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# Intra-Aortic Balloon Counterpulsation: Simple Triggering from the Standard Electrocardiogram

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During cardiac operations reliable monitoring of myocardial electrical activity is mandatory but electrode placement is often difficult. Intraaortic balloon counterpulsation, a way to augment coronary artery blood flow and reduce afterload, regulates its timing by the patient's electrocardiographic signal through separate ECG electrodes. Frequently, aortic counterpulsation is used after unsuccessful withdrawal from cardiopulmonary bypass, a time when electrode placement is limited because the patient is draped and diaphoretic. In order to overcome these problems, a system has been devised to allow simple, reliable electrode placement and includes a lead system with a spare set of electrode wires which can be used for timing intra-aortic balloon counterpulsation.

The ECG *backpack*\* (A of Fig I) consists of four flat copper electrodes separated and surrounded by an adherent backing which facilitates preoperative placement of the standard frontal ECG leads in the

infrascapular area of the back. When the patient is supine, the electrodes are isolated from prep solutions and bodyweight provides excellent electrode contact. A lead cable adaptable to any ECG monitoring system (B of Fig I) connects the electrode pad to the ECG cable. A separate female receptacle and lead wire allow precordial (V5) monitoring. Thus, there is full electrocardiographic monitoring with this system.

With the technical assistance of the manufacturer, a separate lead divider (Y yoke) was engineered to allow reduplication of 3 of the 5 lead wires (F of Fig. I). This duplication allows 2 separate ECG signals to be generated. Standard lead II and V5 are monitored from the five-wire set of leads and the additional 3 lead wires are reserved for the intra-aortic balloon pump. Theoretically, a combination of reduplications could be used depending on the number of ECG signals needed. The leads allow instant ECG input, when needed, to the intra-aortic balloon pump without the frustration of electrode placement at a difficult time.

This system has been used during the past year during many cardiac operations. The system is simple to use and comparable in cost to the standard limb electrode technique. The clarity of the ECG signal is excellent, its tracing reliable, and the ECG signal of the second "set" is often helpful.

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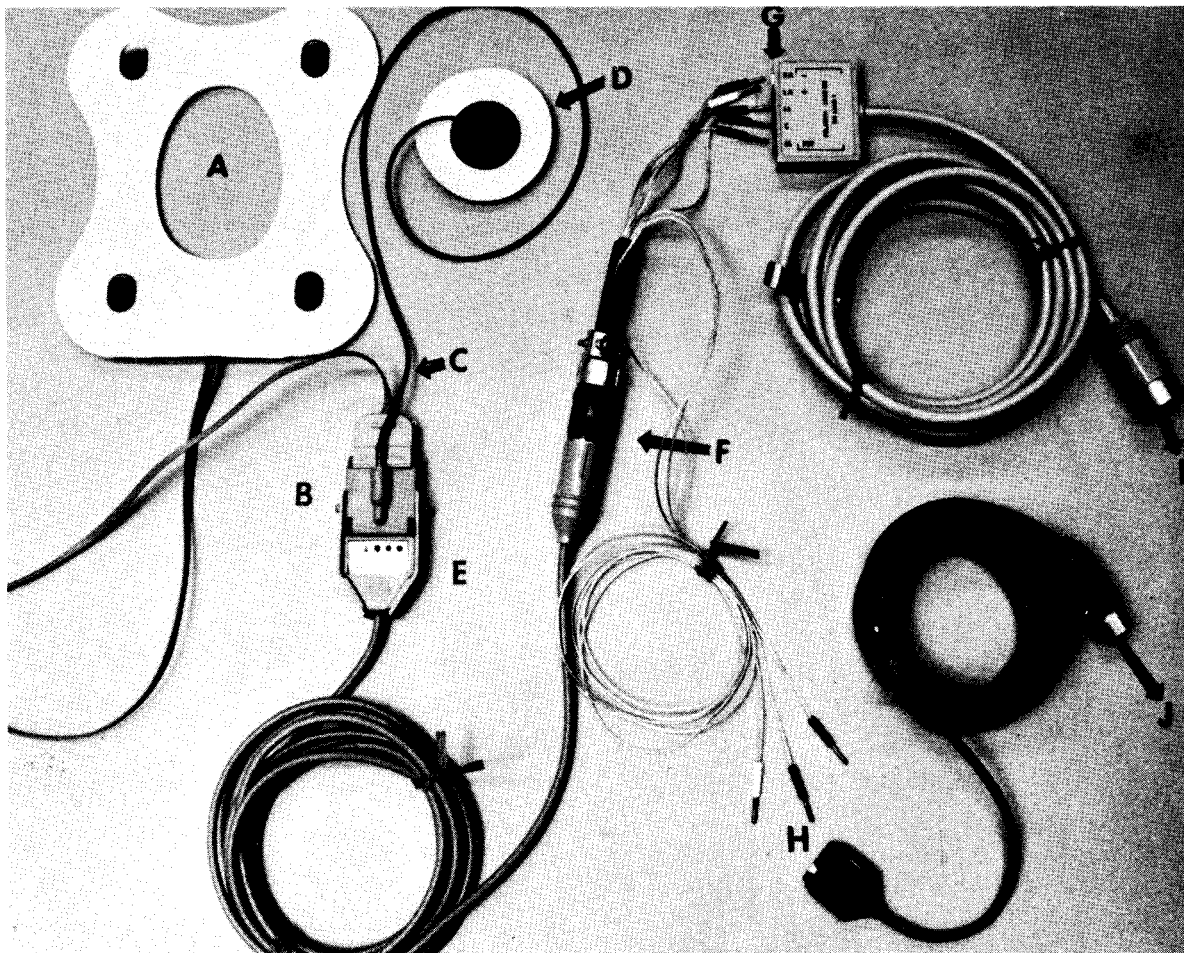
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**FIGURE 1.** Electrocardiograph monitoring system with a backpack electrode (A) with a plug connection (B) for patient cable and an additional receptacle for V5 electrode (C), V5 electrode pad (D) and patient cable (E). There is a lead divider (F) with 5 wire leads connected through a monitor cable (G) to any standard ECG monitor. Also, there are 3 reduplicated leads (H) available for connection through the intra-aortic balloon pump cable (J) for timing the assist device.