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MAGNETOCARDIOGRAPHY (MCG) EXPLAINED

Magnetocardiography (MCG) is a new technology, that is uniquely suited for **heart health screening** because the measurement is extremely accurate and the exam is fast and entirely non-invasive. Earlier technologies are discussed below.

Electrocardiography (ECG) is typically used as an initial test during a routine physical health checkup. Many physicians rely on this simple test to understand a patient's heart rate, rhythm, and in some instances, evidence of electrical conduction related disturbances. Used in this context the ECG is a very useful tool.

However, the ECG test has many limitations. First, it suffers from being just an indirect measure of cardiac electrical activity, because the true signals from the heart are distorted by the many elements of electrical resistance that lie between the source of the signal (deep inside the body in each heart muscle cell) and the ECG electrodes (placed on the skin outside the body). Second, the measurement and its interpretation is very directional in nature. Imagine the ECG electrode to be a window through which one views the heart. Misplaced electrodes will give a different view of the heart, and indeed, a misplaced electrode can change a monophasic wave (a hill on an ECG trace) into a biphasic wave (hill and valley).

Recognizing these limitations researchers have tried to make ECG systems with many sensors, as many as 200 and more! While such an approach increases the number of "windows" viewing the heart, it turns the ECG into a tremendously complicated and awkward procedure. And although the increased view of the heart is an advantage, each "window" sees information that suffers from the same problem, namely that an unknown resistance between heart and electrode distorts the information conveyed from the actual cardiac electrical current. Finally, there are some electrical currents in the heart that carry important and valuable information, but which are invisible to the ECG!

The magnetocardiogram suffers from none of the above limitations because (1) there is no resistance to magnetic field distributions and the signals that reach the MCG sensors are directly related to undistorted cardiac electric current flow, (2) the MCG is an areal and not a point measurement, therefore, the view of the heart is a complete, integrated one, and (3) the MCG in addition "sees" those cardiac electrical currents that are invisible to the ECG.

For these reasons the MCG is the exam of choice for screening the general population for heart health because it is a test with extraordinary accuracy and it is entirely non-invasive.

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Computed Tomography (CT) is another much used diagnostic technology. Recently, there has been much promotion about the potential of multi-slice CT to possibly replace coronary angiography and the excitement of using 64-slice CT, in one simple fast test, to diagnose aortic dissection, coronary artery disease, and pulmonary embolism in patients with chest pain. However, people with active chest pain are but a small fraction of the general population, and while heavy doses of ionizing radiation in a multi-slice CT exam may be acceptable to diagnose chest pain in an emergency situation, it is not acceptable for routinely assessing heart health in the general population, where the risk of having heart disease or even a heart attack is unknown. Moreover, the minor changes in cardiac electrical currents, the heart's most fundamental driving force, responsible for contraction of the atria and ventricles, cannot be seen using any of the anatomical imaging techniques so popular in the radiology suite, namely CT, MRI, coronary angiography. They also cannot be seen with insensitive tools like the ECG.

Only the MCG is sensitive enough to monitor and track these current flows. And understanding the direction and strength of these current flows allows the physician to make profound statements about the health of an individual's heart in a real-time examination. Hence, for routine checkups, every person should have a baseline MCG while relatively healthy, i.e. before the effects of aging set in, before an increase in risk factors deteriorate health and before changes in lifestyle (sedentary versus active) take their toll. Even if an MCG baseline exam is postponed until one has become ill, it still has value as changes in the MCG thereafter have considerable value in assessing the success of an individual's recovery or the severity of a worsening disease.

For patients who have already undergone some treatment, whether it be medication, invasive treatment using modern stents, or even surgery such as coronary artery bypass grafting (CABG), the MCG offers a safe, non-invasive and radiation-free alternative to monitoring the efficacy of treatment, giving the patient added comfort by being able to track the course of their recovery.

MCG has also been suggested as a sensitive technique to periodically monitor the effects of risk modification for individuals who react proactively to MCG test results that indicate early signs of cardiac illness.

The MCG system is environmentally friendly. It uses/produces no biohazards, there are fewer disposables than the ECG, and there is no risk of danger to others (as there is in any X-ray, CT, or MRI procedure).

MCG is recommended for everyone, and it is safe for all ages, from the child to the adult. It is as useful for the healthy individual who wants to annually monitor his/her heart health to the seriously ill who rely on the physician to use the most modern tools to make the best diagnosis as soon as possible, in case there is a suspected change in health or wellness.

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