

OBSERVATIONS ON THE TREATMENT OF THE DEPRESSIVE PSYCHOSES
BY ELECTRICALLY INDUCED CONVULSIONS : WITH SPECIAL
REFERENCE TO THE MODUS OPERANDI OF THIS
FORM OF THERAPY.

by

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PREFACE

The work described in this thesis was commenced in November , 1942.

Of the series of 120 patients , 40 were under treatment at St. George's Hospital , Morpeth , Northumberland, and the remainder at Newcastle City Mental Hospital.

I am indebted to Dr. J. R. Murray , Superintendent of St. George's Hospital , and Dr. H. D. Mac.Phail , Medical Superintendent of Newcastle City Mental Hospital , for permission to use the case material and for facilities to carry out the work.

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PART I

OBSERVATIONS ON THE TREATMENT OF THE DEPRESSIVE PSYCHOSES
BY ELECTRICALLY INDUCED CONVULSIONS.

CHAPTER I.Introduction

Since its introduction in 1934 by von Meduna (1) , Convulsive Therapy has been used to a greater extent each year until now it is an acknowledged form of treatment in most Mental Hospitals.

The use of electricity in the production of Convulsions was initiated in 1938 by Cerletti and Bini (2) , and in 1939 , Shepléy and Mc.Gregor (3) described a British apparatus which embodied certain improvements on the original.

As results in the treatment of Schizophrenia were disappointing , this method of treatment was extended to various other types of Psychoses. In 1941 , Metcalfe (4) drew attention to the fact that the Affective Psychoses responded much better to treatment by Electrically Induced Convulsions than did Schizophrenia. It is now generally recognized that this form of therapy is almost specific in the treatment of Depressive States of non-schizophrenic origin , though actual statistical evidence was lacking until figures were recently published by Fitzgerald (5) and Batt (6).

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CHAPTER II .Technique

The apparatus used is the standard product of the Edison Swan Electric Company , and treatment is given at 10-30 a.m. on three days per week . (Monday , Wednesday , and Friday). The patients in this series received no food after 5 p.m. on the previous evening.

As all the beds in the Admission Ward are wheeled , the patients can be taken to the treatment room and returned to the ward after treatment with a minimum disturbance to the patient and a minimum of effort on the part of the Nursing Staff ; the patient receiving the treatment in his or her own bed. An ordinary mattress is used , but the foot-rail of the bed is suitably padded with pillows. The bedclothes are not tucked in at the sides of the bed and are turned back at the lower end to expose the feet and ankles of the patient.

The lead electrodes of the apparatus are covered with two thicknesses of non-medicated lint soaked in ~~hyp~~ertonic saline . (20%). No contact cream is used and

there is no local preparation of the patient's head.

A standard dose of 120 volts at 0.3 sec.

is used and few patients fail to respond to the first passage of this current. During the convulsion , the Medical Officer stands at the head of the bed and controls the patient's jaw movements , while three nurses stand round the bed to control any excessive movements of the limbs , but this is rarely necessary.

A course of treatment consisting of ten Electrically Induced Convulsions is administered to each patient and , should there be any relapse in the patient's condition , a further course of six Convulsions is given.

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CHAPTER IIIComplications

With the method described in the previous chapter , the complications have been fortunately few in number and of little consequence. They comprise one dislocated jaw (in a patient who had had frequent subluxations of the temporo-mandibular joint on previous occasions prior to admission) and a slight haemarthrosis of the shoulder joint in a recently admitted case suffering from sub-clinical scurvy. The latter condition cleared up on intensive treatment with Vitamin C and Convulsive Therapy was resumed with excellent results. As there is no reference to this type of complication in the literature on this subject and as the condition of sub-clinical scurvy is by no means a rarity during the present Emergency , a résumé of his case history is given below.

No. 33 Age 51 Single Labourer Admitted 4/4/43.

5/4/43. A small , poorly nourished man . He is very depressed and apprehensive and is extremely agitated. Has attempted suicide on three recent occasions.

- 3/5/43. He does not improve and is still very dull , depressed and agitated. A course of Electrically Induced Convulsions was commenced today.
- 5/5/43. An hour after treatment today , he complained of pain in the right shoulder. Examination reveals tenderness posteriorly , slight limitation of movement and slight swelling of the joint.
- 6/5/43. The joint swelling is slightly increased and a fairly large bruise has appeared over the right scapula.
Vitamin C content of Urine :- 5 mgm.%.
100 mgm. Vit. C administered t.i.d..
- 13/5/43. All trace of swelling has disappeared and there is only slight limitation of movement.
- 17/5/43. Convulsive Therapy was resumed today.
- 19/5/43. 4th. treatment was given this morning. Patient is much brighter though inclined to be hypochondriacal.
- 25/5/43. Patient has now had 6 Convulsions and is bright and cheerful. He is beginning to take more interest in his surroundings.
- 5/6/43. Treatment completed. Patient is now alert , bright, cheerful , takes an interest in everything and states that he wishes to resume work as soon as possible.
- 21/6/43. Improvement has been well maintained , and he was today granted a month's leave.

19/7/43. There appears to be no tendency towards relapse and he was today discharged RECOVERED.

(the Vitamin C in Urine was estimated by the modified method of Harris and Abbasy (1).

The only other complication occurred in a Norwegian patient , who had a complete cessation of respiration after each convulsion . On each occasion artificial respiration was applied , and it was usually at least five minutes before the patient was again breathing normally. He was in excellent physical condition and there was no abnormality of the heart or lungs. It was found that the administration of Amphetamine Sulphate in 10mgm. doses , forty minutes before treatment , partially prevented this occurrence.

The complications referred to above , were the only ones noted in a series of over 2000 Electrically Induced Convulsions. This compares favourably with the statement by Kolb and Vogel (3) that the average incidence of mechanical injuries is 0.9% .

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CHAPTER IVResults

Of the 120 Depressive Cases treated , 97 recovered and 23 were relieved.

For the purpose of analysis , these patients were classified as follows :-

- (a) First attack cases.
- (b) Recurrent cases .
- (c) Involutional cases.

- (a) 33 out of 35 cases in this group recovered , representing a recovery rate of 94% .
- (b) 42 out of 60 cases in this group recovered , representing a recovery rate of 70%.
- (c) 22 out of 25 cases in this group recovered , representing a recovery rate of 88%.

The spontaneous remission rate in patients suffering from Affective Psychoses treated in this hospital

(Newcastle City Mental Hospital) during the past ten years , has been 38% . The average period of hospitalisation of " first attack " was 11 months . The use of Electro- Convulsive Therapy has reduced the latter period to 2 months , and has increased the recovery rate to 80% .

In 18 out of the 23 cases which were relieved , the Depressive Psychosis was complicated by a marked Anxiety Neurosis . Treatment by Electrically Induced Convulsions was successful in abolishing suicidal tendencies , extreme depression and apathy , but the neurotic symptoms persisted.

There is very little published work dealing with the effects of this form of therapy on the Depressive Psychoses. In a series of 55 cases , Furst (1) claimed a recovery rate of only 40% , Hemphill and Grey Walter (2) and Gonda (3) have published small series and claim a recovery rate of 88% and 90% respectively. In the series published by Fitzgerald (4) , the recovery rate was 78% , while Batt (5) claims a " Success Percentage " of 87% .

Contrary to the findings of Fitzgerald (4) , most of the cases in this series showed a marked improvement after 5 Convulsions had been induced.

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PART II

TESTS CARRIED OUT TO DETERMINE THE MODUS OPERANDI
OF TREATMENT BY ELECTRICALLY INDUCED CONVULSIONS.

INTRODUCTION.

This investigation was undertaken to test the correctness of the theory which attributes the therapeutic effects of Convulsive Therapy to stimulation of the vegetative centres.

100 of the patients mentioned in Part I were the subjects of the investigation. In each patient, the Basal Metabolic Rate, the Specific Dynamic Action of Protein, and the Fasting Blood Sugar were determined before, during, and after a course of treatment by Electrically Induced Convulsions. In 50 of these patients, the Parotid Secretory Rate was determined under similar conditions.

Gastric Analysis was carried out on 60 of the above patients, but the results were not at all convincing and are therefore not included in this thesis. Estimations of Blood Iodine were attempted, but were discontinued owing to inconsistent results and the technical difficulties involved.

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CHAPTER IEstimations of Basal Metabolic Rates
and Specific Dynamic Action of Protein.TECHNIQUE

The Basal Metabolic Rate was estimated in all patients on three occasions before the commencement of treatment, and an average figure was thus obtained. Thereafter, this test was carried out at 10 a.m. on the days of treatment.

The method used was that introduced by Read (1), and the results were calculated from the following formula :-

Basal Metabolic Rate =

$$0.683 (\text{Pulse Rate} + 0.9 \text{ Pulse Pressure}) - 71.5$$

Although it is admitted that this method may not be strictly accurate, it is recorded by Beaumont and Dodds (2) that the error does not exceed 10% as compared with the results obtained with the Benedict - Roth Apparatus (3)

or the Douglas Bag (4) . In any case , it is much easier to ensure basal conditions with the patient lying in his own bed - the only apparatus used being the sphygmomanometer with which most patients are fairly familiar - than by isolating him in a special room and surrounding him with complicated apparatus. Furthermore , although a patient suffering from one of the Depressive Psychoses may be perfectly content to lie still for hours , it is a different matter to obtain the degree of co-operation necessary for breathing correctly into a tube. Taking these facts into consideration , it is therefore submitted that , with the employment of adequate precautions , this method is as accurate as any other.

