Extension of the velocity-depth product for Pulsed Doppler Ultrasonic Flowmeter.

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Introduction- The Pulsed Doppler Ultrasonic Flowmetry is limited by the maximum measurable blood cells velocity due to its intrinsic sampling process. This limitation restricts its use for large velocities at deep vessels. To avoid this limitation, a large number of techniques has been developed and the results are not promising.

Materials and methods- A new technique was developed to increase the maximum measurable velocity of a standard coherent Pulsed Doppler Ultrasonic Flowmeter, adding a continuous variable sample between equally spaced pulses. The interlaced variable sampling process avoids additional range ambiguity. The detection is accomplished by a simple low pass filter.

Results- Computer simulation for deterministic signals shows that a Doppler instantaneous spectrum width of twice repetition frequency is unambiguously recovered. This result is confirmed under various flow conditions using a 20 MHz high resolution Pulsed Doppler Ultrasonic Flowmeter

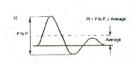
Conclusions- These results suggest an alternative low cost method for single gate pulsed ultrasonic flowmetry.

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VASCULAR INDEXES: HOW GOOD ARE THEY FOR DIAGNOSIS?

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[Introduction] Doppler diagnosis is used in Brazil as a clinic tool to avoid unnecessary risks and the high cost of arteriography. Nevertheless most vascular clinics do not explore all the advantages a Doppler system can offer such as the calculation of vascular indexes. They are parameters extracted from the blood flow wave form and are sensitive to



some vascular diseases. The indexes quantify the wave form morphology (PI, PDQ and RT), and the pulse wave velocity (EMD) as defined in the figure.

[Materials and Methods] In order to automatically calculate these indexes a microprocessed Doppler system has been designed. It is comprised of: a) a low cost specially designed electrocardiograph amplifier (ECG) needed as a time reference for the calculation of the indexes; b) a 10 MHz CW Doppler directional flow meter; c) an interface to be plugged into a microcomputer (IBM-PC compatible), and d) a software which is responsible for the control of the interface and for the analysis and processing of the acquired signal.

[Results] In order to analyze the efficiency of the Vascular Indexes it was necessary to find normal values for the indexes for specific locations. Twelve asymptomatic individuals with ages ranging from 24 to 48 years old were analyzed furnishing data for 24 lower limbs (average±standard deviation): PI=9.0±2.2; EMD=279±28 ms, PDQ=1.30 ±0.07 and RT=128±13 ms. Then, in order to test the feasibility of the indexes, 20 pathologic patients were chosen in the University Hospital vascular clinic. In this group, 13 lower limbs with obstruction on the superficial femoral were analyzed. The following results were found: PI=3.62±1.05; EMD=265±55 ms, PQD=1.28±0.13 AND RT=127±34 ms. [Conclusion] From a comparison between the two analyzed groups the following conclusions can be stated: (1) From the indexes RT, EMD and PDQ it is impossible to distinguish in which group the analyzed vessel belongs (pathologic or non pathologic); (2) The index IP has shown a good capability of separation between the two groups. It has been also noticed that all indexes are good for a patient follow up, particularly those under therapy.