PERICARDIAL ASPIRATION WITH A NEEDLE ELECTRODE

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Aspiration of the pericardial sac is a procedure which induces far more anxiety and discomfort in the operator than in the patient. It is a 'blind' procedure not without risk and, though no figures of the mortality attendant on its use are available, fatal accidents do occur.[1] The risk is particularly high when pericardiocentesis is employed to differentiate pericardial effusion from cardiac failure of unknown origin (cardiomyopathy). In most instances pericardial effusion can be differentiated from cardiomyopathy on clinical grounds. However, in the occasional patient the diagnosis can only be made by aspiration; advancing a needle into a pulsating myocardium can be a dangerous and nerve-racking manoeuvre.

In this country both pericardial effusion and cardiomyopathy of unknown origin are extremely common conditions. In a recent series of 160 cases of pericarditis, pericardial effusion was present in 100.[2] The purpose of this communication is to draw attention to a safe technique for pericardial aspiration.

Bishop *et al.*[3] in 1956 reported a method based on continuous electrocardiographic (ECG) monitoring during the procedure. A slight modification using a pericardiocentesis electrode has been described[2] and this technique is the one discussed here. A simpler needle has since been designed.[4] The pericardiocentesis electrode (Fig. 1) con-

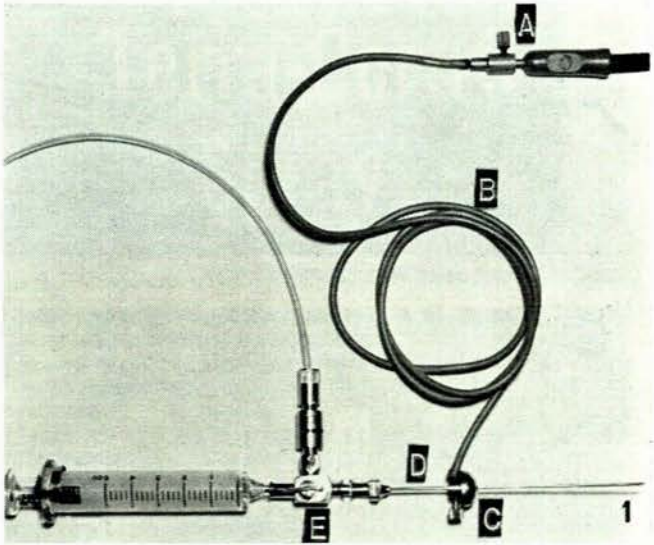

Fig. 1. The chest lead of the ECG is plugged into the brass socket (A). An insulated flexible copper wire (B) connects the chest lead to a brass collar with a screw (C), which serves as an electrical contact with the needle shaft (D) as well as an adjustable depth guard. A two-way tap (E) facilitates aspiration and expulsion of pericardial fluid.

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sists of a brass socket (A) to which an ECG chest lead can be fixed. From this leads an insulated flexible copper wire (B), which is soldered to a brass collar with a screw (C). This serves as an electrical contact with a needle shaft (D), as well as an adjustable depth guard. A home-made electrode can be produced from two pins of a standard 5-amp. plug (Fig. 2). The electrode is sterilized in a solution of 'zephiran'.

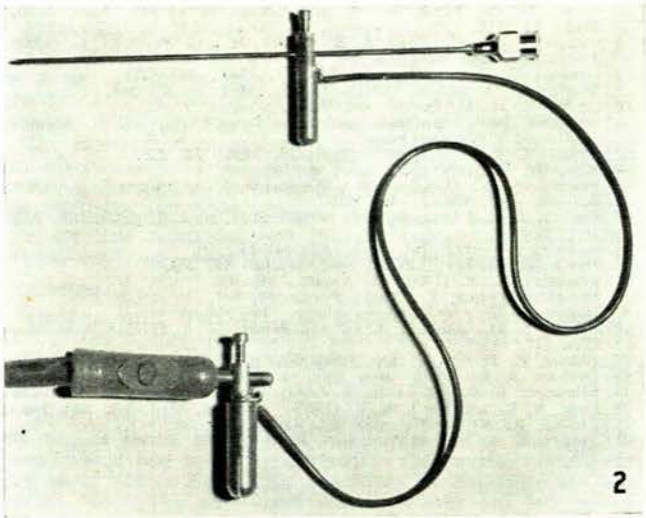

Fig. 2. Home-made electrode from a standard 5-amp. plug.

