THE USE OF SHORT-ACTING RELAXANTS IN E.C.T.*

By A. B. Monro, M.D., D.P.M.,
Physician-Superintendent, Long Grove Hospital, Epsom,

and

Anne K. Kirkland, M.B., Ch.B., D.P.M.,
A. Gillie, M.B., Ch.B., and
D. L. M. McNeill, M.R.C.S., L.R.C.P.,
Registrars, Long Grove Hospital, Epsom.

Since the introduction of curare to modify the contractions in E.C.T., the use of relaxants has become standard psychiatric practice. These substances reduce the risk of fractures and enable treatment to be given to patients who would otherwise be denied it owing to risks arising from concomitant physical disease. During recent years great efforts have been made to simplify the technique of muscle relaxation, in particular to evolve a method which is short in duration, free from undesirable side-effects and easy in use. In this short paper we give a description of our experience with three drugs recently introduced, namely, Suxamethonium Bromide or Brevidil " M " which we used in 111 treatments, Suxethonium Bromide or Brevidil " E " (70 treatments), and Suxamethonium Chloride or Scoline (653 treatments). These choline succinic ester derivatives have similar characteristics which can be considered together.

According to experimental evidence (Bovet *et al.*, 1949 and 1951) they produce a specific blocking action at the skeletal neuromuscular junction. Their initial, transient, acetyl-choline-like stimulation (Ginzel *et al.*, 1951) (Von Dardel and Thesleff, 1951) is followed by complete block which wears off quickly and is followed by a correspondingly rapid return to normal. In therapeutic amounts they appear to have little effect upon the autonomic or central nervous systems (Thesleff, 1951 ; Von Dardel and Thesleff, 1951). Cholinesterases, especially serum pseudo-cholinesterases (Glick, 1941 ; Bovet-Nitti, 1949) are thought to account for their rapid breakdown to the physiological metabolites succinic acid and choline (Castillo and De Beer, 1950*b*). Hence possibly their transient action and freedom from toxicity. In contrast, tubo-curarine, gallamine and decamethonium iodide are excreted unchanged.

All these drugs produce muscular fasciculation within a few seconds of intravenous administration. The process starts in the face and spreads gradually to the trunk and limbs. The patient may experience muscular pain, and invariably shows respiratory distress while this is going on ; therefore a quick-acting barbiturate given either before or with the relaxant, is essential.

Considering the relaxants individually, Suxamethonium Chloride (sometimes known as succinyl-choline chloride, or Scoline) comes first. To begin with, we used this in the dosage recommended by the makers, based on the body-weight, and varying from 0·4 to 1·0 ml. (16 mgm. to 40 mgm. active cation). The amount of thiopentone we used, also recommended by the makers, varied from 0·15 gm. to 0·4 gm. Both substances were mixed in one syringe, as we were assured that Scoline lost only 10 per cent. of its efficacy in 5 minutes when mixed with thiopentone. We found, however, that four-fifths of the recommended dosage produced adequate protection in women, possibly owing to their having less muscle tissue than men. This smaller dose resulted in more rapid restoration of breathing and therefore became our standard technique for women, the full dose being retained for men. We also found it possible, in some cases, to reduce the recommended dose of thiopentone. We gained the impression that this tended to shorten the period of apnoea.

* Read at the Autumn Meeting of the South-Eastern Division of the Royal Medico-Psychological Association held at Long Grove Hospital on 14 October, 1952.

https://doi.org/10.1192/bjp.99.415.288 Published online by Cambridge University Press

Scoline produced less fasciculation and slower respiratory arrest than the other two drugs, so we found the one syringe technique quite adequate. The thiopentone acted sufficiently rapidly to prevent the patient from experiencing discomfort. A two-syringe technique was used experimentally, giving thiopentone first, then the relaxant. This had advantages in trying to reduce the dose of thiopentone to the smallest possible limit, but the extra trouble did not appear justified in routine use. The relaxation following Scoline was almost uniformly good, often the only manifestation of the convulsion being slight peri-orbicular twitching. Oxygen inflation was carried out as a routine after the fit and was nearly always necessary. Apnoea lasted for one or two minutes usually, up to four minutes occasionally, once seven minutes and once ten minutes.

The next drug for consideration is Suxethonium Bromide—Brevidil " E." In the dosage recommended by the makers we found that it produced painful fasciculation and respiratory distress within 5 to 10 seconds. A two-syringe technique using the barbiturate first was therefore imperative. Even so, we found fasciculation more rapid and severe than with Scoline. The relaxant effect was extremely transient, so that we had to give the shock only 20 seconds after the injection. The relaxant effect was markedly inconstant both as between different individuals, and in the same individual at different times. For example, a woman weighing 5 stones had 60 mgm. of active cation with practically no relaxant effect; another of 8 stones obtained full protection with only 40 mgm. On the other hand, resumption of breathing was so rapid that oxygen was hardly necessary except as a gesture. No case of prolonged apnoea occurred.

