Over the last few years there has been an insatiable appetite to replace diagnostic invasive angiography with non invasive imaging techniques. Magnetic Resonance and CT Angiography have to date performed adequately often surpassing the diagnostic ability of invasive angiography. Almost all of the common clinical applications and questions that are encountered in daily vascular practice can be resolved and answered with MRA.

The number of different approaches and techniques of performing an aortogram and runoff are plentiful. Below is a synopsis of my approach to the examination:

Dynamic cine-like rendering of the vascular anatomy however has been conspicuously absent with current MRA and CTA techniques. Imagine the fruitless study we'd procure if we were to only able to take a "snap shot" or a single image of the vascular tree of interest after injecting contrast through our catheters? The multiple frames that are gathered provide us information about a dynamic process in real time. We are able to assess velocity subjectively, direction of vascular flow and pathways of vascular reconstitution. These elements have always been paramount in the appropriate and complete evaluation of any vascular pathology for accurate therapeutic planning. Up to the present time, MRA and CTA techniques have not been able to provide multiple frames and time points of vascular flow with a single injection of contrast related to technical challenges. These were accepted and the important dynamic component was being implicitly sacrificed for the provocative benefits and advantages that MRA and CTA offer.

Recent creative developments in magnetic resonance sequence manipulation and faster integrative computing power has delivered the missing dynamic piece. It is now possible to perform high resolution cine-like imaging, rapidly and accurately with MRA.

Timing of the gadolinium bolus is no longer an imperative for a diagnostic study. The entire gadolinium bolus is tracked throughout the injection (arterial and venous phases) and is captured in a 3D volume to allow for interrogation of the data in an infinite number of obliquities and angulations. These time resolved techniques have demonstrated themselves to be especially powerful clinically, in the tibial and pedal vascular territory which has been notoriously difficult to image accurately with high resolution and with any consistency and reliability.

The goal of the lecture is to provide new impetus to utilize and embrace MRA as the non-invasive vascular diagnostic workup of choice, thus reserving invasive catheter techniques for endovascular intervention alone and in so doing the following will be addressed:

Summarize the different techniques of the lower extremity examination,

Explain the differences between conventional MRA techniques and time resolved imaging and in so doing highlight the limitations of the conventional approach,

Showcase the prowess and utility of MRA in managing common clinical scenario's of the lower extremities

Illustrate how MRA of the lower extremities facilitates endovascular and surgical management and planning thereby enhancing patient care.

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4. Mazaheri, Carroll, Du, Block, Fain, Hany, Aagaard, Strother, Mistretta, Grist Combined time-resolved and high-spatial-resolution 3D MRA using an extended adaptive acquisition; Magnetic Resonance Imaging Mar 2002
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1:05 p.m.