After the patient has been sedated and propped in a sitting position, the skin is cleaned, draped and infiltrated with a local anaesthetic solution. The pericardiocentesis electrode is attached to the chest lead of the ECG. The limb-lead electrodes are best strapped, since the suction-cup electrodes become loose too easily. An assistant operates the direct-writing ECG, which is *properly earthed*, and has a full roll of recording paper. Earthing is essential because ventricular fibrillation may be induced by the ECG if insulation is imperfect.

The aspirating needle is passed through the collar, which is firmly screwed to the shaft. Long needles and large syringes make close control difficult and should not be used. A two-way tap (Fig. 1 E) speeds up and facilitates aspiration. It helps to eliminate electrical interference to wear rubber gloves and handle the all-glass syringe only. With the needle under the skin and the lead selector left on the V position, ECG recording is begun. Base-line drift must be controlled. While suction is applied the needle is slowly advanced under continuous ECG control.

As soon as the needle comes into contact with the myocardium, an acute current of injury is recorded, viz. elevation of the S - T segment (Figs. 3 and 4). The needle need not actually penetrate the myocardium to produce changes, since it has been shown experimentally[1] that S - T segment elevation can occur when the pericardium is firmly indented against the epicardium. If a xiphoid approach is used the ECG may show elevated P - R segments when the atrium is contacted.[1]

