AN EVALUATION OF ELECTROPLEXY (E.C.T.) TECHNIQUES

By

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I Introduction and Problem

The court hearing (Bolam *v.* Friern Hospital Management Committee) showed that British psychiatrists disagreed about the best technique of administering electroplexy. The implications of this were discussed in a recent communication (1), which also contained an extensive review of the literature showing a similar disagreement amongst previous authorities. In order to ascertain which E.C.T. techniques were most widely practised in this country, a questionnaire was circulated to a number of mental and teaching hospitals and the results of this, which were reported in full (1, 3), are summarized in Table I.

Table I

E.C.T. Techniques in Current Use in 48 British Hospitals in 1957
Male Patients

	No.	Percentage
E.C.T. modified with Pentothal and Scoline	29	60
E.C.T. modified with Pentothal and Brevidil "E"	7	15
E.C.T. modified with Brevidil "E" alone	4	8
E.C.T. modified with the Ectonus technique	3	6
E.C.T. unmodified	1	2

In view of the divergence of opinions regarding the best ways of administering electroplexy, it was decided to carry out an empirical investigation into their relative merits.

II Method

(i) *Selection and Description of Patients*

The patients were consecutive admissions with schizophrenic and affective disorders to a disturbed male admission ward between August, 1957 and August, 1958. One hundred and twenty-six patients were included in the scheme, and each patient received not less than 5 and rarely more than 20 individual treatments depending upon diagnosis and response to E.C.T. which was given three times per week.

The diagnosis of each patient was based on the clinical impression of the admitting doctor, and an interview by one of us (J.C.B.). Seventy-eight of the patients were diagnosed as suffering from schizophrenia, and 48 were classified as affective conditions (mania, manic-depressive psychosis and depression).

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(ii) *Treatment Techniques*

The four most popular techniques given in Table I, together with the technique in current use at this hospital, namely Ectonus E.C.T. with Brevidil "E", were compared. At the outset of the scheme it was not considered justifiable to use "straight" unmodified E.C.T. because of the risk of causing unnecessary fractures. The techniques used were designated A, B, C, D, and E, and were as follows:

"A" *E.C.T. modified with Thiopentone Sodium ("Pentothal") and Succinyl Choline Chloride ("Scoline").*
The anaesthetic and relaxant were administered intravenously in separate syringes. An hypnotic rather than an anaesthetic dose of Pentothal was used, consisting of 150–300 mg. according to body weight. The dose of Scoline was 20–50 mg. according to weight.

"B" *E.C.T. modified with Thiopentone Sodium and Suxethonium Bromide (Brevidil "E").*
The relaxant was given in a separate syringe in a dose of 1·0 to 1·25 mg. cation per kg. of body weight, as recommended by the manufacturers (100 mg. of the cation is contained in 150 mg. of the total salt).

"C" *Ectonus E.C.T., without relaxants, using the Ectron apparatus.*
This technique was originally described by R. J. Russell (6).

"D" *E.C.T. modified with Suxethonium Bromide (Brevidil "E") alone.*
The dosage was similar to technique "B".

"E" *Ectonus E.C.T. with Suxethonium Bromide (Brevidil "E").*

In techniques A, B and D, a single electrical stimulus was applied, which was the current practice at most hospitals (1). In techniques A and B, in order to ensure the maximum modification of the convulsion, the stimulus was not applied until the fasciculation induced by the relaxant had extended throughout the body, and was tending to pass off. In techniques D and E, the shock was given when fasciculation was established in the face and upper limbs, or as soon as there was objective evidence of discomfort, whichever came first. Atropine 1/100 gr. was given subcutaneously thirty minutes before techniques A and B, and with both these techniques oxygen was administered under positive pressure with the Lucas breathing apparatus, immediately prior to the electrical stimulus.

The same routine was adopted for all patients on treatment mornings. They were ushered individually into the treatment room on a stretcher placed upon a trolley, and following E.C.T. were conducted into the recovery room, where the time of regaining consciousness was recorded by a nurse. Efforts were made to reduce changes of nursing staff to a minimum during the period of this investigation.

Patients ineligible for all five techniques were excluded from the scheme. They included those with heart disease and skeletal abnormalities, upon whom the use of E.C.T. without relaxants was considered inadvisable.