As was indicated in Part I , the patients received no food from 5 p.m. on the previous evening , and they were not allowed out of bed for any purpose on the morning of the test. Reading and smoking were also prohibited . At 9.20 a.m. each patient urinated into a urine bottle and then lay flat , perfectly still , and the first patient did not speak for the next forty minutes. At 9.50 a.m. had his pulse rate taken over a period of two minutes.

As there were usually ten patients undergoing treatment at the same time , the last patient had his pulse rate and Blood Pressure estimated at approximately 10.10 a.m.. The whole process was carefully explained to each patient , and several trial estimations were carried out before the first recorded test. The patients lay in bed with the right arm uncovered , and it was arranged that the same nurse would on each occasion take all the pulse rates just before the blood pressures were taken.

Owing to War Conditions , it was impossible to give a standard protien meal to these patients , but the Specific Dynamic Action of Protien was estimated by determining the Metabolic Rate two hours after lunch and comparing the results with those obtained from 20 controls who received an identical meal . (in each case , part of the patients normal diet). The precautions adopted were similar to those mentioned above in connection with the estimation of Basal Metabolism. Each patient lay flat in bed after lunch (12,noon) and passed urine into a urine bottle at 1.30 p.m. No talking or smoking were allowed until

after the pulse rates and blood pressures were taken at 2 p.m.. The Basal Metabolic Rates of the controls were estimated at 9.30 a.m. , an identical technique being adopted.

(Note ; - As mentioned in Part I , it was necessary to keep all patients in bed during the course of treatment by Electrically Induced Convulsions , in order that the Metabolic Rate should not be affected by exercise. It will also be noted that these patients received neither supper nor breakfast on three days per week , for an average period of four weeks. Notwithstanding this , every patient gained weight during treatment - the increase ranging from three pounds to one and a half stones.).
(See Appendix pps.83 - 91).

RESULTS

A detailed list of results will be found in the Appendix. (page 50).

Fig. I is a graphical representation of the results of treatment by Electrically Induced Convulsions on the Basal Metabolic Rate of an average Depressive. Before treatment , the Basal Metabolic Rates of these patients varied from +0.2 to - 15 , the average being in the region of - 6 . It would therefore appear that the

Basal Metabolic Rate in Depressives tends to be low.

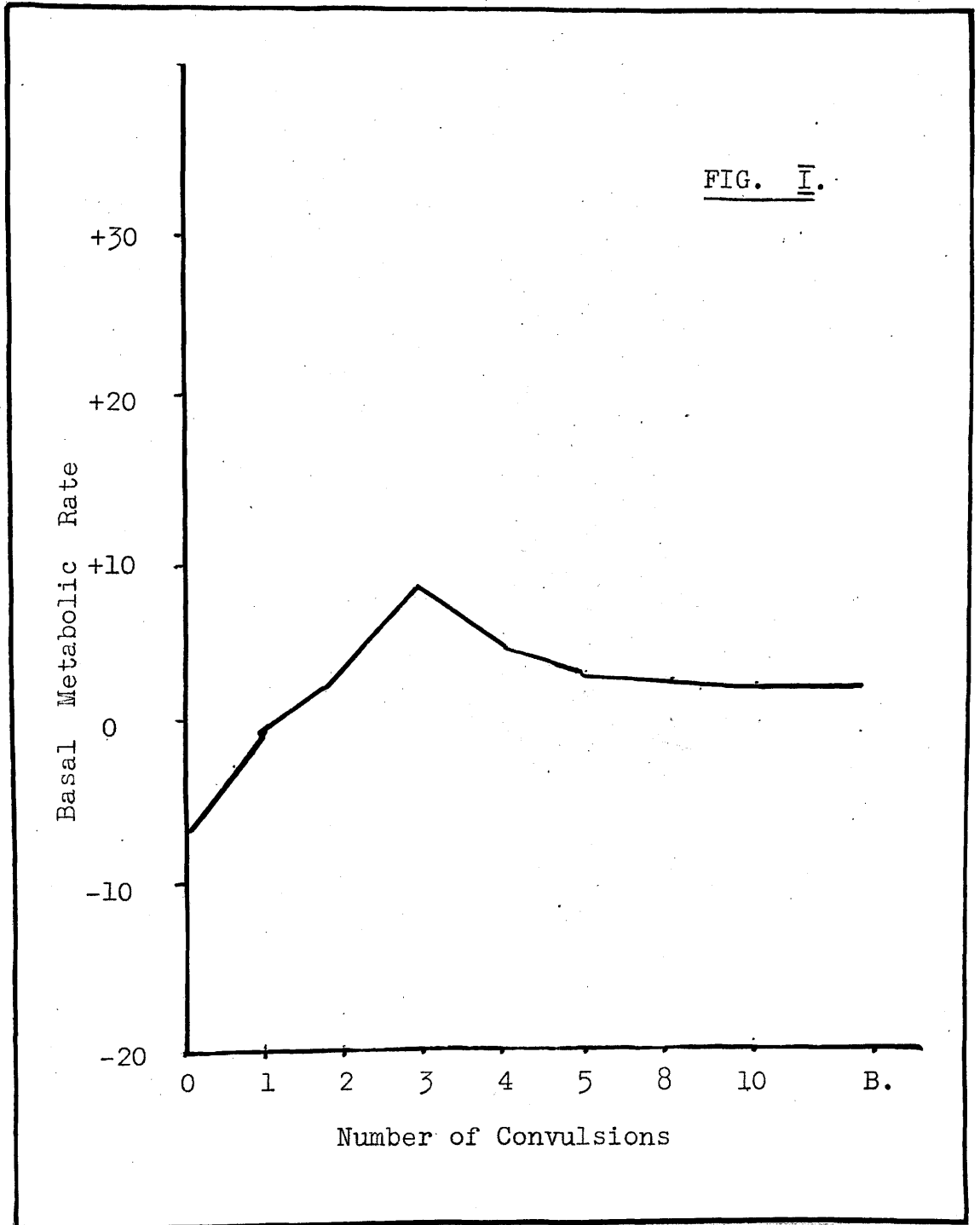


Fig. II represents the results of treatment on a case of Depression of Schizophrenic origin (not included in this series) , which did not respond well to this form of therapy. The patient , a chronic case of several years' standing , became slightly brighter after the second induced convulsion , but thereafter quickly relapsed to his former condition though treatment was still in progress. It will be noted that , in this case , the Basal Metabolic Rate was apparently originally stimulated , but shortly after was reduced to its initial low level.

It seems , therefore , that , in the early stages of treatment by Electrically Induced Convulsions , the Basal Metabolic Rate is stimulated to an extent which roughly corresponds to the clinical improvement in the case. Thereafter , in favourable cases , the Basal Metabolic Rate is maintained at a higher level , which is well within the limits of normality.

(Case A.L.)

FIG. II.

