A New Clip Electrode for Clinical Electrocardiography

By GEORGE R. HERRMANN, M.D., Ph.D.

In every cardiac emergency the application of the electrodes for taking electrocardiograms should require the least possible time. Time saved may be a life saved. The prompt establishment of the presence of and the exact type of cardiac mechanism disorder by electrocardiographic tracings, is a prerequisite to effective therapy. The electrocardiogram must often be taken while external cardiac compression, opening of the airways, mouth-to-mouth breathing, and passive respirations are being carried out by a first-aid assistant. The new external cardiac defibrillators and pacemakers usually have built-in galvanometer and oscilloscope and plug-ins for lead wires to be attached to electrodes for visualization of the electrocardiogram. These instruments are widely used in medical management of arrhythmias. The traditional German silver electrodes, with rubber straps and salt jelly, are fairly satisfactory, but require time for their application and are somewhat messy. The suction cup electrode is cumbersome, unstable, and often falls off, and it too may be messy as it must also be applied with salt jelly.

The success of clip electrodes used in the taking of a large series of electrocardiograms of baboons, prompted the trial, in man, of the same clip-type of electrode. However, the strong tension springs of the battery clip caused trauma and pain in patients, even when applied to the skin in the less sensitive areas just below the olecranon processes and in the subpatellar regions.

At my request, battery clips with weaker springs were made by Mr. E. H. deConingh of the Mueller Electric Company of Cleveland, Ohio. Mr. deConingh kindly supplied all of the various types of the Mueller Company's battery clips with weaker springs for trial (fig. 1). It was found that the special no.-27C solid copper clips, equipped with weaker springs of four coils of 0.020 gauge steel wire, were more satisfactory than were any other type of clip, such as no. 45C, 50C, 60S or 60HS, that had been equipped with weaker springs.

Mr. Carl Schuster, of our shop, soldered half-inch pieces of brass tubing of 1/8-inch or 3/16-inch caliber as receptacles or barrel jacks on each of these weak spring no.-27C clips. The 1/8-inch slightly tapered receptacles made good contact with the American lead terminals and the 3/16-inch barrel jacks were for the European banana plug terminals of the lead wires of the Swiss electrocardiographic equipment. Vinyl or rubber insulation coverings were extended from the end of the barrel jack to the angles of the jaw of the clip. These modified battery clips were quite satisfactory as electrodes when attached to conscious patients, and were well tolerated when applied to the skin just distal to the olecranon processes and below the patellae.

The square 1 by 1-cm. mouth of the special electrode no. 27C with about 1 mm. depth above and below, was found particularly satisfactory. It would accept and hold a conductor substance, if needed, in a patient with very high skin resistance. The coverings of the vinyl insulators could be slit back to expose the jaws

Figure 1

Modified special weak-springed solid copper clip electrode.
of the no. 27C special clip to facilitate attachment to the skin. It is possible, and may at times be necessary, to further lower skin resistance. Salt impregnated electrode jelly could be used, but it is messy and causes the clip electrode to slip. It is better to fill the 10 by 10 by 1 mm. or 100 mm.\(^3\) areas inside the no. 27C head with a thin square of balsa wood, or porous metal, or plastic, or clay, or fabric impregnated with a deliquescent salt as lithium chloride, which would greatly improve the contact. Fischmann et al.\(^7\) pointed out that balsa wood was the preferable absorbent for the stable, colorless, neutral, relatively noncorrosive, and lightly deliquescent, noninflammable lithium chloride conductor. They have suggested the use of a thin slice of balsa wood impregnated with lithium chloride as an electrode pad.

**Summary**

Solid copper no.-27C weak-spring batter-clip electrodes have been found quite suitable for rapid application to patients. These electrodes should be especially useful to electrocardiographers and technicians under emergency situations as well as in routine heart-station work.

**References**


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**Social Position of Physicians**

What, then, will posterity conclude of the barbarism of a country, which, at the beginning of the nineteenth century, places medical graduates in the very lowest rank of privileged society? What will they think of men chosen from an important branch of the legislative body, who could openly assert the inexpediency of employing physicians to superintend the health of the brave defenders of their country? It requires no strong powers of observation to see the tendency of such principles to discourage the scientific pursuit of medicine, and to debase it to the level of a mere mechanical art, capable of being practised by the meanest and most sordid of mankind. —Preface, Collections from the Unpublished Medical Writings of the Late Caleb Hillier Parry, M.D.F.R.S. Vol. I., London, Underwoods, Fleet-Street, 1825, p. 4.
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