The relationship between Myocardial SPECT and Fractional Flow Reserve: Is it drifting apart?

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In the paper, Tc-99 m sestamibi single photon emission computed tomography for guiding percutaneous coronary intervention in patients with multivessel disease: a comparison with quantitative coronary angiography and fractional flow reserve by Forster et.al. the authors correctly point out that FFR (Fractional Flow Reserve) was initially validated against non-invasive studies which included Thallium SPECT, Stress Echocardiography and standard exercise testing. In the paper by Pijls et.al. in 1995 which was one of the first validation studies of FFR [1] there were a significant number of negative SPECT and stress echo results at FFR values significantly lower than .75 although in all patients myocardial ischaemia was demonstrated on one of the three tests used. In the same study two patients had positive exercise tests and one patient a positive Thallium SPECT scan with FFR values significantly above .75. Later studies have confirmed that a FFR results can have a prognostic significance which can be better than

SPECT in a selected group of patients with untreated intermediate lesions after PCI of a severe lesion [2].

In contrast SPECT itself has a significant prognostic value in patients with low or intermediate risk of coronary disease and has been recommended as a first line diagnostic method in coronary disease by the UK National Institute of Clinical Excellence (<http://www.nice.org.uk/nicemedia/pdf/TA073guidance.pdf>). A normal Myocardial SPECT scan has been shown in large studies to have a very good prognostic value with adverse event rates of 0.6%/year quoted in one study of 7,376 consecutive patients [3]. The prognostic value of SPECT scanning may be improved by using cardiac gating [4] and when ejection fraction and end-systolic volumes are also considered as additional data the overall prognostic value of SPECT scanning improves further [5].

The patient conditions under which FFR is measured also have to be taken into account. In this study the patients had multivessel disease. Although a single stenosis in each vessel would not modify the result multiple stenoses in a vessel require a modified approach to FFR measurement [6] and patients with a prior myocardial infarction resulting in microvascular dysfunction [7] may also have a falsely elevated FFR but usually by 5% however in chronic myocardial infarction FFR may still be accurate [8].

So can the relative merits of these two tests be put into perspective? How also should we view the role of QCA (quantitative coronary angiography) in this context? This study concludes that SPECT gives a

Editorial comment on the article of Förster et al.
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41% of false positive and false negative results in the setting of multivessel disease examined invasively by QCA and FFR. These results are in accord with received wisdom in invasive cardiology of the usefulness of FFR measurements [9]. However the reference standard for FFR measurement validation is still the myocardial SPECT scan. There is no absolute answer to this issue but once the patient has reached the catheter laboratory it is clear that the method of choice for determining whether intervention should occur is FFR combined with angiography and quantitative coronary angiography improves the diagnostic power of the coronary angiogram. Greater use of these techniques should result in better long term outcomes for these patients [10].

SPECT studies will in the mean time still continue to be an important part of the diagnostic investigation of patients with coronary disease in particular to determine which patients will be referred for diagnostic angiography and intervention [11].

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