The E.C.T. technique used each day was selected on a random basis, so that each patient was unaware of the technique to be used on his next day of treatment. This was done by inscribing the letters A, B, C, D, and E separately on the fronts of five playing cards. The first technique used in the investigation was "A", and that for the next treatment day was decided by shuffling the cards face downwards and removing the top one which indicated the method to be

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used. This was continued, using the remainder of the cards, until all the techniques had been given, and constituted a sequence of five treatments. Subsequent sequences commenced with techniques B, C, D, and so on. Altogether there were 24 sequences of five different techniques, covering 120 treatment days.

(iii) *Comparison of Techniques*

(a) *Recovery times.* These were recorded for the different techniques according to the subdivisions enunciated by Little and Reid (5). These are: Phase I, from the stimulus to the cessation of the convulsion. Phase II, from the stimulus to the first breath. Phase III, from the stimulus to the return of consciousness as judged by the patient's ability to respond to simple commands. This last phase was always recorded by the same nurse throughout the entire investigation to minimize error.

(b) *Effects of treatment.* These were registered for the different techniques, and included inadequately relaxed convulsions, difficulty in obtaining a convulsion, excessive restlessness, cyanosis, prolonged apnoea, fractures, headaches, vomiting, the development of confusion, delayed fits, and the loss of front teeth following E.C.T. The necessity for premedication before treatment, and the instances of patients with veins unsuitable for venepuncture were also recorded. All complaints made by patients against the different techniques were carefully noted.

(c) *Patients' preferences.* These were estimated in two ways. (1) By obtaining a global assessment of the preference for different techniques at the completion of the course of treatment, and (2) by calculating the like/dislike ratio between different techniques. With the latter, each patient was asked the morning following each treatment whether he preferred the last technique or the one given previously. No leading questions were posed unless he was undecided, when he would be informed that he had received treatment either without an injection, or with an injection in his arm, or with an injection in his arm which put him to sleep. These suggestions were only necessary in a small minority of patients. Recording was as follows: 2 red marks were given to each technique preferred, and 2 blue marks to each technique disliked by a patient. If he was undecided between techniques, each was given one red and one blue mark. If he remembered one technique only it was given 2 red or 2 blue marks depending upon whether it was pleasant or unpleasant, or 1 red and 1 blue mark if it was indifferent. The results were scored by (*a*) estimating for each technique the proportion of red to blue marks, and (*b*) ranking the global preferences for the different techniques at the final interview.

(iv) *Statistical Assessments*

The statistical techniques employed to assess the results varied according to the type of data being evaluated, but were usually either "t" or chi-squared tests. The former were calculated on the assumption of unrelated means and a perusal of the raw data did not indicate that this assumption was incorrect. It should be remembered, however, that, in the event of the means being even slightly correlated, the "t" test for unrelated means would minimize rather than maximize the significance of the difference between them. We can therefore be sure that all significances assessed in this article by the "t" test had at least the statistical significance attached to them in the Tables.

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Chi-squared was used whenever possible, in spite of the fact that some of the theoretical frequencies were lower than those usually required for this test. It was not possible, however, to circumvent this problem in an easy manner because of the nature of the raw data. Nor did we see any easy way of satisfactorily manipulating the raw data except by increasing the sample size which was not, in this case, practicable.

Patients' preferences for the treatment technique have been dealt with by the use of the "t" test for the Like/Dislike ratios. The patients' global assessments of techniques have been simply ranked in orthodox fashion and the mean ranks tabulated.

III Results

Phase I recovery times recorded as the time in seconds between the administration of the shock and the end of twitching are set out in Table II together with the critical ratios of differences between the five techniques.

TABLE II

Means and Significance of Differences for Phase I Recovery Times

N=150

		Treatment Technique				
		A	B	C	D	E
Mean time in seconds	..	33·0	33·4	41·3	37·9	39·0
σ		14·2	12·6	17·4	7·7	9·7
Treatment Technique	A ..	( )	NS	**	**	**
	B ..		( )	**	**	**
	C ..			( )	*	NS
	D ..				( )	NS
	E ..					( )

NS — Not significant.
** — Significant at 1 per cent. level or beyond.
* — Significant at between 5 per cent. and 1 per cent. levels.