CTA: What You Need to Know to Make it Work

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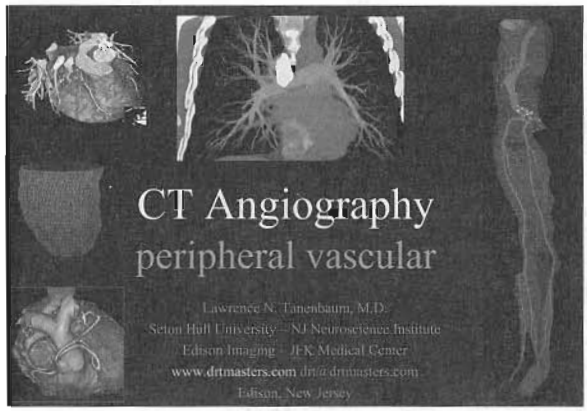
CT Angiography
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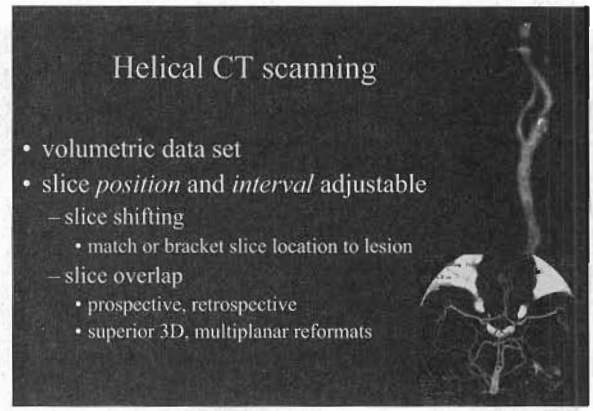
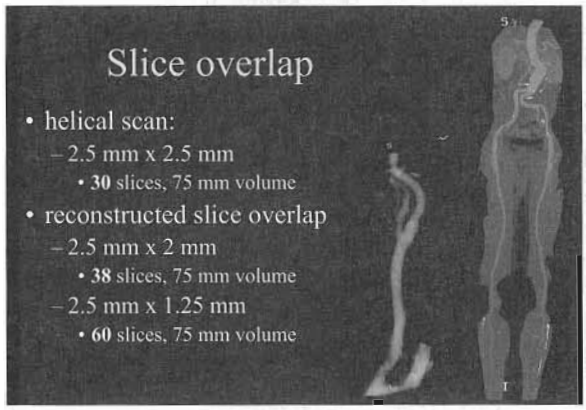
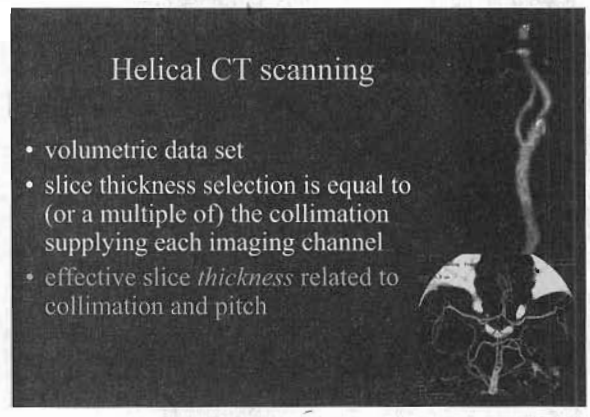
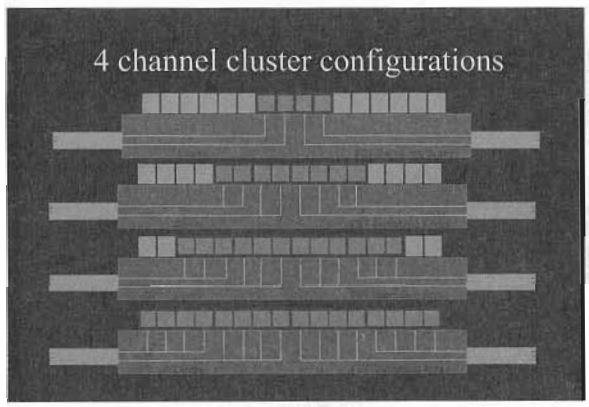
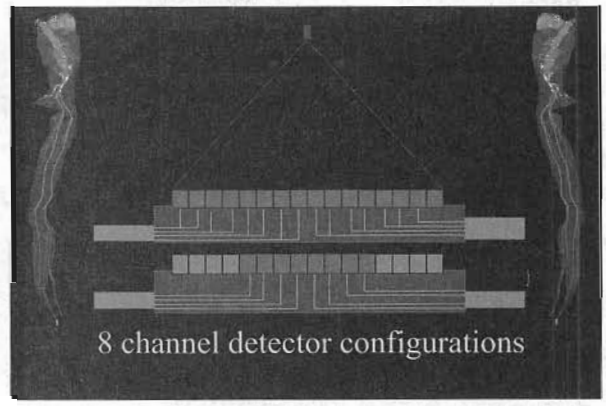
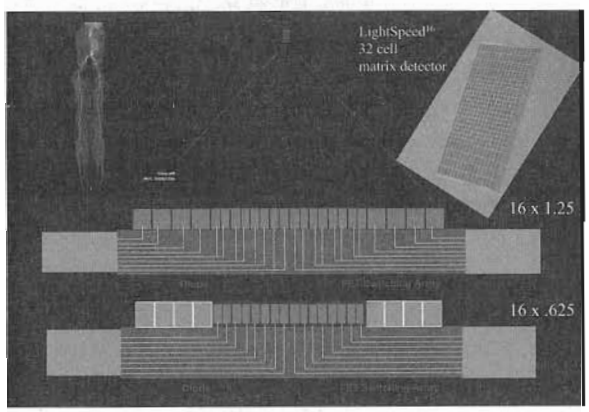

Helical CT scanning
• volumetric data set
• slice *position* and *interval* adjustable
– slice shifting
• match or bracket slice location to lesion
– slice overlap
• prospective, retrospective
• superior 3D, multiplanar reformats

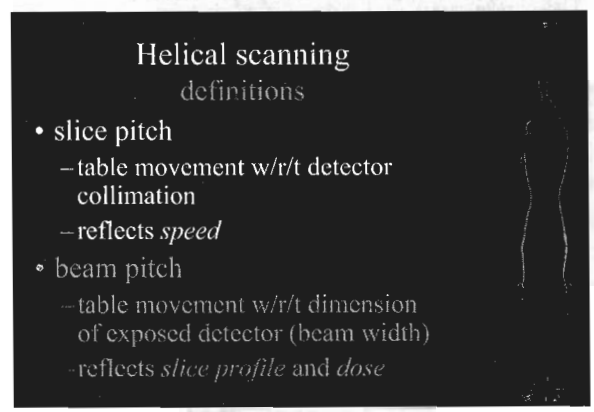

Slice overlap
• helical scan:
– 2.5 mm x 2.5 mm
• **30** slices, 75 mm volume
• reconstructed slice overlap
– 2.5 mm x 2 mm
• **38** slices, 75 mm volume
– 2.5 mm x 1.25 mm
• **60** slices, 75 mm volume


Helical CT scanning
• volumetric data set
• slice thickness selection is equal to (or a multiple of) the collimation supplying each imaging channel
• effective slice *thickness* related to collimation and pitch


4 channel cluster configurations


8 channel detector configurations


LightSpeed16
32 cell
matrix detector
16 x 1.25
16 x .625


Helical scanning
definitions
• slice pitch
– table movement w/r/t detector collimation
– reflects *speed*
• beam pitch
– table movement w/r/t dimension of exposed detector (beam width)
– reflects *slice profile* and *dose*