www.knowyourCVrisk.md

Two-thirds of cardiovascular (CV) events occur in those who are “low-risk”. Prevent sudden cardiac death by knowing your true risk before it's too late!

What is CIMT and What Do My Results Mean?

Carotid intima-media thickness (CIMT) measurement is a non-invasive screening tool, using ultrasound, that provides very useful information about a person's cardiovascular health. It detects the earliest traces of plaque within the layers of the artery wall, years before there is enough obstruction of blood flow to cause heart attack or stroke. It also allows the calculation of "arterial age", which equates a person's average carotid artery thickness to a person of that age who is at normal risk. If the arterial age is more than 5 yrs greater than actual age, then there is significant increased risk of a cardiovascular event.

CIMT is the only screening tool for cardiovascular disease that meets all the criteria of an effective screening test. It is non-invasive (no needles or radiation) and relatively inexpensive ($175). It is able to detect the disease at a subclinical stage, years before symptoms occur, when risk factor modification is best able to prevent the disease from progressing. It is proven by more than 10 studies with over a thousand patients each for its ability to predict increased risk of an event; in fact, it predicts events better than does blockage seen by heart catheterization, because CIMT can tell the difference between soft (dangerous) and hard (chronic) plaque. It is the only screening tool that is valid in both men and women below the age of 50, because enough patients in that age group were included in studies to validate its use. In summary, CIMT is the closest thing we have to being a true surrogate marker of cardiovascular disease. In other words, if your CIMT increases, then your risk of a cardiovascular event increases; likewise, if your CIMT decreases, then your risk of an event decreases. This is why large scale clinical trials on medications for the treatment of heart disease use changes in CIMT over 2 yrs as a surrogate for changes in risk of a cardiovascular event.

CIMT differs from the traditional doppler ultrasound, which is only abnormal when there is enough plaque present to reduce blood flow, when the proverbial "horse is already out of the barn." CIMT directly measures the thickness of the space between the intima and media layers of the carotid artery wall. The intima and media layers are the two inner layers of the carotid wall, directly adjacent to the artery lumen, where blood flows. All of the precursors for plaque formation--tiny cholesterol-rich proteins and inflammatory mediators live in the space between these two layers. If the CIMT measurement is more than the 75th percentile for age, then the process that leads to plaque build-up is already happening to a significant extent. This is why CIMT not only predicts risk of a cardiovascular event, but it also screens for the presence of disease in its earliest form. This is one major reason why it is so useful in younger, at-risk, but still asymptomatic individuals! Other screening tests are still normal in these individuals, so the disease remains undetected, slowly progressing until there is 40-50% blockage in arteries--enough to cause symptoms, or an abnormal test. Those who are fortunate discover the blockage before symptoms occur. Some, however, experience death as their first symptom, or experience such a major event at a young age that they live the remainder of their life with significant disability. Obviously the goal should be to find the disease very early, like we discover small calcifications in the breast with mammography, or a small precancerous colon polyp with
Reducing the “high public burden of low individual risk” one patient at a time.

colonoscopy, or HPV changes on a pap smear before cervical cancer develops. Simply put, if cardiovascular disease claims more lives each year than these cancers combined, why aren't we screening for early CVD now that we have a noninvasive tool that detects the disease in its earliest stages? Why do we rely on tests for screening that are only going to show plaque if the artery is at least 40-50% blocked already?

So if you recognize the value of CIMT screening enough to have it done, what will the results tell you about your cardiovascular health? The CIMT measurement itself is reported, in millimeters, as the average of many measurements in the last 1cm of the carotid wall, before it splits into the internal and external carotid. This is why the result is so reproducible and can be monitored over time to predict risk—it is taken from precisely the same place each time. To help you put the measurement into perspective, it is reported as your arterial age (AA). Your AA is the age at which your measurement would be considered a normal measurement. If you are 50 and your AA is 65, you have the same thickness as a normal 65 year old (of the same sex and race). If your AA is more than the 75th percentile for your actual age, the result is highlighted in red, indicating increased risk. Furthermore, if the actual CIMT measurement is > 1mm, this is considered synonymous with subclinical cardiovascular disease, meaning that you have the disease in its earliest form. Full risk factor modification needs to occur before symptomatic disease develops. The CIMT exam also includes a scan of the entire carotid artery and the extracranial part of the internal carotid artery for plaque. This is reported as being present or absent, but is not measured as a percentage like a Doppler exam. This is because the plaque is being seen, in most cases, before there is enough blockage to even give a percentage (ie nonobstructing plaque). So if you are told that plaque is present, you should not equate this with plaque that is clogging your arteries. If this is a possibility you will be sent separately for the traditional Doppler exam. The proper way to interpret an abnormal result is that all risk factors for cardiovascular disease should be identified and treated. The main treatment would be therapeutic lifestyle change (TLC), but medications may also be warranted to lower LDL cholesterol levels below the usual target range.

There are 4 main categories into which the test results may fall, and each will be discussed separately.

1) Normal CIMT and no plaque, ie NORMAL test—This indicates that cardiovascular disease is not present to a significant extent AND the risk of a cardiovascular event in the next ten years is very low. Any risk factors should remain controlled and therapeutic lifestyle followed. If risk factors are present (including family history), then consider repeating in 5 years to make sure that the risk factors are still not causing early disease.