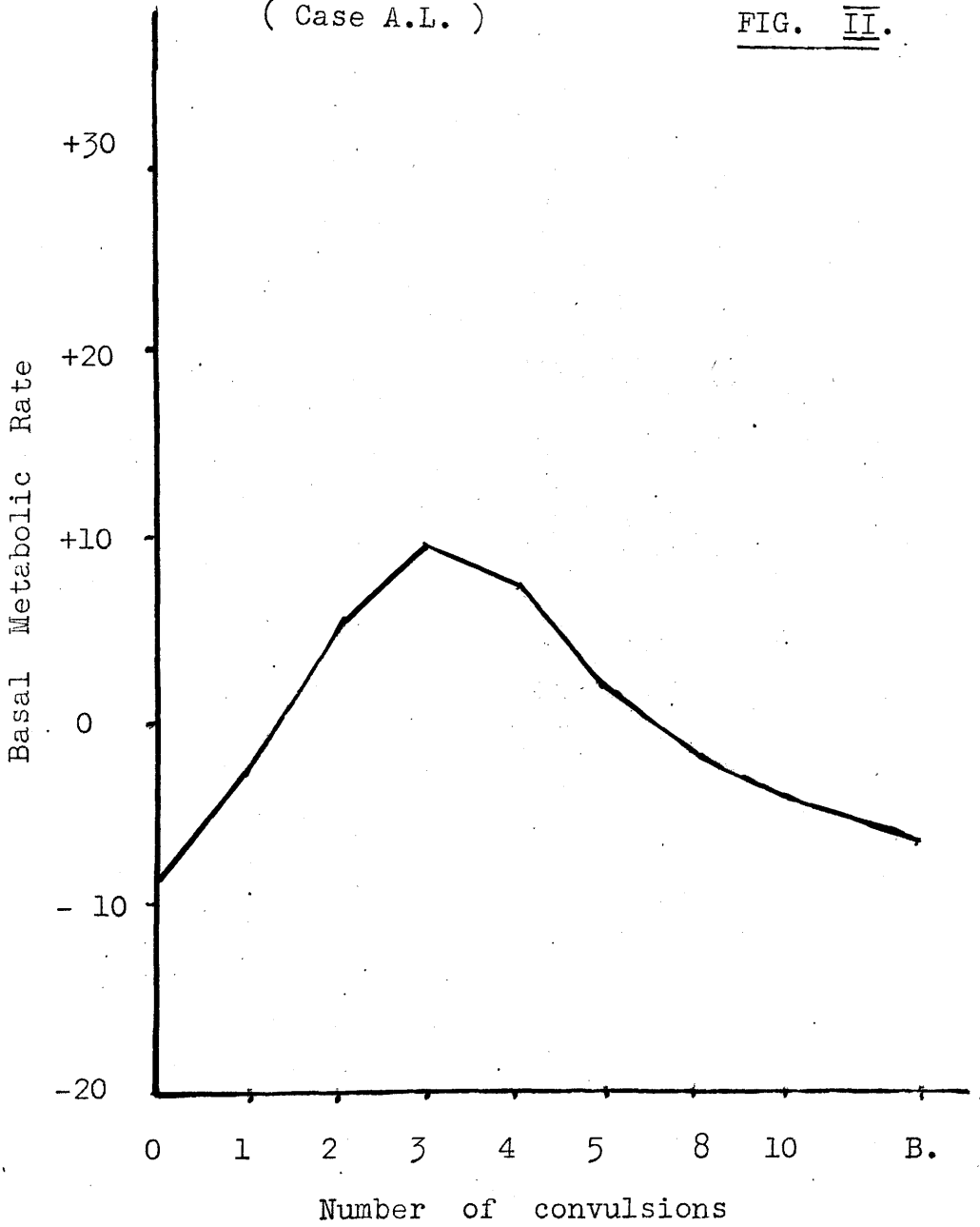


Fig. III represents the results of treatment on one of the patients of this series , who originally was improved to a marked extent , but subsequently relapsed and once more became very depressed and apathetic. A further series of six Electrically Induced Convulsions was administered and a further marked improvement took place. This improvement was maintained and he was eventually discharged recovered. It will be noted that , in this case , the Basal Metabolic Rate was originally stimulated and , for three weeks , a new higher level was maintained. A few days after the cessation of treatment , however , it was noted that he had relapsed clinically . Estimations of the Basal Metabolic Rate demonstrated that this had fallen to a lower level , and this fall continued until treatment was resumed. Thereafter , the level again rose and was more permanently maintained. An estimation carried out immediately prior to the patient's discharge from hospital , showed that there had been no further tendency towards lowering of the Basal Metabolic Rate. This record provides further confirmation of the relation between the level of Basal Metabolism and the clinical condition of the patient.

(Case No. 33)

FIG. III.

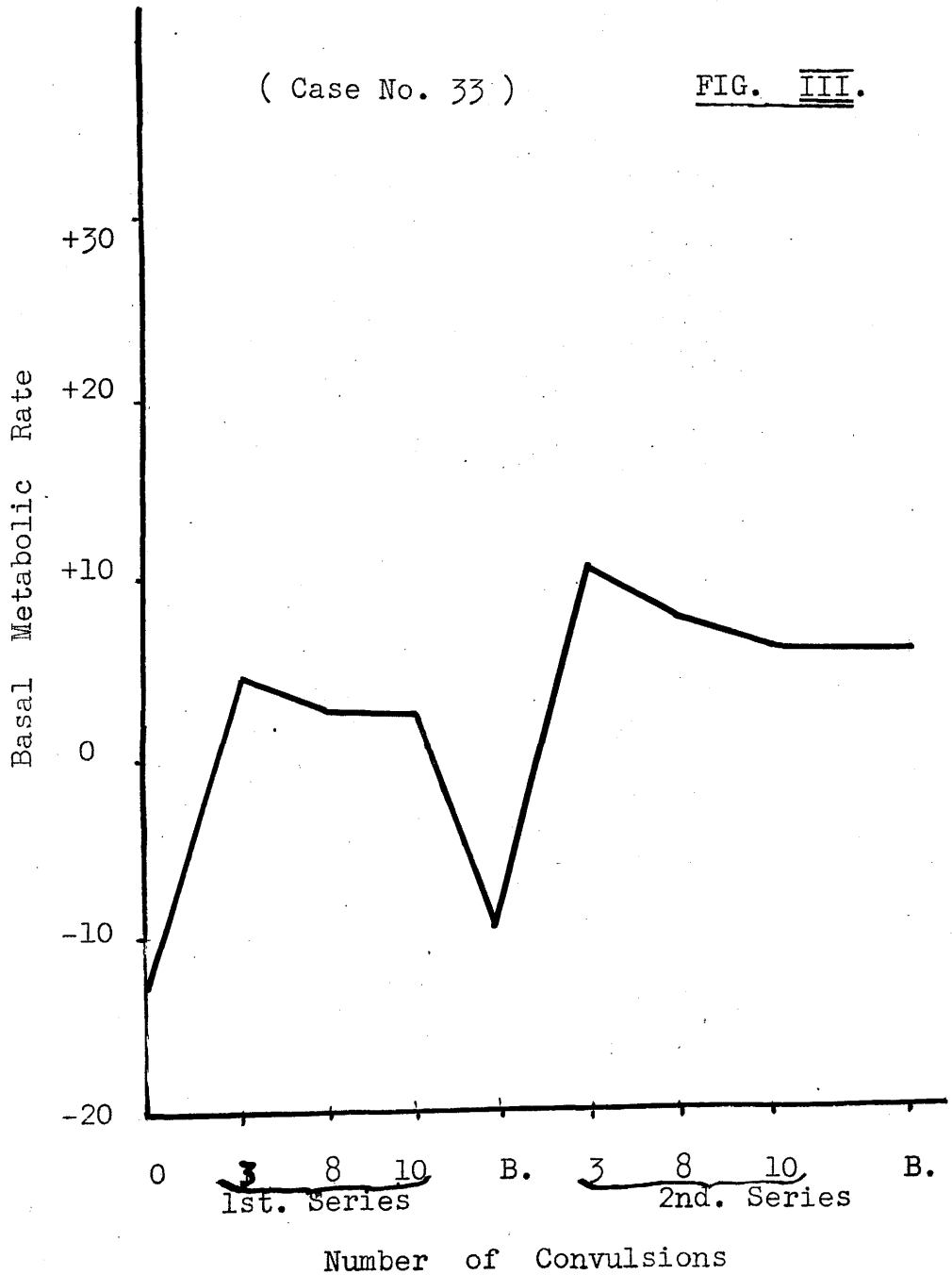
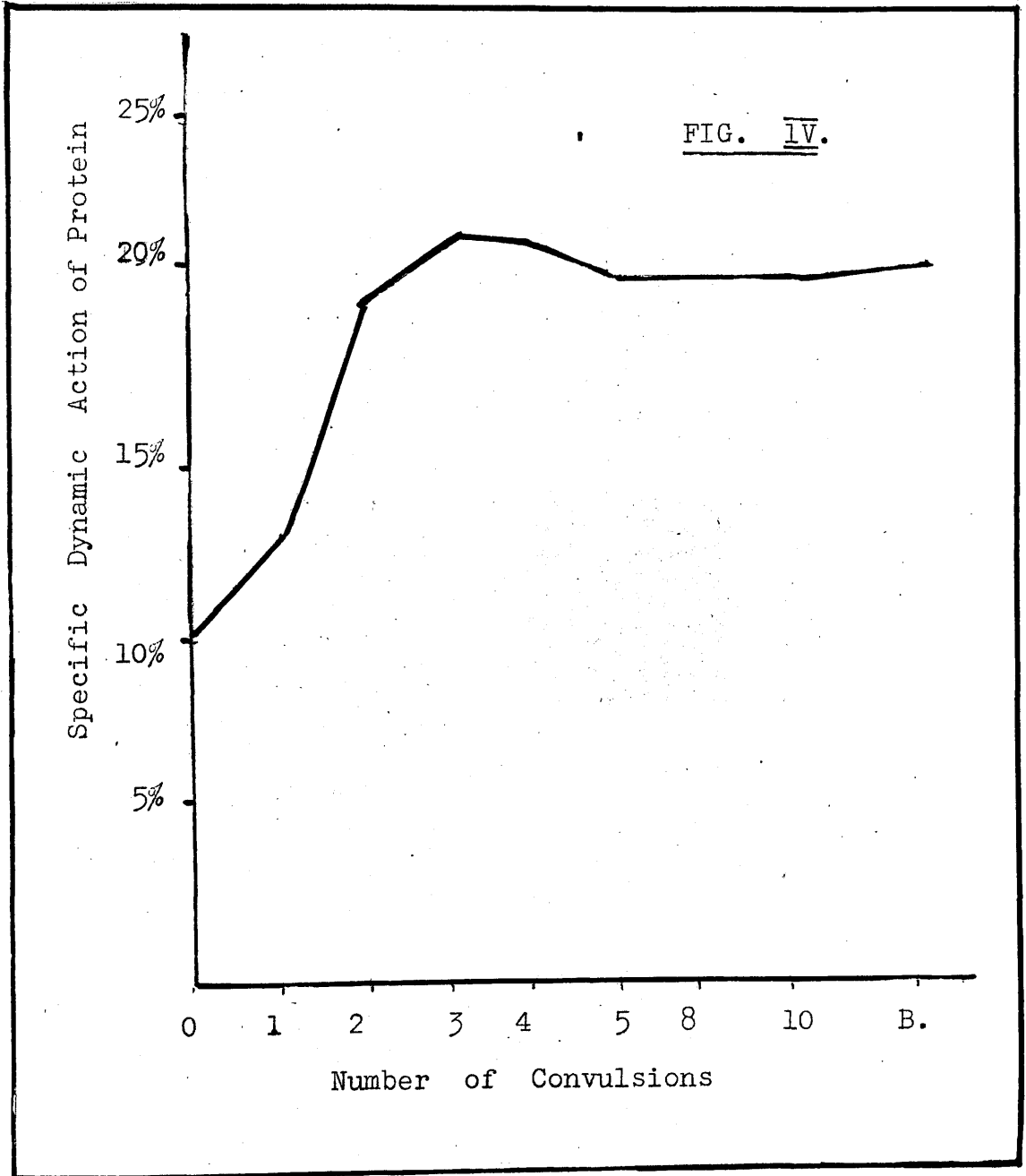


Fig. IV is a graphical representation of treatment by Electrically Induced Convulsions, on the Specific Dynamic Action of Protein in an average Depressive.



