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A Technique for Dynamic Isotope Flow Studies

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In the seach for a diagnostic methodology which is atraumatic and without morbidity and mortality, dynamic isotope flow studies or "motion" scanning is probably the procedure of choice in the diagnosis of, and in the delineation of the extent of, those diseases due to, or reflected by, the absence of or the alteration of normal flow rate phenomena in the vascular space or extra-vascular space; for example, delineating thrombotic or embolic phenomena involving the vasculature of the brain.

The inherent ability of the imaging camera, such as the Anger camera, to simultaneously detect and accurately display radative events over the entire viewing area of the entire viewing area of the collimator crystal complex makes the imaging camera the sine qua non for depicting dynamic flow studies.

All the methods of of obtaining motion are, in essence, multiple single frames taken in a constant very short or very long exposure and/or interval or some where in-between. The method of recording is discontinuous and the discontinuites are rendered continuous by displaying them in a fashion to take advantage of retinal persistence, which is the ability to perceive an object as an after-image.

The basic thrust for obtaining insight into the normal and abnormal flow patterns has been, and is, to break the flow pattern down into its components by obtaining discontinuities or frames of reference per unit of time. The analogy is the slow motion moving picture, wherein a greater insight is obtained analyzing motion by recording more frames per unit of time greater than normal and displaying them at less frames per unnit of time than normal.

The method of recrding motion off of the osilloscopic face with the movie camera and reproducing the motion with a movie projector is an extension of the rapid still photographic format methodology, so as to obtain movement during the reproduction of the movie film and also so as to be able to analyze any given frame or series of frames in expanded or contracted time as in a single still frame. The movie methodology is still a series of rapidly-taken discontinuites or frames. As in all photographs, each frame is a simultaneous integration of the photon events over the entire crystal-collimator complex for the time of the diaphragm speed, which is directly related to the film frames per unit of time emulsion speed. There are other variables, such as lens speed, et cetera, but within limits, not of practical importance. Because of the rapidity of the framing with the movie camera, there is less superimposition of multiple flow events on each frame as simultaneous integration of the photon events place and thus, resolution is increased; in contra-distinction to hand-pulling of Polaroid Pack film or a motor-driven still camera, wherein events superimpose over a period of one to three seconds.

The ability to record a recognizable moving image, whether utilizing either a TV system or a photographic system, with few exceptions, requires the ability to produce a recognizable image onthe oscilloscopic screen. This cannot be bone with reproducible consistency on the usual time domain oscilloscope, but requires the availability of a time domain variable persistence oscilloscope. This particular type of oscilloscope acts as an integrating device for impulses we see from the gamma camera so that the light blips on the oscilloscopic screen last a long enough time to furnish an image …… somewhat analogous to retinal persistence.

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