ABSTRACT

Differential diagnosis by means of A-scan echography depends to an important extent on the echogram. These characteristics can be evaluated and statistically analysed by computer programs. The analysis is aided by the storage in the computer of a series of echograms in a short period of time (3 seconds). The possible uses of the programs which have been developed are demonstrated.

Echo-ophthalmology is a valuable method of examination, not only for the detection and localization of intra-ocular and intra-orbital pathology, but also for its differential diagnosis (see Till & Ossoinig, 1975; Ossoinig, 1974; Poujol, 1974; Koomen & Thijssen, 1976, etc.).

In the A-scan examination the ultrasound crystal is applied to the eyeball and the echo pattern is evaluated visually by the examiner. The application is repeated many times, so that systematically the whole eye or orbit is scanned. After the lesion has been localized in this way an attempt is made to obtain a characteristic echogram in the area concerned. For this purpose three quantitative characteristics are important: the average reflectivity, which is represented by the amplitude of the echo; the attenuation, which is visible as a decrease in the amplitude of the echoes in the pathological area; the texture, which is the pattern of the consecutive echoes. These criteria for differentiation are most suitable for statistical evaluation; other criteria are discussed elsewhere (Verbeek & Thijssen, 1980).

This statistical evaluation is performed with a digital computer. The procedure allows the determination of the quantitative characteristics of a larger number of echograms per patient. This means that the differentiation does not depend on a single echogram which is deemed to be characteristic, but on a mean. In addition, the differential diagnosis can be aided and possibly extended by statistical comparison of the quantitative characteristics with those of patients from the data file in the computer, whose diagnosis has been confirmed histologically or otherwise.
The computer starts to collect the echograms, internally, at the moment that the examiner makes a photograph of an echogram. In this way it is possible to control the computer recordings afterwards. After the starting signal 24 echograms are read in 3 seconds. The examiner can then decide whether to make a new entry or to control the data andanalyse them. Control is carried out by means of a quasi-three-dimensional graphic reproduction (Fig. 1) in which all 24 echograms are plotted by the computer together. The computer program then plots the first echogram (Fig. 2) and the area in which the pathological process is to be found can be indicated. After this manual selection the statistical evaluation program can be started. These results are also written and graphically reproduced on the screen of the computer terminal (Fig. 3). Finally some data on the localization of the lesion