



▶ HOME

E.-R. Rietzschel, M. L. De Buyzere, S. Bekaert, P. Segers, D. De Bacquer, L. Cooman, P. Van Damme, P. Cassiman, M. Langlois, P. van Oostveldt, *et al.*

**Rationale, design, methods and baseline characteristics of the Asklepios Study**

European Journal of Cardiovascular Prevention & Rehabilitation, April 1, 2007; 14(2): 179 - 191.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



**PHARMACOLOGICAL REVIEWS**

▶ HOME

J. H. Revkin, C. L. Shear, H. G. Pouleur, S. W. Ryder, and D. G. Orloff  
**Biomarkers in the Prevention and Treatment of Atherosclerosis: Need, Validation, and Future**

Pharmacol. Rev., March 1, 2007; 59(1): 40 - 53.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## ARCHIVES OF INTERNAL MEDICINE

► HOME

J. Heeringa, D. A. M. van der Kuip, A. Hofman, J. A. Kors, F. J. A. van Rooij, G. Y. H. Lip, and J. C. M. Witteman

### **Subclinical Atherosclerosis and Risk of Atrial Fibrillation: The Rotterdam Study**

Arch Intern Med, February 26, 2007; 167(4): 382 - 387.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## ARCHIVES OF GENERAL PSYCHIATRY

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J. C. Stewart, D. L. Janicki, M. F. Muldoon, K. Sutton-Tyrrell, and T. W. Kamarck

### **Negative Emotions and 3-Year Progression of Subclinical Atherosclerosis**

Arch Gen Psychiatry, February 1, 2007; 64(2): 225 - 233.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Circulation

► HOME

M. W. Lorenz, H. S. Markus, M. L. Bots, M. Rosvall, and M. Sitzer

### **Prediction of Clinical Cardiovascular Events With Carotid Intima-Media Thickness: A Systematic Review and Meta-Analysis**

Circulation, January 30, 2007; 115(4): 459 - 467.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Diabetes & Vascular Disease Research

► HOME

R. A Ajjan and P. J Grant

### **Cardiovascular disease prevention in patients with type 2 diabetes: the role of oral anti-diabetic agents**

Diabetes and Vascular Disease Research, December 1, 2006; 3(3): 147 - 158.

[\[Abstract\]](#) [\[PDF\]](#)



## Stroke

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M. J. E. van Rijn, M. J. Bos, M. Yazdanpanah, A. Isaacs, A. Arias-Vasquez, P. J. Koudstaal, A. Hofman, J. C. Witteman, C. M. van Duijn, and M. M. B. Breteler

### **{alpha}-Adducin Polymorphism, Atherosclerosis, and Cardiovascular and Cerebrovascular Risk**

Stroke, December 1, 2006; 37(12): 2930 - 2934.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Stroke

► HOME

S. Debette, J.-C. Lambert, J. Gariépy, N. Fievet, C. Tzourio, J.-F. Dartigues, K. Ritchie, A.-M. Dupuy, A. Alperovitch, P. Ducimetiere, *et al.*

### **New Insight Into the Association of Apolipoprotein E Genetic Variants With Carotid Plaques and Intima-Media Thickness**

Stroke, December 1, 2006; 37(12): 2917 - 2923.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Journal of the National Comprehensive Cancer Network

► HOME

E. Efstathiou and C. J. Logothetis

### **Review of Late Complications of Treatment and Late Relapse in Testicular Cancer**

J Natl Compr Canc Netw, November 1, 2006; 4(10): 1059 - 1070.

[\[Abstract\]](#) [\[PDF\]](#)



## THE JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM

► HOME

A. Tivesten, J. Hulthe, K. Wallenfeldt, J. Wikstrand, C. Ohlsson, and B. Fagerberg

### **Circulating Estradiol Is an Independent Predictor of Progression of Carotid Artery Intima-Media Thickness in Middle-Aged Men**

J. Clin. Endocrinol. Metab., November 1, 2006; 91(11): 4433 - 4437.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Clinical Chemistry

► HOME

S. Zhu, G. Su, and Q. H. Meng

### **Inhibitory Effects of Micronized Fenofibrate on Carotid Atherosclerosis in Patients with Essential Hypertension**

Clin. Chem., November 1, 2006; 52(11): 2036 - 2042.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Stroke

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M. P.S. Sie, A. G. Uitterlinden, M. J. Bos, P. P. Arp, M. M.B. Breteler, P. J. Koudstaal, H. A.P. Pols, A. Hofman, C. M. van Duijn, and J. C.M. Witteman

### **TGF- $\beta$ 1 Polymorphisms and Risk of Myocardial Infarction and Stroke: The Rotterdam Study**

Stroke, November 1, 2006; 37(11): 2667 - 2671.

[\[Abstract\]](#) [\[Full Text\]](#) [\[PDF\]](#)



## Angiology

► HOME

M. Kanadasi, M. Cayli, M. San, K. Aikimbaev, C. C. Alhan, M. Demir, and M. Demirtas

### **The Presence of a Calcific Plaque in the Common Carotid Artery as**



## **a Predictor of Coronary Atherosclerosis**

Angiology, October 1, 2006; 57(5): 585 - 592.

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