The third relaxant, Suxamethonium Bromide, or Brevidil " M," we used initially in a dosage of 0·3 mgm. of active cation per kilo of body-weight. In rapidity of onset, shortness of duration and lack of respiratory complications it was similar to Brevidil " E," and therefore also required the two-syringe technique. Our first impression was that Brevidil " M " gave more consistent relaxation than Brevidil " E," but a later batch gave rise to second thoughts. With this batch results were very inconsistent, even though the dose was increased to 0·4 and later to 0·5 mgm. per kilo of body-weight. More important still, with the 0·5 mgm. dose two cases of prolonged apnoea occurred, of 5 and 6 minutes respectively.

In evaluating our results, it is fair to say that we would have been satisfied with Scoline had it not been for our case of apnoea lasting ten minutes (reported in the *British Medical Journal* of 10 May, 1952), together with other cases reported in the medical press. We have not given undue weight to these other reports, as most cases occurred in connection with anaesthesia after rather larger doses than those commonly used with E.C.T. In one instance also neostigmine was administered, and may have assisted in prolonging apnoea. Since our case of respiratory arrest was reported, we have had a further case lasting seven minutes which somewhat resembles that reported by Wolfers in the *British Medical Journal* of 4 October, 1952. It occurred during the fourth treatment in a series of ten, the same dose having been given throughout without any untoward result occurring before or after. We therefore tried the Brevidil preparations in the hope of finding a relaxant with the advantages of Scoline but without this drawback.

Our early results gave us the impression that Brevidil " M " was superior to Brevidil " E " in certainty of relaxation. However, inconsistency did occur in Brevidil " M," and when we increased the dose we encountered apnoea of five minutes and six minutes in two treatments out of twelve with little improvement in reliability of action. Our experience to date with both Brevidil compounds leads us to conclude that certainty of relaxation cannot be guaranteed even with doses substantially greater than those suggested by the makers. In the case of Brevidil " M," increasing the dose incurs the risk of lengthy respiratory paralysis.

A proper perspective on this disadvantage of Scoline can perhaps be obtained by our finding that prolonged apnoea occurred only twice in 653 treatments.

Our general conclusion then, at present, is that Scoline is the most satisfactory short-acting relaxant of these three. It gives consistently adequate relaxation with comparatively little risk of dangerously long respiratory arrest. Furthermore, a one-syringe technique can be employed, with consequent saving of time and trouble. We have not yet jettisoned Brevidil for we feel that, with further modification in administration, it may well prove to be a safe and rapid relaxant.

A further point which requires discussion is the efficacy of protection in cases of hypertension. We found no rise in blood-pressure when decamethonium iodide,

https://doi.org/10.1192/bjp.99.415.288 Published online by Cambridge University Press

Scoline and Brevidil " M " were injected with pentothal, no shock being administered. In E.C.T. with and without protection the blood-pressure patterns were similar, though further investigation into the relationship of this rise to such factors as age, autonomic lability, etc., is required. Protection in hypertension is perhaps of doubtful value, but violent fluctuations during the convulsions are probably reduced.

We should like to thank Miss Munro, the Matron, Mr. Baker, the Chief Male Nurse, the nursing staff, and our colleagues, who have given us invaluable help and advice in carrying out these investigations.

References.

Bovet, D., Bovet-Nitti, F., Guarino, S., and Longo, V. G., *R.C. 1st sup. San.*, 1949*a*, **12**, 81.
Iidem and Marotta, M., *ibid.*, 1949*b*, **12**, 106.
Iidem and Fusco, R., *Arch. Int. Pharmacodyn.*, 1951, **88**, 1.
Idem, *R.C. 1st sup. San.*, 1949, **12**, 138.
Castillo, J. C., and De Beer, E. J., *J. Pharmacol.*, 1950*b*, **99**, 458.
Ginzel, K. H., Klupp, H., and Werner, G., *Arch. Int. Pharmacodyn.*, 1951*a*, **86**, 385.
Iidem, *ibid.*, 1951*b*, **87**, 79.
Iidem, *ibid.*, 1951*c*, **87**, 351.
Iidem, *Arch. exp. Path. Pharmak.*, 1951*d*, **213**, 453.
Iidem, *Sci. pharm.*, 1951*e*, **19**, 164.
Glick, D., *J. biol. Chem.*, 1941, **137**, 357.
Hurley, M. J., and Monro, A. B., *Brit. med. J.*, 1952, i, 1027.
Thesleff, S., *Nord. Med.*, 1951, **46**, 1045.
Von Dardel, O., and Thesleff, S., *ibid.*, **46**, 1038.

https://doi.org/10.1192/bjp.99.415.288 Published online by Cambridge University Press