demodulation, the signals are displayed on a large screen oscilloscope and recorded on analogue magnetic tape for subsequent reference. The signals are selected in an appropriate sequence under software control and digitized at a suitable rate, for example 300 times/s for an e.c.g. waveform. The analogue data transmission can be switched out and normal telephone conversation substituted to help to identify sequences of recorded signals. The processed data are printed out in the operating room area on a teleprinter, shortly to be replaced by an alpha-numeric visual display unit. When the duration and amplitude of the transmitted and received signals are compared they invariably agree to within 5% and usually to within 2%. For example, when a series of fifteen cardiac outputs from three patients were analysed a mean difference of −0·38% (range +3·4 to −4·1) was obtained between the original dye curve values and those derived from the computer.

The link, which has been used regularly for 9 months, is reliable and no external electrical interference has been encountered. It has been used for the transmission of e.c.g., e.e.g. and respiratory patterns, arterial and right atrial pressure waveforms and dye dilution curves in the study of drug actions during anaesthesia in man. In this connection suitable on-line programs have been developed. Although this project has been confined to a short distance in central London, other studies carried out with a single channel link from Lincoln to London (Colbeck, Hill, Mable & Payne, 1968) and a two-channel link from Nijmegen, Holland, to London (Hill, Payne & Crul, 1970) have shown the suitability of the system for long-distance transmission.

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An improved method of measuring drug-induced peripheral vascular responses in conscious man

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The application of venous occlusion plethysmography has been extended by the development of on-line digital computing methods (Hope, Carter, Horny & Wilcock, 1970). Individual blood flow results are now made available immediately but there is still difficulty in assessing the adequacy of control period measurements and the degree of recovery from a response to a pharmacological or physiological stimulus. This difficulty arises from the several spontaneous and cyclic fluctuations in tissue volume which occur in normal resting man (Burch, Cohn & Neumann, 1942; Burch, 1954) and which obscure the mean trend if regular sampling is employed with a pre-set inter-batch interval (Hope, Carter, Horny & Wilcock, 1970).

The five main physiological volume fluctuations as identified by Burch are those due to pulse and respiration and alpha (α), beta (β) and gamma (γ) volume fluctuations. The last three have naturally occurring frequencies of 8/min, 1–2/min and 1–8/h respectively.

The intermittent nature of venous occlusion plethysmograph acquisition makes it impractical to synchronize venous occlusion with any fluctuations faster than the

β component. The following technique was devised to reduce time wastage in obtaining significant data. Occlusion cuff inflation-deflation sequences are varied between 4 and 8/min. The analogue signal is sampled immediately before occlusion cuff inflation begins and basal tissue volume trend is thereby monitored. Venous occlusion integrates pulsatile flow, and the respiratory and α components are averaged out by using a sufficient number of collections over many α cycles. The monitored basal volume change allows identification of β cycling and the calculation of mean flow is obtained over a small integral number of β fluctuations. This mean result is minimally affected by the naturally occurring volume fluctuations. During on-line data acquisition a 4β mean and standard deviation is calculated and indicates mean flow and dispersion for pulse, respiration and α and β components. It is assumed that the slow γ component does not significantly affect individual 4β means. Verification of the consistency of successive 4β means will give the earliest possible indication of steady state. Drug response and recovery can therefore be more easily identified during the course of an experiment.

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Comparison of atropine and (−)-hyoscyamine on heart rate in man

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(−)-Hyoscyamine is about twice as potent as the racemic mixture atropine when tested on mammalian and human salivary glands, heart rate, and pupil diameter (Cushny, 1920). The two drugs have been compared in five healthy male volunteers aged 22 years pretreated with propranolol. The procedure was based on that described by Chamberlain, Turner & Sneddon (1967), and involved measuring heart rates before and 5 min after propranolol (0·15 mg/kg intravenously). Atropine or (−)-hyoscyamine was then injected intravenously over 1 min. Heart rate was recorded at rest supine for 4 min from the start of injection, again after the subject had stood for 30 s, and subsequently during the last 10 s of consecutive periods of increasingly strenuous exercise on a motor-driven treadmill. Two doses of atropine (1·2 mg and 0·04 mg/kg) and (—)-hyoscyamine (0·6 mg and 0·02 mg/kg) were given to each subject, the drugs being administered on different days in varying order, the smaller before the larger doses.

The heart rate 4 min after injection was significantly increased by both drugs, even in the smaller doses, when compared with propranolol alone. The higher doses produced a significantly greater response than the lower doses, but there was no significant difference between atropine and (—)-hyoscyamine when the effects of corresponding doses were compared (Fig. 1). As vagal tone decreased with increasing levels of exercise the difference between treatments diminished, disappearing at maximum exercise. Comparing their initial parasympathomimetic effects, both