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CHAPTER II.Blood Sugar Estimations

Owing to War Conditions , the use of glucose for Sugar Tolerance Tests was out of the question, so Fasting Blood Sugar Levels ~~were~~ alone estimated.

TECHNIQUE

5 c.c. of blood was withdrawn from each patient prior to the commencement of a course of treatment by Electrically Induced Convulsions. This was repeated on four occasions during the course of treatment. The collection of blood was carried out at 9 a.m. , the patients having fasted as described in Chapter I .

The Colorimetric Method, in which a protein - free filtrate is prepared as described by Folin and Wu (1) , was employed.

RESULTS.

Full results of these estimations will be found in the Appendix (page 69).

Fig. V is a graphical representation of the results of treatment by Electrically Induced Convulsions on the Fasting Blood Sugar Level of an average Depressive. It will be noted that the average fasting blood sugar level of these cases tends to be high , though still within normal limits. Soon after the commencement of treatment , it will be observed that the level falls and then rises slightly , the latter level being maintained . As in the case of the Basal Metabolic Rate ; the Blood Sugar Level (fasting) corresponds to the clinical improvement of the patient.

Fig. VI is a graphical representation of the results of treatment on the Fasting Blood Sugar Level of the Schizophrenic patient whose Basal Metabolism Curve is recorded in Fig. II (page 20). It will be noted that the Fasting Blood Sugar Level does not vary much as a result of treatment.

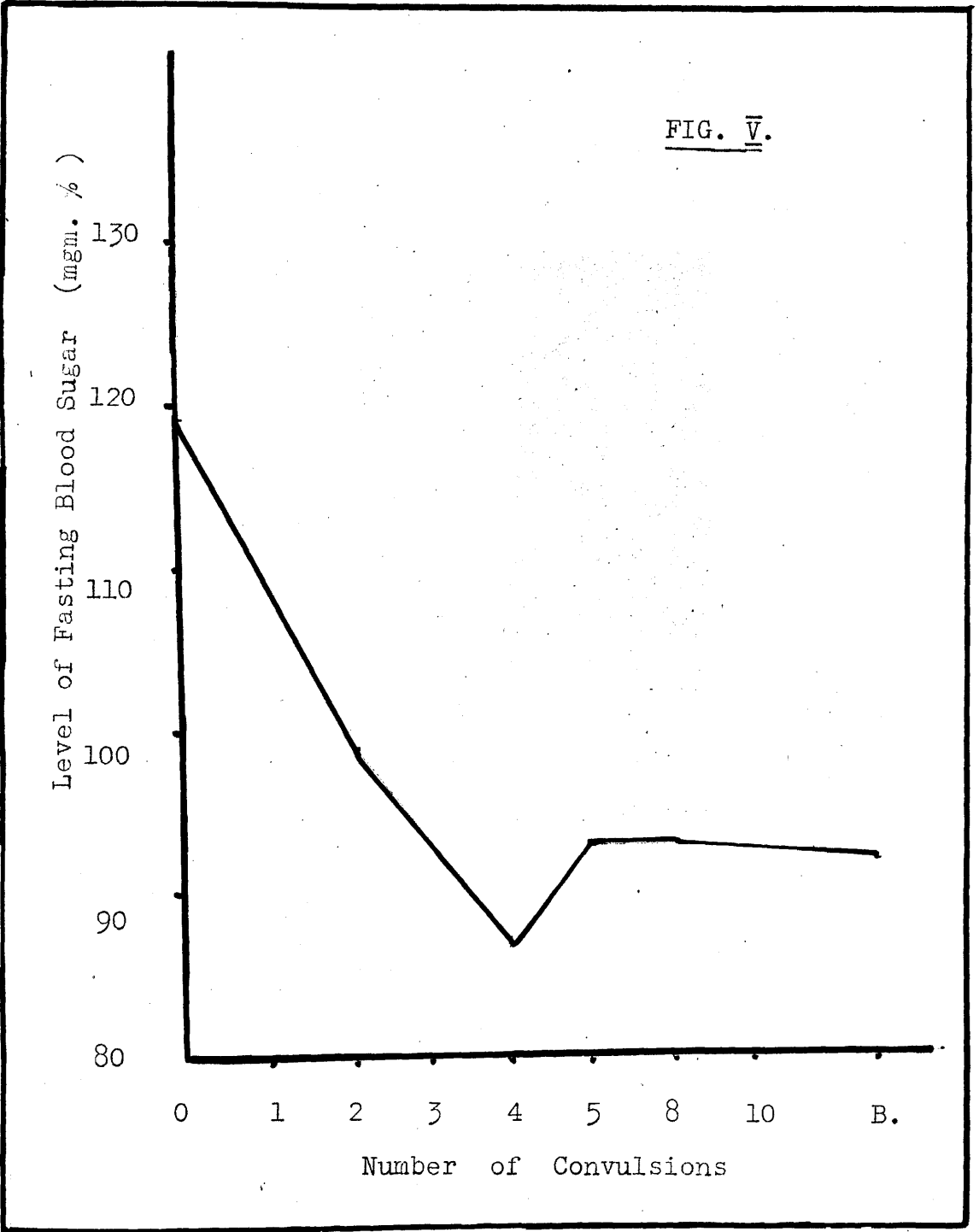
Level of Fasting Blood Sugar (mgm. %)

FIG. V.

130
120
110
100
90
80

0 1 2 3 4 5 8 10 B.