Phase II recovery times are given in Table III. These represent the time in seconds between the shock and the onset of respiration. The statistical significance of the differences between the five techniques are also given.

TABLE III

Means and Significance of Differences for Phase II Recovery Times

N=150

		Treatment Technique				
		A	B	C	D	E
Mean time in seconds	..	86·1	78·1	45·0	69·3	81·6
σ		47·2	21·0	24·5	24·7	25·5
Treatment Technique	A ..	( )	NS	**	**	NS
	B ..		( )	**	**	NS
	C ..			( )	**	**
	D ..				( )	**
	E ..					( )

NS — Not significant.
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Phase III recovery times, the time in minutes between shock and recovery of consciousness, together with the statistical significance of the differences between the five techniques are given in Table IV.

TABLE IV

Means and Significance of Differences for Phase III Recovery Times

N=150

		Treatment Technique				
		A	B	C	D	E
Mean time in minutes ..		9·9	9·7	7·0	7·6	7·5
σ		3·3	3·9	3·8	4·0	4·1
Treatment Technique	A ..	( )	NS	**	**	**
	B ..		( )	**	**	**
	C ..			( )	NS	NS
	D ..				( )	NS
	E ..					( )

NS — Not significant.
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Table V gives the average time in minutes required to give each patient his treatment (including mixing the solutions). It is obtained by dividing the total amount of time spent in administering treatment each day by the number of patients treated. The significances of the differences between the techniques in this respect are also given.

TABLE V

Means and Significance of Differences for Times Required for Treatment Administration

N=20 (days)

		Treatment Technique				
		A	B	C	D	E
Time in minutes per patient		5·6	5·7	3·5	5·3	5·4
σ		1·7	2·2	·82	1·6	1·7
Treatment Technique	A ..	( )	NS	**	NS	NS
	B ..		( )	*	NS	NS
	C ..			( )	**	*
	D ..				( )	NS
	E ..					( )

NS — Not significant.
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The frequencies of a number of effects of treatment for each treatment technique are given in Table VI together with statistical assessments of the differences.

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TABLE VI

Frequencies of Variables Associated with Treatment for Whole Group

N=126

	Variable	Treatment Technique					χ^2 All Groups	Significance of Differences									
		A	B	C	D	E		AB	AC	AD	AE	BC	BD	BE	CD	CE	DE
0	No. of treatments	257	259	262	243	264											
1	Premedication	18	18	25	18	15	NS										
2	Complaints	0	0	0	0	0	NS										
3	Not relaxed	24	19	omit	36	8	<1%	////		**	////	**	*	////	////	**	
4	Restless	21	11	46	38	28	<1%	**	**		**	**	**		*		
5	Cyanosis	17	10	0	31	50	<1%	**	*	**	**	**	**	**	**	*	
6	Apnoea	3	0	0	0	5	<1%							*		*	*
7	Fractures	0	0	4	0	1	5%	*			*				*		
8	Headaches	19	12	42	11	19	<1%	**			**				**	**	
9	Vomiting	5	1	4	1	3	NS										
10	Vein difficulty	10	15	omit	13	8	NS	////			////				////	////	
11	Fit difficulty	1	0	2	1	0	NS										
12	Confusion	44	40	48	43	42	NS										
13	Delayed fits	0	0	3	0	0	NS										
14	Loss of teeth	0	0	0	1	1	NS										

//// Not applicable

** Significant at 1 per cent. level or beyond.

* Significant at between 5 per cent. and 1 per cent. levels.

In Tables VII to XI the statistical assessments for the whole group split into diagnostic and age subdivisions are presented.

TABLE VII

Frequencies for Variables in Table VI for All Patients Subdivided by Diagnosis

Schizophrenia (N=78)

	Variable	Treatment Technique					χ^2	Significance of Differences									
		A	B	C	D	E		AB	AC	AD	AE	BC	BD	BE	CD	CE	DE
0		185	191	185	181	181											
1		14	14	17	12	11	NS										
2		0	0	0	0	0	NS										
3		17	17	omit	34	7	<1%		////	*	*	////	*	*	////	////	**
4		19	8	32	28	22	<1%	*	*	**		**	**	**			
5		10	1	0	18	30	<1%	**	**		**		**	**	**	**	*
6		2	0	0	0	3	NS										
7		0	0	3	0	1	NS										
8		8	7	29	6	12	<1%		**			**			**	**	
9		2	0	2	0	1	NS										
10		7	11	omit	11	6	NS		////			////			////	////	
11		0	0	1	0	0	NS										
12		38	33	41	39	38	NS										
13		0	0	1	0	0	NS										
14		0	0	0	1	0	NS										

//// Not applicable

** Significant at 1 per cent. level or beyond.

* Significant at between 5 per cent. and 1 per cent. levels.

