

PULSED AND CONTINUOUS WAVE DOPPLER IN HEART LESIONS:

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Blood flow velocities can be recorded noninvasively with Doppler provided a small angle to blood flow can be obtained. Velocities within the normal range and the moderate increases seen with increase in flow can usually be recorded with pulsed Doppler. Continuous wave Doppler is often necessary to record the higher velocities found with obstructions to flow. The Bernoulli equation can be used to calculate the pressure drop from the increase in maximal velocity across an obstruction, and instantaneous as well as mean pressure drops can be obtained. If the velocity is underestimated due to a too large angle to flow, the pressure drop will also be underestimated. The audio signal is used to find the transducer position and the beam direction which gives the most high frequent signal, that is the smallest angle and the largest frequency shift.

The pressure drop across obstruction of the various valves can be obtained, as well as across prosthetic valves and across sub- and supra-valvular obstructions, regurgitant valves and shunts. The use of spectral analysis has improved the recording of high velocities, especially when less than optimal Doppler signals are obtained with relatively few high frequencies present in the signal. This may occur with signals from large depths, or from small amounts of flow, or when only part of a jet is recorded. With this improvement the calculated pressure drop has compared well to pressure drops obtained at catheterization in the various lesions and age groups.

The simultaneous use of 2-D echo and Doppler has made orientation and localization of flow signals easier. Flow directions however, can only be assumed from the image and the Doppler signal must still be used to obtain an optimal Doppler recording. With the 2-D image there is also the possibility of correcting for an angle to flow. But the direction of a jet may not be clear from the image, and corrections may therefore lead to errors which are larger than by neglecting a small angle, and overestimations may also occur.

Doppler has also proved a sensitive method for detection of valve regurgitations, and semiquantitations of regurgitations seems possible.