Number of Convulsions



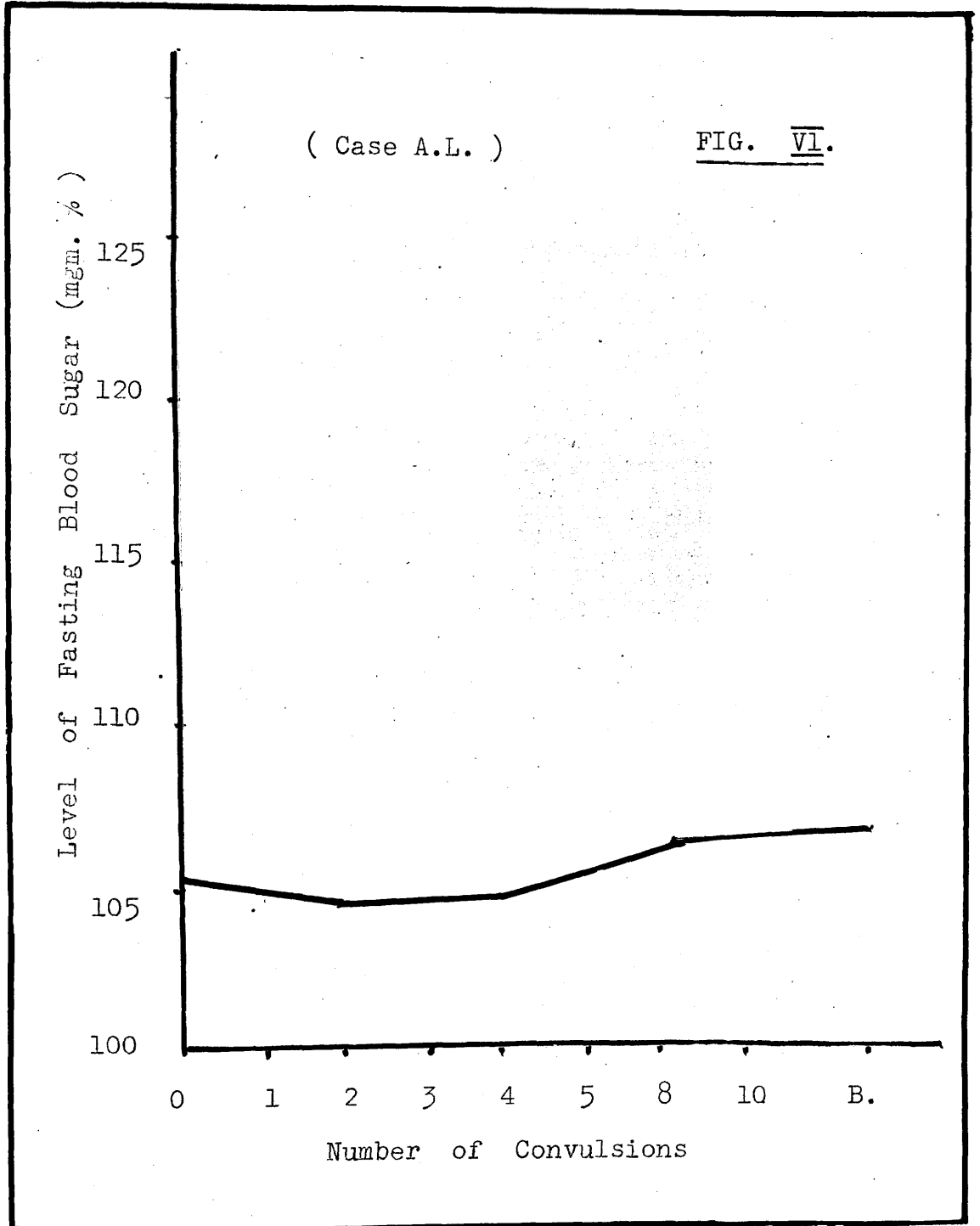


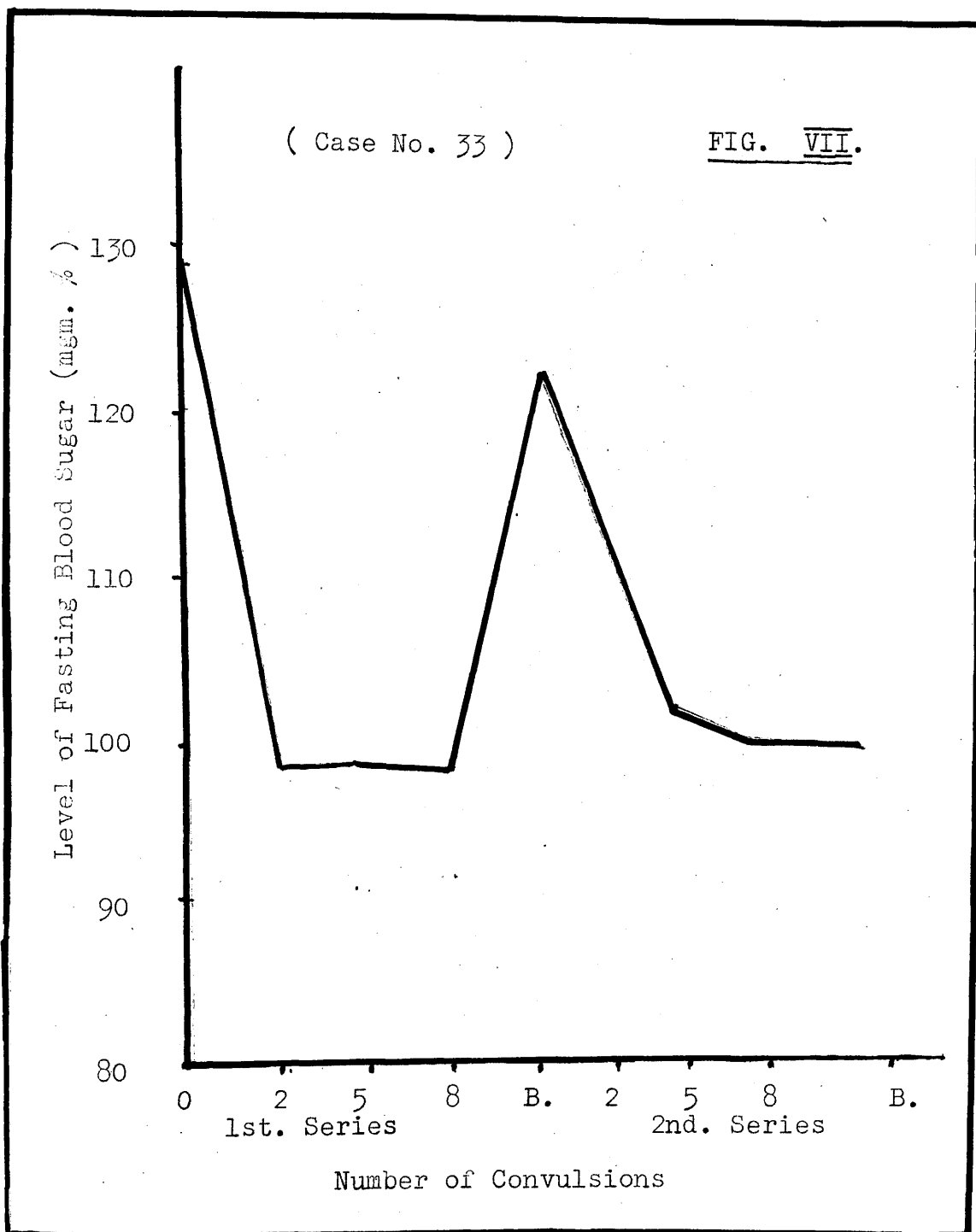
Fig. VII is a graphical representation of the results of treatment on the Fasting Blood Sugar Level of the patient whose Basal Metabolic Rate Curve is recorded in Fig. III (page 22). It will be noted that , as a result of treatment , the blood sugar level falls , but rises again during the period when the patient's clinical condition relapsed. When treatment was resumed , there was a further fall , and the new low level was maintained.

It appears , therefore , that the Fasting Blood Sugar Level can be co-ordinated with the clinical condition of the patient.

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CHAPTER III.Estimations of Parotid Secretary Rates.TECHNIQUE

Estimations of the Parotid Secretary Rate were carried out on 50 of the patients prior to the commencement of treatment by Electrically Induced Convulsions. These tests were repeated on four occasions during treatment.

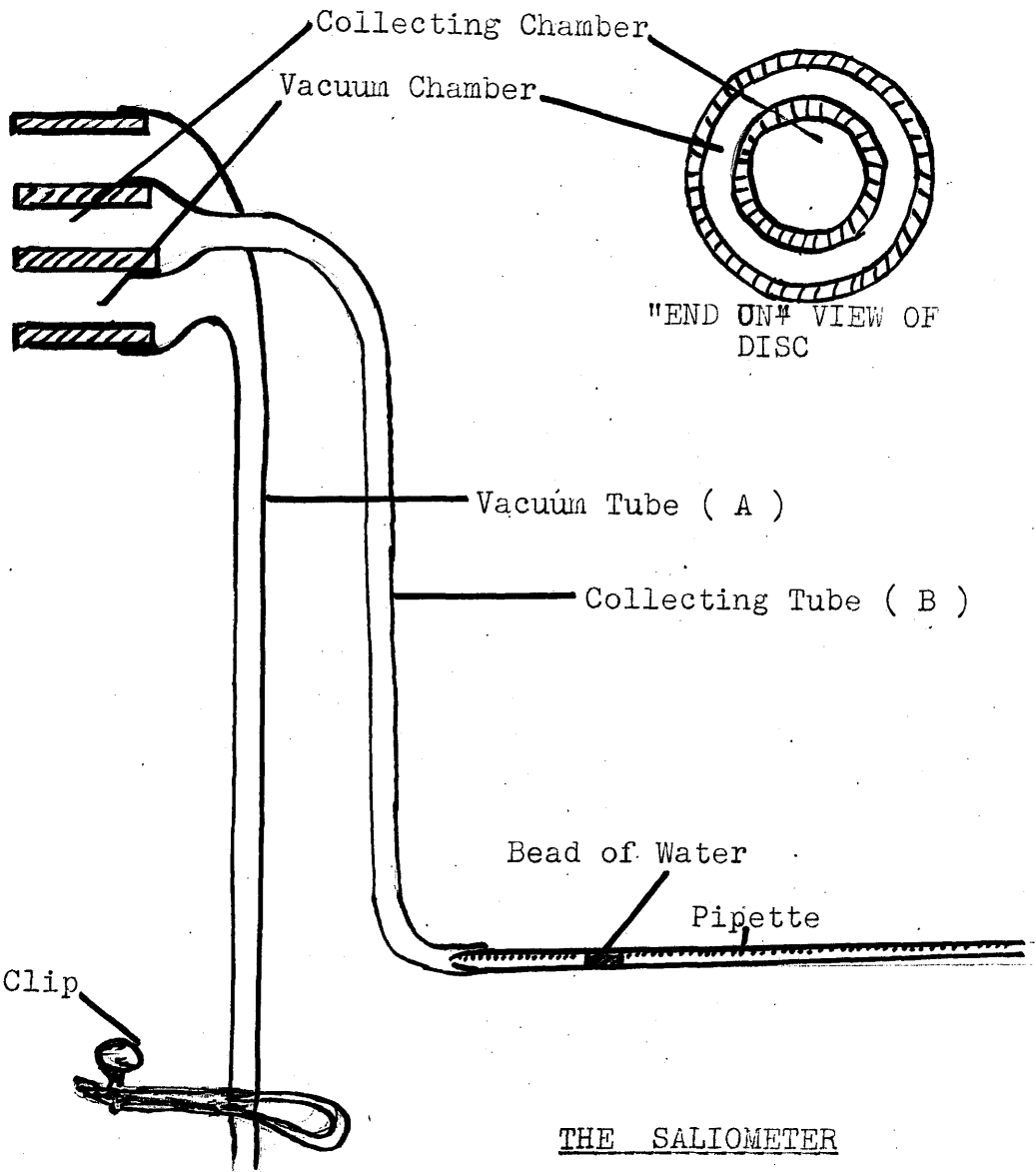
The method used was that of Strongin and Hinsie (1) (later more fully described by Lourie et al.(2)). As the original type of Saliometer is , as yet , unobtainable in this country , a modification was designed by the author. (see Fig. VIII). This simple apparatus consists of a vacuum chamber (which is used to keep the instrument in position over the stoma of the parotid duct) and a collecting chamber. The original instrument is made of light metal , but the author's modification was constructed from glass and rubber tubing.