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TABLE VIII

Frequencies for Variables in Table VI for All Patients Subdivided by Diagnosis

Affective (N=48)

Variable	Treatment Technique					χ^2	Significance of Differences									
	A	B	C	D	E		AB	AC	AD	AE	BC	BD	BE	CD	CE	DE
0	72	68	77	62	83											
1	3	4	8	6	4	NS										
2	0	0	0	0	0	NS										
3	7	2	omit	2	1	NS		////			////			////	////	
4	2	3	14	10	6	<1%		**	**		**	**			**	*
5	7	9	0	13	20	<1%		*		*	*			**	**	
6	1	0	0	0	2	NS										
7	0	0	1	0	0	NS										
8	11	5	13	5	7	NS										
9	3	1	2	1	2	NS										
10	3	4	omit	2	2	NS		////			////			////	////	
11	1	0	1	1	0	NS										
12	6	7	7	4	4	NS										
13	0	0	2	0	0	NS										
14	0	0	0	0	1	NS										

//// Not applicable
** Significant at 1 per cent. level or beyond.
* Significant at between 5 per cent. and 1 per cent. levels.

TABLE IX

Frequencies for Variables in Table VI for All Patients Subdivided by Age

<30 Years (N=37)

Variable	Treatment Technique					χ^2	Significance of Differences									
	A	B	C	D	E		AB	AC	AD	AE	BC	BD	BE	CD	CE	DE
0	101	94	92	93	95											
1	10	11	12	14	10	NS										
2	0	0	0	0	0	NS										
3	7	9	omit	17	5	5%		////	*		////			////	////	**
4	9	3	10	12	8	NS										
5	5	1	0	5	13	<1%		*		*			**	*	**	
6	3	0	0	0	1	NS										
7	0	0	0	0	0	NS										
8	9	6	15	4	10	NS										
9	0	0	1	0	0	NS										
10	5	4	omit	7	5	NS		////			////			////	////	
11	0	0	1	0	0	NS										
12	21	16	20	21	17	NS										
13	0	0	0	0	0	NS										
14	0	0	1	0	0	NS										

//// Not applicable
** Significant at 1 per cent. level or beyond.
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TABLE X

Frequencies for Variables in Table VI for All Patients Subdivided by Age

30–50 Years (N=64)

Variable	Treatment Technique					χ^2	Significance of Differences									
	A	B	C	D	E		AB	AC	AD	AE	BC	BD	BE	CD	CE	DE
0	142	140	146	136	134											
1	13	11	18	7	7	NS										
2	0	0	0	0	0	NS										
3	14	8	omit	21	4	<1%	////				////	*		////	////	*
4	12	8	33	27	16	<1%		**	**		**	**			*	
5	6	4	0	18	19	<1%		*	**	**	*	**	**	**	**	
.. ..	1	0	0	1	1	NS										
7	0	0	2	0	1	NS										
8	10	7	22	8	9	5%		*			**			*	*	
9	5	1	2	1	2	NS										
10	5	6	omit	3	2	NS	////				////			////	////	
11	1	0	1	0	0	NS										
12	22	25	20	20	24	NS										
13	0	0	3	0	0	NS										
14	0	0	1	0	0	NS										

//// Not applicable
** Significant at 1 per cent. level or beyond.
* Significant at between 5 per cent. and 1 per cent. levels.