2) Abnormal CIMT but no plaque—If the CIMT is >1mm, then subclinical disease is present and all risk factors should be controlled to the same extent as someone with advanced disease. This is the best way to prevent progression to symptomatic cardiovascular disease, and it involves lowering LDL cholesterol below 100, as well as other aspects of Therapeutic Lifestyle Change (see the link on the homepage for TLC). If the CIMT is abnormal (highlighted in yellow or red), but less than 1mm, then the precursors to plaque are present. It is imperative to initiate TLC and to aim for an LDL < 130. You should also at least have an hsCRP to detect inflammation and start a low dose statin if present. You should also consider having an expanded lipid panel to see if you have an abundance of cholesterol particles that are small and dense, or extra "sticky,"

Reducing the "high public burden of low individual risk" one patient at a time.
which would cause them to accumulate within the intima-media layer. Go to www.bhlinc.com for more info on high risk cholesterol types. The measurement should be repeated in 2 years to make sure there is not an increase in CIMT. An increase of more than 0.034 mm per year is associated with an increased risk of an event and would warrant more aggressive risk reduction.\(^5\)

3) Normal CIMT but plaque is present--Here the risk depends on the type and extent of plaque. First, since the CIMT is normal, there is not an abundance of plaque precursors or inflammation present. So any plaque that is present should be stable, calcified plaque formed years ago when risk factors were not so well-controlled. Short-term risk of an event is usually still low. The report describes the type of plaque present, which determines how risky it is for rupturing and causing an acute event. S represents soft plaque, which is dangerous; E (echogenic) represents hard, calcified plaque, that is less susceptible to rupture; and H represents heterogeneous, or a mixture of the two. The main concern is when there is enough plaque present to narrow the artery by 50%, which would be noted, or if there is soft plaque. In this case, further evaluation with doppler ultrasound is needed (if >50% blockage is noted), or expanded markers of risk should still be checked (ie Berkeley Panel) due to the risk of more soft plaque forming, which increases the short-term risk of an event. Regardless, therapeutic lifestyle should be followed and any risk factors that are present should be optimized. Aspirin should be considered and LDL goal can be set at <130. If there is >50% plaque or expanded markers of risk are present, then an LDL goal <100 is reasonable. Again, the test should be repeated in 2 years.

4) Abnormal CIMT and plaque is present--this is the most concerning scenario because it indicates that all the precursors for plaque formation are present AND they have been busy at work in the building of plaque for some time. The short-term risk will often be high, particularly if the arterial age is highlighted in red and there is soft plaque present. You should have a visit to discuss the results, because a plan of attack to reduce ALL risk factors has to be initiated. TLC must be started and expanded lipids should be checked. It is also reasonable to consider some noninvasive method of evaluating the coronary arteries, such as nuclear stress testing, or CT angiogram of the coronary arteries, although this is not usually necessary. In addition, doppler ultrasound of the carotids should be done if >50% blockage was noted. In all cases the LDL should be <100 and a target of <70 is optional, particularly if HDL (good) cholesterol is low.

So you can see that CIMT screening allows for an individualized plan for cardiovascular risk reduction based on the presence or absence of plaque precursors, or plaque itself, in your artery walls, rather than guessing on whether they are present based on your risk factors. This more accurate method of risk assessment not only prevents you from being undertreated when you have higher risk than expected, but it also can prevent you from being overtreated if your actual risk is lower than we would have guessed. There are several situations that deserve special mention when screening is better than guessing. First, in those with family history of disease, there is more likely to be some inherited factor present, like small or sticky cholesterol particles, that allows plaque to form at a younger age without ever knowing it (since the cholesterol numbers look normal). Second, in perimenopausal women who have high cholesterol as their only risk factor, it is hard to guess whether risk is high enough to treat the cholesterol or not. CIMT can guide that decision. Third, men in their 40s or early 50s with several risk factors are usually still assessed to be at low risk, because age is weighted the most in the risk equation. They can be at much higher risk than expected, particularly if HDL is <40 and triglycerides are elevated. Again, CIMT can tell if short-term risk is low enough to just focus on TLC and modest risk factor reduction, or if there is enough early disease present to warrant more aggressive risk

Reducing the “high public burden of low individual risk” one patient at a time
reduction measures. In all of these situations, a screening stress test would almost always be normal, leaving risk undetected even if it present, and missing the opportunity for risk reduction measures.

As discussed abundantly in other links on this site, we know from large epidemiologic studies done by the Centers for Disease Control, that the majority of the > 400,000 annual cardiovascular events occur in those individuals who are "low-risk" according to our best ability to guess risk.³ If we are going to make any significant impact on lowering the effect of this disease on society as a whole, we have to do 2 main things. First, we have to have comprehensive, community-based efforts to educate all people what is necessary for ideal cardiovascular health (see link on the home page for US Healthy People 2020). It will also be helpful to create incentives for people to achieve ideal cardiovascular health, and to remove barriers to achieving that goal. Second, we have to do a better job of identifying those who are actually at high risk, or already have subclinical disease, despite being low to intermediate-risk by the risk assessment method. This can only be achieved through population-based screening, since the risk assessment method incorrectly predicts risk more than two-thirds of the time. The greatest obstacle to expanding screening is the lack of insurance reimbursement for CIMT. Still, most men over age 40 and women over age 50 should consider whether screening would be worthwhile for them (see link on homepage entitled who should be screened). Low-risk does not equate to no risk; hence the best way to prevent sudden cardiac death or disability due to heart attack or stroke is to screen for early plaque before the horse is out of the barn. You can then use preventive measures to lock the barn door and throw away the key.

References