Two pieces of glass tubing , a quarter of an inch long , cut from half inch and three sixteenths of an inch bore tubing , respectively , form the chambers. The larger chamber is the vacuum chamber , the smaller is the collecting chamber. Thin rubber tubing , three sixteenths of an inch in diameter , is stretched over the vacuum chamber and forms the vacuum tube (A). Thin rubber tubing , an eighth of an inch in diameter , is stretched over the collecting chamber and forms the collecting tube (B). The vacuum chamber has an opening cut in it to allow the collecting tube to pass through , and this opening is then rendered air-tight with rubber solution.

The rest of the apparatus consists of a clip for the rubber tubing and a pipette graduated in hundredths of a cubic centimetre. This pipette is fixed to a flat box with adhesive tape and a drop of water , coloured with methylene blue , is drawn up and used as an indicator when the scale is read.

The test was carried out two hours after the patient's lunch. As the ingestion of certain drugs may affect the results , it was arranged that the patient should receive no drugs whatsoever during the forty eight hours preceding the test.

FIG. VIII.



THE SALIOMETER

The test is performed as follows:-

The flat box with the pipette is placed on the patients locker , care being taken to see that the latter is level , otherwise the bead of water will not stay in position. The saliometer disc (i.e. the open ends of the vacuum and collecting chambers) is applied over the stoma of the parotid duct and suction is applied to the vacuum tube (A) by mouth pressure. This tube is then clipped . The instrument then remains in position without any necessity for manual support , and the patient can almost close his mouth ; the tubes issuing in a like manner to the Ryle tube , used for gastric analysis. The patient's pillows are then arranged so that he is in a comfortable position , with his head on a level with the pipette. The collecting tube (B) is then connected to the pipette , and the reading on the scale is noted. Exactly five minutes later , another reading is taken , and the difference between the readings gives the Parotid Secretory Rate. This estimation is repeated several times and the average reading is calculated from these results.

Before attempting estimations of the Parotid Secretary Rate in Depressives , a hundred normal individuals were first subjected to the test. The average results obtained varied from 0.02 to 0.03 c.c. per five minute interval. As the above-mentioned figures are identical with those obtained by Strongin and Hinsie (1) , using the original Saliometer , it would appear that the author's modification of this instrument serves the purpose equally well.

RESULTS

Complete results of this estimation will be found in the Appendix (pages 78 - 82).

The Parotid Secretary Rate in Depressives is apparently much reduced and , in the majority of the cases of this series , the secretion appears to be entirely inhibited.

Fig. IX is a graphical representation of the effects of treatment by Electrically Induced Convulsions on the Parotid Secretary Rate of the average Depressive.

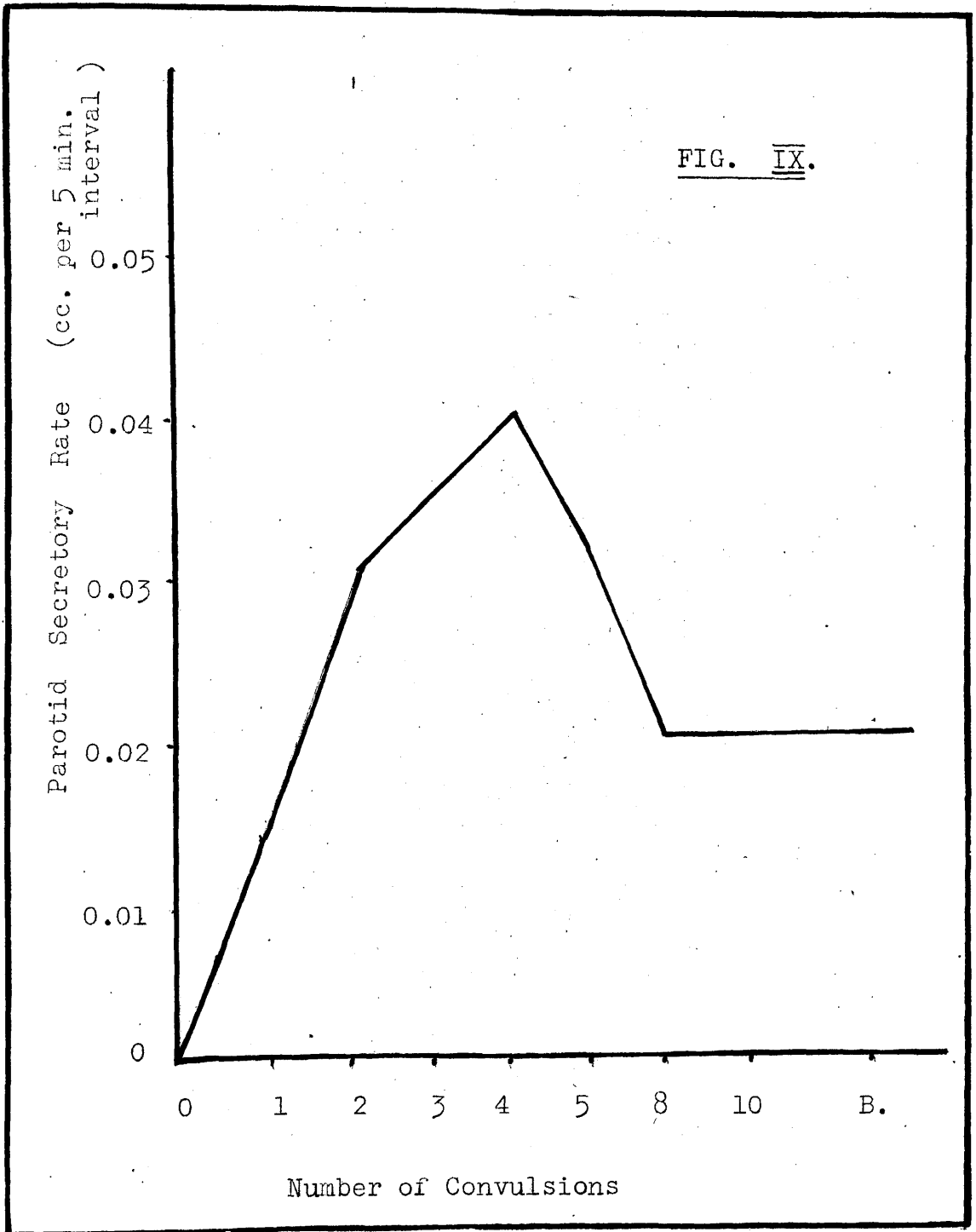


FIG. IX.

Number of Convulsions

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CHAPTER IV.DISCUSSION

Many theories have been advanced to explain the mode of action of Convulsive Therapy. There are several psychological explanations, but none of these are very convincing. Mc.Cowan (1) considers fear to be the operative factor, because the patient is brought up against an unpleasant reality, but the work of Low (2), Cohen (3), Cook (4), and Blaurock (5), is opposed to this hypothesis. These workers consider that fear has no significance. This is confirmed by the fact that fear does not, or should not, exist in Convulsions produced by Electrical Methods. The only patients in this series who expressed any manifestation of fear, were those few who believed the ludicrous tales of other patients concerning their behaviour after treatment. One of this small group of patients expressed the feeling of the remainder of the group when he stated that he was not

afraid of the treatment itself , but was very worried lest he should " make a fool of himself " afterwards.

No doubt , now that the sensational Lay Press has presented to its readers a full account of the lurid details of treatment by Electrically Induced Convulsions , we may find some patients who will be afraid to submit themselves to this form of therapy. As most patients , however , are entirely unaware that they have had a convulsion (and will confabulate in a remarkable manner to explain away their period of amnesia) , the factor of fear must be discredited.

Schilder (6) states that , as in idiopathic epilepsy , the convulsion represents the death and rebirth of Psyche . The elevation of mood and the ready co-operation of the patient is taken to represent his willingness to live and make a fresh start.

Fetterman (7) , on the other hand , regards depression as a " downward course of mood with an inherent tendency to reverse itself after a varying interval ". He implies that this reversal is implemented by the unconscious period which follows the convulsion.

These explanations are rather academic and

there is very little evidence produced to substantiate them.

Another psychological theory attributes the effects of treatment to the large amount of energy that the patient expends during the clonic stage of the convulsion. Flescher (8) considers that the untreated Depressive directs this energy towards suicide and destruction generally.

There are three physiological theories which attempt to explain the phenomenon on an organic basis.