TABLE XI

Frequencies for Variables in Table VI for All Patients Subdivided by Age

>50 Years (N=25)

Variable	Treatment Technique					χ^2	Significance of Differences									
	A	B	C	D	E		AB	AC	AD	AE	BC	BD	BE	CD	CE	DE
0	42	43	49	39	58											
1	2	1	1	2	1	NS										
2	0	0	0	0	0	NS										
3	3	2	omit	1	0	NS	////				////			////	////	
4	0	0	4	0	4	NS										
5	7	5	0	11	21	<1%		*			*		**	**	**	
6	1	0	0	0	3	NS										
7	0	0	2	0	0	NS										
8	4	0	4	2	1	NS										
9	0	0	1	0	0	NS										
10	0	5	omit	3	1	NS	////				////			////	////	
11	1	0	0	1	1	NS										
12	6	6	12	3	6	NS										
13	0	0	0	0	0	NS										
14	0	0	0	0	1	NS										

//// Not applicable
** Significant at 1 per cent. level or beyond.
* Significant at between 5 per cent. and 1 per cent. levels.

Data regarding patients' preferences for treatment are given in Tables XII to XXI. In these Tables the total group of patients has been subdivided again by age and by diagnosis.

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TABLE XII

Average Like/Dislike Ratio for Each Technique with Statistical Assessment of the Differences

N=63

		Treatment Technique				
		A	B	C	D	E
Mean ratio		2·41	1·58	1·18	1·16	·83
σ		2·17	1·35	1·46	1·11	·65
Treatment Technique	A ..	( )	**	**	**	**
	B ..		( )	NS	*	**
	C ..			( )	NS	*
	D ..				( )	*
	E ..					( )

NS — Not significant.
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* — Significant at between 5 per cent. and 1 per cent. levels.

TABLE XIII

Average Like/Dislike Ratio for Each Technique for Schizophrenic Patients with Statistical Assessment of the Differences

N=39

		Treatment Technique				
		A	B	C	D	E
Mean ratio		2·12	1·44	1·08	1·07	·85
σ		1·81	1·26	·97	·73	·57
Treatment Technique	A ..	( )	*	**	**	**
	B ..		( )	NS	NS	**
	C ..			( )	NS	NS
	D ..				( )	NS
	E ..					( )

NS — Not significant.
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* — Significant at between 5 per cent. and 1 per cent. levels.

TABLE XIV

Average Like/Dislike Ratio for Each Technique for Affective Patients with Statistical Assessment of the Differences

N=24

		Treatment Technique				
		A	B	C	D	E
Mean ratio		2·86	1·80	1·35	1·29	·78
σ		2·59	1·46	2·01	1·53	·77
Treatment Technique	A ..	( )	*	**	**	**
	B ..		( )	NS	NS	**
	C ..			( )	NS	NS
	D ..				( )	NS
	E ..					( )

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TABLE XV

Average Like/Dislike Ratio for Each Technique for Patients Under 40 Years with Statistical Assessment of the Differences

N=42

		Treatment Technique				
		A	B	C	D	E
Mean ratio		2·54	1·60	1·20	1·29	·72
σ		2·33	1·46	1·63	1·12	·39
Treatment Technique	A ..	( )	**	**	**	**
	B ..		( )	NS	NS	**
	C ..			( )	NS	*
	D ..				( )	**
	E ..					( )

NS — Not significant.
** — Significant at 1 per cent. level or beyond.
* — Significant at between 5 per cent. and 1 per cent. levels.

TABLE XVI

Average Like/Dislike Ratio for Each Technique for Patients Over 40 Years with Statistical Assessment of the Differences

N=21

		Treatment Technique				
		A	B	C	D	E
Mean ratio		2·13	1·55	1·15	·90	1·03
σ		1·79	1·10	1·05	1·05	·97
Treatment Technique	A ..	( )	NS	**	**	**
	B ..		( )	NS	NS	NS
	C ..			( )	NS	NS
	D ..				( )	NS
	E ..					( )

NS — Not significant.
** — Significant at 1 per cent. level or beyond.
* — Significant at between 5 per cent. and 1 per cent. levels.