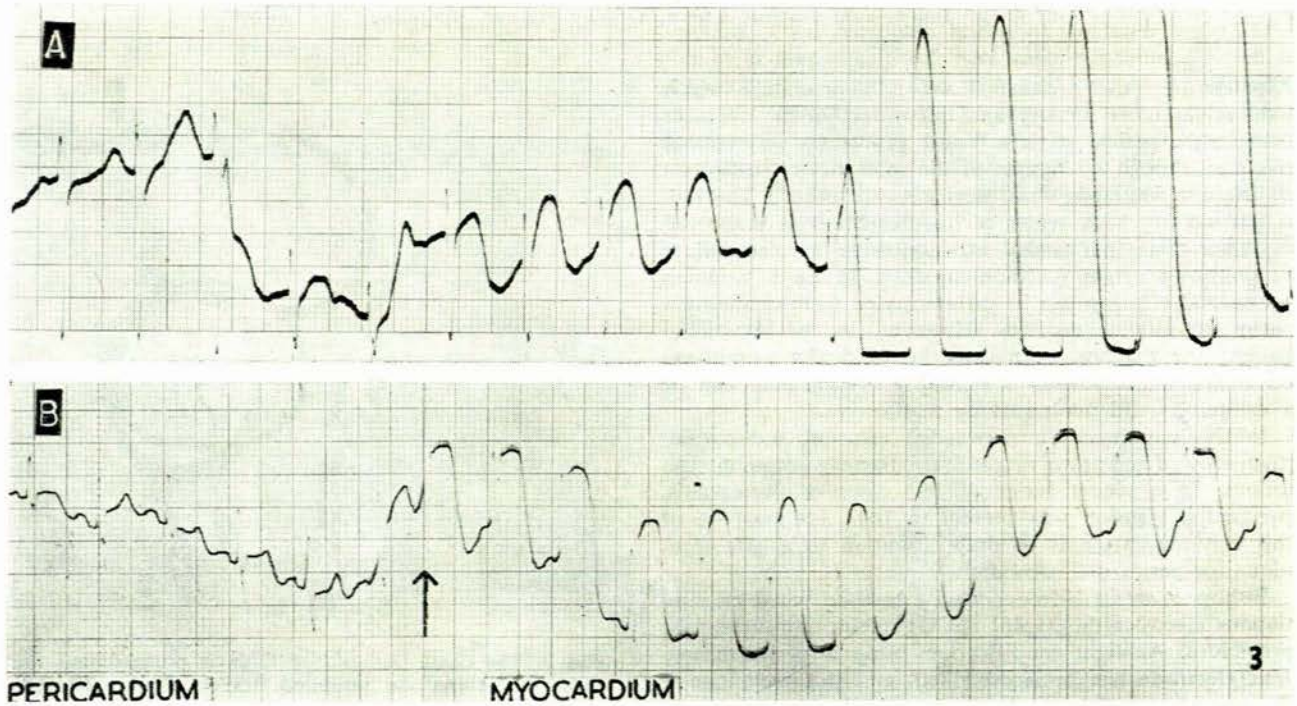

Fig. 3. (A) Base-line drift can be seen while the needle is being advanced into the pericardium. As soon as the point comes into contact with the epicardium S - T segment elevation appears, and becomes extreme when the needle is inserted a few mm. deeper.

(B) The difference between the ECG tracing with the needle in the pericardial sac and in contact with the myocardium is well shown.

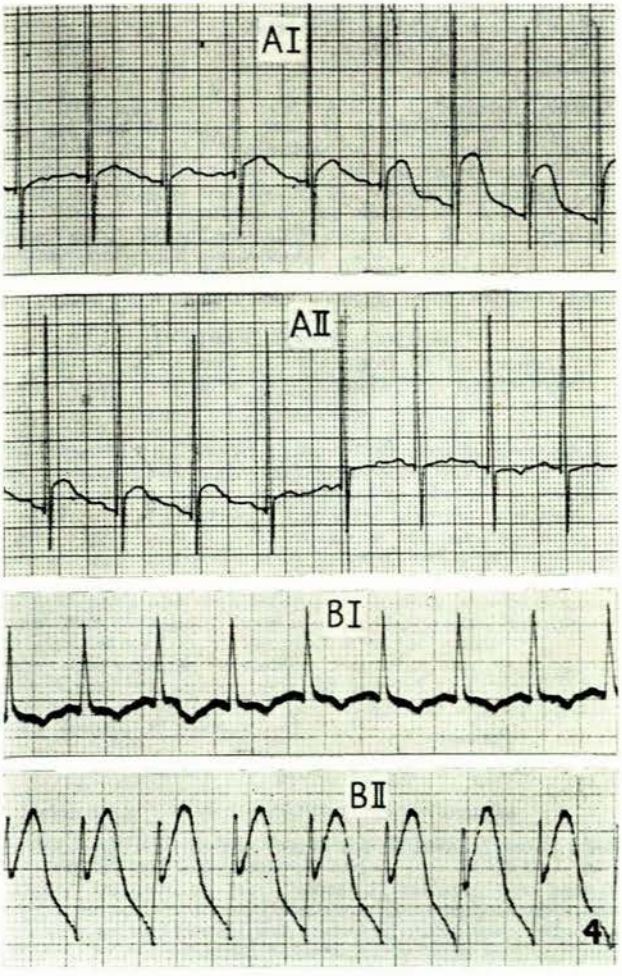

Fig. 4. AI=entry; AII=exit; BI=needle in pericardium; BII=needle in myocardium.

(A) A continuous tracing taken during insertion and withdrawal of the exploring needle from the pericardial cavity. S-T segment elevation immediately alerts the operator to the proximity of the needle to the myocardium.

(B) The acute S-T segment elevation due to needling of the myocardium is clearly seen.

The assistant must watch carefully for S-T segment elevation, since this may be slight and comes on suddenly.[5] Perforation of the myocardium in spite of ECG monitoring has been documented,[1] but significant changes occurred in all these patients. Such accidents are ascribed to lack of alertness and delayed observer response. As soon as any ECG changes are observed the needle should be slightly withdrawn.

If fluid is encountered, the collar is quickly loosened, slid down to the skin, and screwed fast. The ECG monitoring continues during aspiration and, should changes develop as the myocardium touches the needle tip, the needle should be withdrawn slightly until the ECG is once more normal. If the fluid is bloody and the ECG pattern remains unchanged a haemorrhagic effusion is present.

SUMMARY

Continuous electrocardiographic monitoring during the performance of pericardial aspiration should become a routine procedure.[6] The technique is described.

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