I. Strecker (9) regards the damage to brain cells , as noted at autopsy , as being responsible. It is said , in this connection , that anoxaemia of the cerebral cortex produces a marginal sclerosis. This received unexpected confirmation from Moniz (10) who reported improvement in Chronic Schizophrenics after severing the nerve fibres connecting the frontal lobes with the deeper parts of the brain. Recently , Golla (11) has found that the Electroencephalogram results after Electrically Induced Convulsions , are similar to those obtained after Pre-frontal Leucotomy.

II. It is claimed by some that the therapeutic effects of treatment are due to a permanent vascular adjustment after the acute dis-equilibrium produced by the convulsion. While this is not an impossible explanation, no conclusive evidence has been advanced to support it.

III. One of the most attractive theories is that which postulates a stimulation of the Vegetative Centres as the operative factor of the treatment. This theory is strongly supported by Gellhorn (12).

Up to date, there have been no reports of research work to test the correctness of the last-mentioned theory. As indicated in Chapter I, that is the purpose of the present investigation.

The main argument in support of this theory is that the blood sugar curves show an apparent excitation of the vago-insulin system, together with an apparent excitation of the sympathico-adrenal system. As a result of treatment, therefore, we would expect to find a rise in the Basal Metabolic Rate and a fall in the Blood Sugar Level. This is precisely what the

results of the present investigation reveal.

There do not appear to be any references in the literature to estimations of Basal Metabolism in Depressives. The present investigation would indicate that this tends to be low. Such a result is hardly surprising when one considers that , in such cases , all bodily and mental activity is reduced to a low level. As a result of Electro-Convulsive Therapy , the Basal Metabolic Rate is stimulated and reaches normal levels shortly after the commencement of treatment. As in the case of the Parotid Secretory Rate , it is significant that higher levels are reached before the readings return to normal. This appears to indicate that there has been a true stimulation of the centres controlling metabolism and parotid secretion. Certainly , it is possible that the raised Basal Metabolic Rate could be due to increased activity of the skeletal musculature , conditioned by the greatly enhanced mental activity , but this factor has been largely eliminated in this investigation by keeping the patient in bed during the whole of treatment.

The Specific Dynamic Action of Protein might possibly be a more reliable guide , but it will be noted , that the results of this confirm the foregoing statements.

More research work has been carried out in connection with blood sugar levels in Depressives. Mc.Cowan and Quastel (13) have shown that the Hyperglycaemic Index is raised in patients suffering from one of the Depressive Psychoses. Although Mann (14) states that Fasting Blood Sugar Levels in Psychotics are within normal limits , the present investigation would indicate that , in Depressives , the average Fasting Blood Sugar Level is in the upper limits of the normal range. (See Appendix - page 77). Shortly after the commencement of treatment , the blood sugar level (fasting) falls . This appears to indicate a stimulation of insulin production.

The Parotid Secretory Rate estimations have already been mentioned (page 41) . These tests confirm the original work of Strongin and Hinsie (15) and these results have also received confirmation in this country by Golla (16).

That stimulation of the Autonomic System does occur during the convulsion , is indubitable when we consider the following occurrences :-

- (a) Dilatation of the pupil . This was originally referred to by Gonda (17) , and is presumably due to stimulation of the sympathetic.
- (b) Dilatation of the capillaries , not only of the face and neck , but of the entire body , which assumes a pink colour. This phenomenon is presumably due to para-sympathetic stimulation.
- (c) Excessive secretion of sweat . This is further evidence of para-sympathetic stimulation.
- (d) Excessive salivation . This is another feature of para-sympathetic stimulation.
- (e) Slowing of the heart rate. This was noted by Hemphill and Walter (18) and is evidence of Vagal Stimulation.
- (f) In some cases , cardiac arrhythmias have been demonstrated , and Wender and Jezer (19) have shown that these are of the type caused by increased vagal action. Lieberman and Liebert (20) have published

similar results.

It has thus been demonstrated that actual stimulation of the Vegetative Centres does occur , and that this can be correlated to the clinical improvement of the Depressive undergoing treatment by Electrically Induced Convulsions. It is therefore reasonable to assume that this theory is , at least , partly correct , and , though stimulation of the Vegetative Centres may not be the only factor concerned , it does seem to play quite a large part in the recovery of the Depressive.

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SUMMARY OF THESIS.

- (a) The results of Electrically Induced Convulsions in the treatment of 120 cases of Depressive Psychoses are noted and classified.
- (b) Observations on Basal Metabolism, Specific Dynamic Action of Protein , Fasting Blood Sugar Levels and Parotid Secretory Rates , are recorded, before, during and after a course of Electrically Induced Convulsions.
- (c) The foregoing observations are discussed in their relation to the physiological theory which attributes the therapeutic effects of Convulsive Therapy to a stimulation of the Vegetative Centres.

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PART III.

APPENDIX

The following symbols are used throughout

the Appendix :-

- A . - Denotes patient's case number in series.
 - B. - Denotes test carried out one month after the completion of a course of treatment by Electrically Induced Convulsions.
 - 0 - Denotes test carried out prior to above treatment
-

BASAL METABOLIC RATES

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
1	-4.6	-1.5	+2.6	+4.7	+2.6	+2.2	+3.6	+2.2	+2.5
2	-1.2	+1.3	+4.3	+6.7	+4.5	+3.1	+2.7	+3.9	+2.1
3	-11.3	-3.2	+6.3	+4.7	+2.3	+2.9	+1.5	+2.4	+3.0
4	-5.6	-1.2	+3.2	+8.7	+4.2	+5.6	+3.1	+1.5	+2.1
5	-2.4	-0.9	+2.6	+5.6	+4.4	+5.8	+3.2	+4.5	+2.5
6	-9.8	-2.6	+4.3	+5.9	+7.8	+4.6	+2.8	+2.4	+3.2
7	-4.3	+1.3	+3.9	+6.2	+4.2	+3.6	+4.8	+2.2	+2.5
8	-1.9	-0.3	+2.6	+3.4	+5.6	+2.9	+1.6	+2.7	+3.3
9	-9.6	-7.1	+1.2	+6.6	+4.1	+2.3	+2.5	+1.2	+1.6
10	-8.5	-5.3	-0.09	+5.4	+3.6	+4.8	+2.2	+2.9	+1.5
11	-2.4	-1.2	+3.6	+7.6	+4.5	+1.6	+3.4	+1.8	+2.4
12	-11.5	-4.6	+3.6	+8.3	+4.6	+3.4	+5.2	+1.6	+1.9

i.e. Before Treatment.

BASAL METABOLIC RATES

After the undermentioned number of convulsions.

A.	0	1	2	3	4	5	8	10	B.
13	-5.6	-2.3	+3.6	+6.7	+4.5	+6.2	+3.7	+2.3	+1.9
14	-6.3	-3.8	+1.3	+6.5	+2.6	+3.1	+2.2	+2.5	+4.2
15	-1.5	+1.0	+2.3	+4.8	+5.6	+1.9	+3.4	+3.6	+4.5
16	+1.2	+1.5	+2.7	+4.9	+2.5	+5.1	+3.6	+2.4	+4.1
17	-3.2	-1.6	+2.4	+7.2	+5.2	+4.6	+4.2	+1.4	+3.9
18	-8.9	+1.4	+10.8	+13.6	+9.2	+11.7	+8.4	+5.6	+3.1
19	-11.3	-2.5	+8.6	+9.9	+7.8	+4.3	+5.6	+6.3	+5.4
20	-4.2	-0.9	+7.4	+9.1	+7.7	+5.6	+4.2	+2.9	+3.0
21	-11.5	-2.3	+5.6	+10.1	+4.8	+3.6	+3.9	+4.2	+2.1
22	-4.9	+1.2	+8.9	+12	+7.6	+5.3	+3.6	+3.8	+4.5
23	-19.8	-5.1	+4.6	+13.0	+7.1	+5.3	+5.6	+4.4	+2.3
24	-3.6	+1.1	+4.5	+7.3	+5.1	+4.6	+4.8	+2.8	+4.1

<u>BASAL METABOLIC RATES</u>									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
25	-6.3	-1.4	+7.8	+9.7	+8.1	+6.6	+6.9	+3.5	+3.7
26	-4.1	-1.9	+5.6	+7.4	+4.5	+3.5	+6.3	+3.4	+1.9
27	-10.2	-4.3	+3.3	+11.9	+9.6	+6.8	+8.1	+5.6	+3.6
28	-3.6	+2.2	+5.6	+6.7	+4.3	+6.5	+4.2	+5.3	+2.1
29	-7.8	+0.9	+5.4	+9.8	+8.3	+6.6	+5.1	+4.9	+3.2
30	-5.7	-4.4	+3.6	+7.3	+3.5	+4.2	+3.2	+4.6	+5.0
36	-4.3	-1.9	+4.6	+9.2	+7.4	+5.6	+4.6	+6.8	+3.2
37	-10.4	-2.6	+13.8	+15.1	+9.7	+5.6	+4.7	+4.8	+4.5
38	-13.8	-5.6	+1.5	+13.8	+7.6	+7.0	+6.5	+5.0	+5.2
31	-6.7	+4.2	+11.7	+9.0	+6.5	+3.4	+3.6	+4.2	+2.9
32	-7.3	-3.0	+4.2	+8.7	+3.6	+2.8	+2.2	+2.6	+2.8
33	-10.8	+2.1	+8.3	+4.6	+3.4	+1.5	+2.3	+1.9	-10.5