TABLE XVII

Mean Ranks of Patients' Global Preferences for Technique and Significance of Differences

N=63

		Treatment Technique				
		A	B	C	D	E
Mean rank		2·5	2·5	3·7	3·1	3·1
σ		·78	·57	1·22	·48	·37
Treatment Technique	A ..	( )	NS	*	**	**
	B ..		( )	*	**	**
	C ..			( )	NS	NS
	D ..				( )	NS
	E ..					( )

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TABLE XVIII

Mean Ranks for Global Preferences of Patients Over 40 Years of Age and Significance of Differences

N=21

		Treatment Technique				
		A	B	C	D	E
Mean rank		2·6	2·6	3·5	3·1	3·1
σ		·65	·65	1·37	·45	·45
Treatment Technique	A ..	( )	NS	*	**	**
	B ..		( )	*	**	**
	C ..			( )	NS	NS
	D ..				( )	NS
	E ..					( )

NS — Not significant.
** — Significant at 1 per cent. level or beyond.
* — Significant at between 5 per cent. and 1 per cent. levels.

TABLE XIX

Mean Ranks for Global Preferences of Patients Under 40 Years of Age and Significance of Differences

N=42

		Treatment Technique				
		A	B	C	D	E
Mean rank		2·6	2·6	3·7	3·1	3·1
σ		·80	·81	1·17	·67	·68
Treatment Technique	A ..	( )	NS	*	**	**
	B ..		( )	*	**	**
	C ..			( )	**	**
	D ..				( )	NS
	E ..					( )

NS — Not significant.
** — Significant at 1 per cent. level or beyond.
* — Significant at between 5 per cent. and 1 per cent. levels.

TABLE XX

Mean Ranks for Global Preferences of Schizophrenic Patients and Significance of Differences

N=39

		Treatment Technique				
		A	B	C	D	E
Mean rank		2·6	2·6	3·6	3·1	3·1
σ		·60	·61	1·29	·52	·52
Treatment Technique	A ..	( )	NS	**	**	**
	B ..		( )	**	**	**
	C ..			( )	**	**
	D ..				( )	NS
	E ..					( )

NS — Not significant.
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TABLE XXI

Mean Ranks for Global Preferences of Affective Patients and Significance of Differences

N=24

		Treatment Technique				
		A	B	C	D	E
Mean rank		2·6	2·6	3·9	3·0	3·0
σ		·58	·57	1·31	·39	·40
Treatment Technique	A ..	( )	NS	**	**	**
	B ..		( )	**	**	**
	C ..			( )	**	**
	D ..				( )	NS
	E ..					( )

NS — Not significant.
** — Significant at 1 per cent. level or beyond.
* — Significant at between 5 per cent. and 1 per cent. levels.

IV DISCUSSION OF RESULTS

As might have been expected, it is far quicker for the psychiatrist to administer electroplexy when anaesthetics and relaxants are not used. The total times required to complete treatment (Table V) using Pentothal and a relaxant, or a relaxant alone, were both significantly longer than when it was given unmodified. The times taken to give E.C.T. with and without anaesthesia were not significantly different. Although important, time should not be the doctor's primary consideration in the choice of an electroplexy technique, especially when the disadvantages of unmodified treatment may outweigh its other benefits.

(a) *Recovery times.* Phase I was significantly prolonged (Table II) by unmodified E.C.T. compared with all the other techniques, and was significantly shorter in the group receiving anaesthetics than those having relaxants alone. By contrast, Phase II (Table III) was lengthened when anaesthetics and relaxants were used, confirming that these drugs significantly delay the return of respiration. The results shown in Table IV indicate that Phase III was significantly prolonged when Pentothal was given compared to the other techniques. With this phase the differences between the unmodified group and those receiving relaxants alone were not significant.

As far as Phase I is concerned, these findings are opposed to those of Little and Reid (5), who noticed the prolongation of this phase after Scoline. The results, however, accord with those reported by these writers with respect to Phases II and III.

(b) *Effects of treatment.* The patients receiving the Ectonus technique with Brevidil "E" had significantly more well relaxed fits than those given all other modified techniques, confirming the advantages of Ectonus over the instantaneous stimulus in smoothing out the convulsion. The results of this study supported the observations of Havens (4), that restlessness occurred significantly more frequently after the unmodified technique, and also indicated that when anaesthetics and relaxants were combined there was significantly less post-E.C.T. restlessness than when relaxants were given by themselves.

By contrast, cyanosis requiring oxygen administration occurred signifi-

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cantly less frequently after unmodified E.C.T. compared with the other techniques, but headaches were significantly more frequent after unmodified treatment.

