《外人演題》

Recent Progress in Nuclear Cardiology

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If progress is to be understood as the process by which one comes closer to a goal, rather than merely random if progressive motion, the past few years have been fruitful.

Firstly, I believe that the goals were better defined. Scintigraphic ventriculography has now become a technique of choice to evaluate left ventricular (LV) function, globally and regionally. On the other hand, it has not remained the precise predictor of coronary artery disease which it was believed to be.

The original paper essentially presented the response of the LV ejection fraction (EF) to exercise as an accurate predictor of the presence of significant coronary artery disease. It did not matter that 'significant' was defined by the arbitrary criteria of coronary constriction of 50% or 75%, depending on the location of the study. To be predictive was the aim, and the method seemed to succeed. Recently, however, two factors have begun to assert themselves.

1) When the method is applied to less typical patients—to a patient population in which the diagnostic questions is real rather than academic—the predictive value is less than perfect. EF response to exercise is more related to the ischemic pain than to coronary lesions (CL).
2) The description of CL is not a good predictor of ischemia.

This may come as a shock, but the mixed effects of cabg in prospective studies is probably due to the fact that the classification of patients according to coronary arteriography only, is inadequate.

Now, technical progress came in three ways. Firstly, the simplistic view that poisson statistics in individual counting cells are the main limiting factor for spatial and temporal resolution was abandoned. We now have images of the cardiac cycle obtained with increasing resolution even from first transit studies using scintillation cameras. Data processing cannot do everything but poisson noise is easily overcome when the major characteristics of the imaged object are known.

We have seen, and will see gated studies in $128 \times 128 \times 100$. Whether we need it is irrelevant but it has taught us to re-think the problem of analysis and this leads me to the second point. The second point is conceptual. Its application comes from ULM and later but independently from Brussels originally. The ventricular function can be estimated by two independent variable either regionally or globally. The variables are amplitude of contraction (EF or wall motion) or rate and timing of motion (ejection rate, relaxation rate, contraction phase). It turns out that for cyclical phenomena, phase or timing can be computed with a resolution which is higher than aquisition resolution. A group from Chicago used this to demonstrate Bundle Branch Block.

The third point is only technical in a derived sense. Nuclear cardiology has been restricted by the artisanal approach of data processing. At 20 minutes of your personnel time for each study, you hesitate to do more studies than strictly necessary. But if the process is automated and requires no more than a few minutes of operator intervention for ten or more studies, one will easily do more. In this case, "more" means continuous monitoring of exercise ventriculography. For each step of the bruce protocal, LV function is analyzed. This allows one to overcome some of the imprecision in the definition of end point exercise and add a large amount of information on the functional status of the patients.

I realize that I have neglected some recent developments, including reconstructive tomography and seven pin hole tomography of cardiac scintigraphic studies, but although they represent increased capabilities, they will still need to the shown to bring us closer to our goal: The functional evalution of the cardiac patient.