MULTI SLICE CT ANGIOGRAPHY

With the advent of new technology and sophistication of equipment, visualisation of coronary arteries and peripheral vessels in the body has become a reality without introducing catheters. CT scan opened a new window offering unrestricted views of many vital structures of body. It has helped in unravelling diagnosis in structures in thorax and abdomen besides brain. However heart and vessels, so far, eluded this technology. Heart is a restless organ and its motion is complex as it squeezes, contracts, moves clockwise and axially at the same time. Coronary arteries of different calibres run on the surface of heart in different directions. Besides motion of heart, chest moves with respiration. Ultra fast technology is required to freeze the heart motion at several frames and then reconstruct especially to image small coronary arteries.

With the introduction of multi slice CT scanning imaging of vessels and heart has become a reality. CT Angio offers quick, reliable and non invasive images of coronary arteries. It offers a detailed 3D virtual model of the patient's heart which a physician can rotate, zoom and move. With a single bolus of contrast, peripheral and cerebral vessels can be visualized, recorded and played in various angles.

Which patients can benefit from it? Essentially all, who are at higher risk of developing coronary artery disease due to either strong family history, or high risk factors like high cholesterol, high blood pressure or diabetes should benefit from it. It can be used as an alternative or second-line non-invasive test in patients with recurrent chest pain to confirm coronary blockages. Especially in patients with a non-conclusive stress-ECG with either baseline ECG changes or inability to achieve target heart rate. It may also be very helpful in patients who cannot exercise and cannot under go exercise tolerance test for non invasive assessment before non cardiac surgery. Its particularly helpful in patients who are not keen for angiography. The technique is sensitive and specific with high negative predictive value above 90%.

CT angio's major advantage lies in the early detection of sub-clinical lesions in asymptomatic, but perhaps intermediate or high-risk patients. Here lies the potential advantage of calcium scoring of coronary arteries. This is a technique which quantifies the amount of calcium in a person's coronary arteries. Calcium scoring, as calculated by the computer can be of immense help in future prognostication.

Is there any role in patients after By Pass surgery? Coronary artery grafts have a natural attrition rate. With every chest pain there is a risk of potential blockage of a graft. These grafts can be imaged very satisfactorily and reliably with CT angio. One can evaluate the grafts in their entirety from the origin to insertion in many views. It is particularly helpful as coronary angiography entailing study of graft takes longer time, uses more contrast medium and can some times miss the grafts. The CT angio can be repeated at annual intervals with minimal discomfort.

How about patients after percutaneous interventions like single or multiple vessel stenting or ballooning? There is a definite life history of these interventions. Restenosis

rate depends on the length of the blockage, size of the vessel and complexity of the lesion besides metabolic conditions like diabetes and cholesterol level. Currently serial exercise test with and without nuclear assessment are being used for the evaluation. A more definitive technique like CT angio can give a clearer picture of the lesion and stent. This procedure can be used for follow-up after revascularization to document progression of disease in other vessels and help in deciding about the future strategy regarding surgery.

A new role being envisaged for CT angio is for planning for an interventional procedure. Many a times the extent of the lesion, involvement of origin of main vessels and branches may not be very obvious from coronary angiography. CT angio because of three dimensional details may be of great help in offering such details. The technology is advancing and it may help in our understanding of characterization of lesion and their life history.

CT angiography offers optimal visualization of cerebral arteries which can be viewed in multiple views. Pulmonary arteries can be seen in entirety and CT angiography has become the investigation of choice in suspected pulmonary embolism. It's very useful for documentation of peripheral disease with one injection. The resolution is good and definite decisions can be made on the basis of this investigation.

What are the down sides of CT angio? The resolution is not very good in smaller vessels therefore the disease can either be missed or over estimated. The risk is higher in patients with higher calcium scoring. The modality may not be helpful in patients who have respiratory disease like asthma or COPD who can neither hold their breath nor can be candidates for beta blockers to reduce the heart rate. CT Angio entails a higher radiation dose than standard coronary angiography. An important side effect is the potential of renal failure in patients with impaired kidney function due to high dose of contrast injection. It can produce undue anxiety in patients with minimal disease, which may not require any specific treatment per-se.

There is consensus of opinion among the cardiologists that this technique does not replace coronary angiography rather it is an investigation helpful in non invasive work up of patient. If a patient is a candidate for percutaneous intervention or surgery then he surely requires conventional angiography. CT angio has a very bright future in assessment of coronary, cerebral and peripheral arterial disease and it may prove to be a reliable and sensitive non invasive technique in a majority of patients but the interpretation requires proper training.

Prof Mohammad Hafizullah
Editor in Chief