Fractures, as might have been expected, were more numerous after unmodified treatment, although the difference between unmodified E.C.T. and Ectonus with Brevidil "E" in this respect just failed to reach statistical significance. Five mid-dorsal fractures, confirmed by X-ray, occurred during the investigation. Four followed the unmodified technique, and one followed Ectonus E.C.T. with Brevidil "E", in a patient who appeared to have a well-relaxed fit. There was no evidence of any residual disability. A few patients complained of temporary back pain following unmodified treatment, but this was not sufficiently severe to warrant radiological examination.

There were eight instances of prolonged apnoea following relaxants during the investigation. Apnoea following Ectonus E.C.T. with Brevidil "E" occurred significantly more frequently than with the other techniques. The majority were fortunately of only a few minutes duration with normal recovery, but one patient did not breathe spontaneously for one hour following Ectonus E.C.T. with Brevidil "E", and showed severe depression of the serum pseudocholinesterase level. His case has previously been reported (2). The remainder showed only slightly depressed or normal serum pseudocholinesterase levels, implying that the apnoea was induced by other mechanisms (2). It was also observed that apnoea was frequently repeated in the same patient undergoing successive treatments, and in this series appeared to be unrelated to age.

None of the other recorded effects of treatment proved to be statistically significant.

When the whole group of patients were subdivided into smaller groups according to diagnosis (Tables VII and VIII) or to age (Tables IX, X, and XI) the incidence of treatment effects did not prove to be essentially different.

(c) *Patients' preferences.* In contrast to the findings of Havens (4), the results from both the global interview (Table XVII) and the like/dislike ratios (Table XII) indicated that a significantly larger proportion of our patients favoured E.C.T. given with an anaesthetic. Interesting differences were noticed using the different methods of obtaining preference with regard to unmodified techniques and those in which relaxants were administered alone. The global preference indicated that unmodified E.C.T. was the most unpopular technique, whereas the results of the like/dislike ratios implied that significantly more patients preferred this method to E.C.T. modified with Brevidil "E" without anaesthesia. This may well be associated with unpleasant suffocating sensations with the latter technique, vividly impressed upon the patient's memory, which have been forgotten at the time of the final interview because of E.C.T. confusion.

The possibility of obtaining a discrepancy in the results of patients' preferences for techniques, which is clearly dependent upon the method of obtaining the patients' preferences, should always be borne in mind in this type of investigation. Because of the confusion following a course of E.C.T. we would suggest that the paired preference technique has more value than the patient's global assessment on completion of his E.C.T. course, and therefore that the patient's preference for unmodified E.C.T. is greater than his preference for E.C.T. with relaxants alone.

Subdivisions of the total group by age and by diagnosis (Tables XIII, XIV, XV, XVI, and XVIII, XIX, XX, and XXI) give results which are not essentially different from the whole group.

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V Conclusions

Whilst other studies (4, 7) have shown no significant differences in the long-term therapeutic effectiveness of modified versus unmodified E.C.T., this investigation was constructed to examine the immediate merits and demerits of different electroplexy techniques. A comparison of these techniques shows that all have advantages and disadvantages with which the psychiatrist must be familiar. The risk of fractures following the unmodified technique is perhaps the most serious disadvantage of all.

In the absence of differential long-term therapeutic effects of modified and unmodified treatment, and in view of the present data which are conflicting for the criteria tested, it would appear that the patient's own preference should be given careful consideration. This, according to our data, is for electroplexy administered under anaesthesia, whilst the addition of a relaxant will reduce the possibility of the occurrence of fractures. These results imply that an anaesthetist should *always* be available during treatment sessions, which is not at present the case (1).

For the patient requiring E.C.T. at out-patient clinics it may be considered advisable to administer electroplexy without anaesthetics which significantly delay the return of consciousness, so as to enable patients to return home or to work in the shortest possible time. It should be remembered, however, that the duration of unconsciousness, although longer for electroplexy given under anaesthesia is longer by only three minutes—a difference which might be considered negligible.

VI Summary

Five different electroplexy techniques have been compared, using 126 male patients with diagnoses of schizophrenia or affective psychosis.

The results suggest that patients' preferences ought to be given consideration in deciding the choice of treatment technique.

The patients in this study consistently chose to have their electroplexy under anaesthesia, while the administration of a relaxant in addition will reduce the possibility of fracture.

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