THE USE OF CURARE-MODIFIED E.C.T.*

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THE purpose of this paper is to establish two points: first, the safety and relative simplicity of curare-modified E.C.T., and secondly, the need for such a treatment.

With regard to the first point, the technique employed is that described by Hobson and Prescott, with minor modifications. Hobson reports no deaths or real difficulties treating allcomers, that is, all his patients requiring E.C.T. The present writer reports on 412 treatments given to 60 female cases who have been specially selected as being unfit for unmodified E.C.T. No deaths or real difficulties have occurred, nor have they in 25 male cases treated by my colleague, Dr. Watt.

It is admitted that deaths have been reported with curare and E.C.T., but most of these were due to respiratory paralysis, which may be avoided by adopting the method to be described. On the other hand, 29 deaths due to unmodified E.C.T. have been collected by Will and Neumann. Regarding the risks of E.C.T., there is much divergence of opinion in the literature as to what physical disability does or does not constitute an obstacle to E.C.T. Thus Jones and Merskovitz are unwilling to treat patients over 60 with any kind of heart disease, or with tuberculosis, whereas Kalinowsky and Hoch are prepared to treat patients with a systolic blood pressure over 200 mm. Hg and patients with active tuberculosis. Sargant and Slater hesitate before treating patients with impaired cardiac function, chest disease, old age and frailty. Most authors, however, do agree that recent fractures and spinal injuries are a bar to treatment.

It is here claimed that the only contraindications to treatment are the presence of severe cardiac failure, any condition interfering with a clear airway, and, on general principles, the presence of active infection.

The technique is as follows:

d-tubocurarine chloride (Duncan Flockhart) is the drug employed to modify the convulsion. This is mixed with thiopentone and atropine and the whole given by rapid intravenous injection. The initial dose of curare is based upon the body weight, 2·5–3·0 mgm. per stone according to various considerations such as muscularity, and the degree of modification of fit required.

0·25 gm. of thiopentone and atropine gr. $\frac{1}{100}$ are given as a standard dose in every patient. These doses are altered in subsequent treatments if necessary.

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The thiopentone is given to avoid apprehension and the very unpleasant sensation of curarization, also to facilitate artificial respiration. Atropine helps to maintain a clear airway.

A Phillip's airway is introduced as soon as breathing ceases, and oxygen is insufflated by means of the Lucas resuscitator. This allows a positive and negative pressure to be produced in the chest, while the bag automatically fills with oxygen when necessary.

Two to three minutes after the injection the electric stimulus is given and a major fit ensues. In a well-curarized patient there is no movement of the spine or limbs, but there are always some clonic movements of the face, enabling one to see whether or not a major fit is taking place.

In an attempt to lessen the number of treatments necessary to effect a cure I have recently been inducing 2 or 3 G.M. fits with an interval of a minute during which oxygen is given. The second and third fits are less pronounced than the first.

Oxygen resuscitation is then continued until respiration recommences spontaneously. The phase of apnoea lasts from two to forty-five minutes. The majority of cases, however, are breathing again within ten minutes.

Prolonged apnoea gives rise to no real difficulty or anxiety, and, unless there is a fall of blood pressure or other complication, there is no need for further interference.

Coramine and prostigmine are at hand should the necessity arise but these have never been used, except in one case in which there was a progressive fall in blood pressure during a prolonged period of apnoea. In this case coramine was given intravenously to stimulate respiration, with good effect. The fall of blood pressure is due to interference with the venous return.

Ten to fifteen minutes after the recovery of respiration, during which time the airway has to be carefully watched and the jaw held, consciousness is regained. The patient then generally feels more comfortable sitting up.

Patients are able to get up and walk one to two hours after treatment.

Laryngeal spasm, which Hobson mentions as being quite common, has only occurred in mild form in one case.

The only other complication which has occurred is described in a case-report to follow.

The need for some form of modified E.C.T. can first be illustrated by giving you the length of stay in hospital some of these patients had before having treatment. One of this series was a patient for 15 years, another for 10, and six others for periods of over one year. All these have been discharged.

Secondly, the large number of patients with bony injury, definitely unsuitable for E.C.T., is shown by the results of routine X-ray examination.

It has been the practice at Shenley to have the spines of all patients X-rayed before undergoing E.C.T. Since the beginning of 1948 some 400 cases have been radiographed. This number includes a few patients X-rayed for other reasons.

Forty-four of these cases had fractures of the spine, a further 42 showed other injuries such as prolapsed disc, slight wedging of the vertebral bodies, diminished joint spaces, etc. In addition, 23 cases showed other contra-

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indications to E.C.T., e.g. Paget's disease, tuberculosis, gross osteoporosis, osteoarthritis, etc.

It is perhaps of interest to note that of the 44 cases with fractured vertebrae, 33 had had E.C.T. previously, whereas of the 293 cases with normal spines, only 55 had had shock treatment. Of 106 cases previously treated with E.C.T. either here or at other hospitals, 32 had fractures of the spine. If it is assumed that these fractures are directly due to E.C.T., then the percentage of fractures due to unmodified E.C.T. is around 30.

It should also be mentioned that of the latter, only half a dozen or so had symptoms of pain in the back, and therefore it follows that without routine X-rays before and after E.C.T., only a small percentage of fractures are detected.

The prevalence of unsuspected spinal injury, in addition to supplying case-material for the writer, provides a strong argument in favour of universal adoption of curare-modified E.C.T.

Twenty of the present series were cases of fractured spine.

Patients with other bony abnormalities, e.g. tuberculosis of joints, Paget's disease, fractures in plaster, etc., demand a modified form of E.C.T. if they are to have it at all.

The need for this treatment is further extended by patients with various pulmonary and cardiac conditions.

Thirteen of the present series had hypertension, complicated in two cases by cardiac failure, another by auricular fibrillation. Two others had electro-cardiographic evidence of past coronary thrombosis. This group was given larger doses of curare, thereby abolishing almost entirely all movement, and in consequence the violence to the circulation. With full curarization oxygen resuscitation is made easier and cyanosis avoided.

Two cases of inactive pulmonary tuberculosis and one of healing empyema were successfully treated.

Lastly, 5 cases classified as frailty were treated. This includes patients under 6 stone in weight and/or over 70 years of age.

Among advantages of this method might be mentioned:

(*a*) It is more easily accepted by nervous patients than E.C.T. without an anaesthetic. Thiopentone alone, it would seem, involves all the inconveniences of treatment by curare, without its added advantages.

(*b*) More time and consideration can be given to the case while routine investigations are carried out, thus, in this series at any rate, providing cases of good prognostic value. This is illustrated by the recovery rate in this series of 60 cases:

Thirty-two patients have been discharged, recovered.
Six are recovered and awaiting discharge.
Five are unchanged.
The remainder are improved or are still having treatment.

The disadvantages of the method are:

(*a*) The extra time involved (one case takes at least ¾ hour). On the other hand, 6 may be done in 1½–2 hours.

(*b*) Additional apparatus is necessary.

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(*c*) There is a potential risk of hypersensitivity to curare or thiopentone.

In conclusion, I will read two case-reports, which will illustrate some of the points mentioned.

The first—a more or less typical one—is a patient of 41 years who was admitted to this hospital on 2 October last, suffering from depression with suicidal thoughts. She was started on a course of E.C.T. on the 15th. After her second treatment she sustained a fracture of the dorsal spine. She remained depressed, and on 19 February was started on a course of curare-modified E.C.T. On each of 7 days she was given 20 mgm. of curare with pentothal and atropine intravenously. Each fit was reduced to face and hand movements only. Oxygen resuscitation was only needed for 10 minutes. She has improved considerably, but is as yet not keen to return home. Repeat X-ray of the spine shows no further injury.

The second case is that of the most seriously ill patient so far treated and the only one who gave cause for anxiety. A housewife aged 64 first became mentally ill at Christmas, 1938, starting with insomnia and worry. While in a general hospital where she was having a B.M.R. she became suicidal and had to be admitted to a mental hospital. Since this time she has been continuously ill, with three admissions as a certified patient in Shenley during her worst phases. On each admission she was diagnosed as depression, being apathetic, querulous, suspicious and deluded. She was convinced that she was covered with lice and that her food had been doped by her husband. Physically she was a poor specimen, 6 st. 8 lb. in weight. Her blood pressure was 170/95. The E.C.G. gave evidence of myocardial damage. X-ray of spine showed an old wedge fracture of D7 with a synostosis of D3, 4, 5 and 6, and marked kyphoscoliosis of dorsal and lumbar spine. In February of last year she had an attack of bronchitis which put her into congestive cardiac failure, with venous congestion in the neck and mild cyanosis. Recovering from this, her mental condition remaining the same, treatment was commenced in March a year ago. She was given 20 mgm. of curare with thiopentone ·25 gm. and atropine gr. $\frac{1}{100}$, followed by E.C.T. The convulsion was well modified, but after it the blood pressure rose to 220/130 and the pulse-rate to 130 per minute. Severe venous engorgement of the neck occurred, which persisted for twenty minutes. With continued oxygen resuscitation, however, these signs of cardiac embarrassment subsided satisfactorily. At the second treatment, which was given three days later, 21 mgm. of curare were given, as it was thought that the rise of B.P. indicated an insufficient modification of the fit. This time the onset of venous congestion was delayed five minutes after the E.C.T., but was more severe than on the first occasion. The pulse rate rose to 150 a minute, the blood pressure only slightly raised, and there was in addition severe cyanosis in spite of adequate oxygenation of the lungs. 100 c.c. of blood was then removed by venesection. Her condition gradually improved, and she completely recovered 75 minutes after treatment. In view of her steady mental progress she was again treated four days later. On this occasion she was given 16 mgm, of curare. She began to breathe spontaneously four minutes after treatment, but ten minutes later she had a

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recurrence of her previous symptoms. Venesection was again performed, to which she quite rapidly responded.

She recovered mentally, and it was decided not to treat her again unless she relapsed. In fact, she has remained well and has been at her home for a year, X-ray of the spine showing no change. It has been suggested that these attacks of congestive failure were initiated by attacks of paroxysmal ventricular tachycardia and were not due to a direct effect of curare.

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