BASAL METABOLIC RATES

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
34	-2.6	+0.2	+3.6	+9.7	+16.5	+7.3	+5.6	+4.2	+4.3
35	-3.0	+1.9	+9.3	+9.4	+6.3	+3.6	+4.1	+3.9	+3.7
39	-4.6	+7.8	+18.3	+14.2	+8.4	+4.2	+4.7	+5.1	+4.0
40	-10.0	-6.1	+2.7	+8.1	+7.6	+7.2	+5.5	+5.6	+3.8
41	-18.6	-1.5	+10.6	+15.8	+12.5	+8.3	+6.3	+5.8	+5.2
42	-2.1	+3.6	+7.2	+9.3	+5.6	+4.1	+3.8	+3.6	+4.2
43	-3.6	+2.2	+7.9	+9.4	+4.8	+5.1	+5.6	+3.9	+3.6
44	-22.1	-3.6	+4.8	+15.3	+11.7	+8.6	+4.3	+4.5	+5.0
45	-11.6	+0.5	+3.6	+7.8	+6.5	+5.3	+4.8	+4.2	+3.9
46	-10.2	-2.1	+7.6	+11.5	+8.2	+6.6	+6.8	+4.1	+5.9
47	-4.6	+1.5	+5.9	+9.6	+4.8	+4.9	+5.6	+5.0	+4.7
48	-1.6	+2.7	+7.1	+8.6	+8.0	+8.2	+3.6	+3.4	+3.0

BASAL METABOLIC RATES

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
49	-1.2	+3.6	+3.2	+4.3	+7.1	+2.5	+3.8	+2.2	+1.5
50	-14.3	-2.1	+15.0	+12.6	+9.3	+7.6	+5.4	+5.1	+4.3
51	-4.6	+3.3	+7.3	+8.6	+5.2	+4.1	+3.6	+4.2	+5.3
52	-8.7	+0.3	+8.7	+15.2	+9.3	+8.7	+4.5	+4.1	+4.8
53	-12.2	-3.1	+9.6	+15.3	+8.8	+9.2	+5.4	+3.6	+5.7
54	-3.6	+2.1	+7.8	+8.3	+5.6	+3.2	+4.6	+3.2	+3.9
55	-9.8	-1.2	+8.6	+11.3	+7.2	+5.5	+3.6	+4.8	+5.1
56	-20.5	-3.2	+4.8	+15.9	+9.8	+8.3	+7.2	+8.5	+5.6
57	-7.1	-.03	+3.6	+5.7	+6.2	+4.3	+3.1	+2.7	+2.5
58	-4.8	+.05	+3.1	+3.6	+4.0	+2.7	+3.1	+3.5	+3.2
59	-2.6	+1.3	+4.2	+4.5	+4.1	+4.6	+5.1	+3.5	+4.2
60	-8.8	-1.2	+4.6	+9.1	+8.6	+5.3	+4.8	+4.0	+3.9

BASAL METABOLIC RATE

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
61	-3.6	+2.2	+5.1	+8.1	+7.3	+7.1	+5.9	+6.4	+5.0
62	-8.1	-0.2	+4.3	+9.8	+7.6	+8.6	+7.1	+6.5	+4.2
63	-7.6	-1.1	+6.8	+11.3	+10.6	+8.5	+4.3	+3.1	+4.0
64	-2.1	+1.6	+2.7	+4.9	+4.5	+3.6	+2.9	+1.2	+1.5
65	-10.6	+2.1	+14.5	+20.2	+8.7	+7.9	+5.4	+5.1	+4.3
66	-12.2	-3.6	+4.7	+12.6	+13.2	+9.9	+4.6	+3.5	+2.9
67	+1.6	+2.5	+7.1	+7.8	+5.6	+3.1	+4.9	+5.3	+3.9
68	+1.2	+2.4	+4.1	+3.9	+2.1	+1.4	+3.6	+3.1	+2.5
69	+3.9	+1.7	+5.6	+7.3	+5.9	+4.3	+4.1	+3.6	+3.9
70	-5.8	+2.3	+4.6	+7.2	+4.5	+5.1	+5.3	+4.8	+4.1
71	-9.9	+2.1	+11.1	+13.8	+10.6	+8.3	+4.2	+5.3	+4.9
72	-2.8	+1.2	+4.8	+7.1	+5.6	+5.8	+4.1	+2.7	+4.3

BASAL METABOLIC RATE

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
73	-4.6	+2.3	+5.6	+8.8	+2.1	+4.9	+3.6	+3.9	+2.5
74	+9.9	-1.2	+7.6	+9.8	+7.1	+7.8	+6.5	+4.3	+6.8
75	-17.1	-2.3	+11.7	+15.8	+10.6	+10.8	+9.7	+6.5	+7.6
76	-13.8	-3.6	+10.5	+16.8	+10.6	+8.5	+9.3	+7.6	+5.4
77	-2.1	+1.6	+4.3	+5.6	+4.3	+4.6	+6.5	+5.3	+3.6
78	-3.6	+2.7	+6.5	+7.6	+6.3	+5.4	+5.6	+3.2	+4.0
79	-7.8	-1.6	+3.6	+5.6	+4.3	+5.8	+6.1	+4.1	+3.6
80	-11.2	-2.3	+5.6	+11.1	+8.6	+5.4	+4.6	+5.8	+3.2
81	-5.6	-1.1	+3.7	+7.2	+5.3	+4.1	+3.2	+3.6	+2.9
84	-1.6	+3.2	+6.5	+11.1	+4.3	+1.1	-1.2	+2.3	+1.6
82	-1.7	+3.9	+7.6	+9.1	+8.7	+4.6	+3.8	+2.1	+4.3
83	-8.9	+1.2	+8.7	+9.9	+5.1	+4.3	+6.2	+4.1	+5.0

BASAL METABOLIC RATE

·After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
85	-7.2	-3.4	+10.1	+10.5	+9.8	+11.7	+3.4	+4.7	+3.1
86	-11.7	-7.8	-3.1	+2.7	+5.1	+2.1	+1.6	-2.3	+1.1
87	-1.1	+2.6	+4.8	+7.3	+4.1	+3.7	+2.1	+1.8	+2.5
88	-18.2	-2.1	+10.6	+18.5	+12.3	+7.9	+8.1	+6.5	+7.1
89	-4.8	-1.6	+5.8	+3.1	+7.6	+5.9	+4.2	+3.6	+2.8
90	-9.7	+1.2	+7.8	+11.6	+5.8	+4.2	+3.6	+2.9	+1.2
91	-3.7	+1.9	+6.5	+3.2	+4.6	+3.7	+5.9	+2.2	+3.6
92	-8.6	+2.2	+7.9	+12.3	+10.5	+8.7	+9.6	+4.3	+5.6
93	-3.1	+4.6	+9.8	+6.3	+3.1	+14.1	+4.6	+8.7	+5.6
94	+5.6	+7.1	+11.9	+4.3	+8.1	+4.6	+9.7	+4.3	+6.5
95	-2.2	+3.6	+5.9	+2.1	+3.5	+3.1	+5.3	+2.1	+1.5
96	-5.6	+1.1	+5.6	+11.9	+5.7	+3.2	+4.6	+4.0	+3.5

BASAL METABOLIC RATE									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
97	-8.9	+1.4	+10.8	+13.6	+11.7	+9.2	+7.4	+5.6	+6.0
98	-2.3	+1.2	+8.5	+12.8	+5.7	+6.8	+5.4	+3.2	+4.1
99	-4.7	+2.4	+9.7	+14.6	+8.2	+9.1	+7.0	+4.2	+3.6
100	-11.8	-1.5	+7.2	+16.3	+12.1	+8.7	+5.2	+4.5	+2.3
AVERAGES OF THE ABOVE READINGS									
	-6.7	-2.5	+5.4	+8.2	+6.4	+5.0	+4.3	+3.6	+3.6

SPECIFIC DYNAMIC ACTION OF PROTEIN

These results were calculated as follows :

The Specific Dynamic Action of Protein in the case of the 20 controls (see page 15) was estimated , and the average of these figures was noted.

Wright (1) states that a standard protein meal of 500gm. of meat , will produce a stimulation of metabolism of about 20%. Therefore , to obtain a fixed standard , the necessary factor to adjust the average reading of the controls to equal 20% was calculated . This factor was added to the figures obtained in the case of the Depressives.

Thus , in each case , the result is standardised and the figures , though relative , are constantly related to this fixed standard.

(1) Samson Wright Applied Physiology 6th. Ed.
Oxford University Press p. 439.

SPECIFIC DYNAMIC ACTION OF PROTEIN									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
1	4%	3%	6%	18%	22%	17%	20%	23%	19%
2	15%	18%	16%	20%	25%	22%	18%	20%	21%
3	2%	6%	12%	23%	22%	20%	22%	21%	21%
4	4%	8%	16%	18%	23%	18%	19%	17%	19%
5	12%	10%	18%	21%	20%	21%	16%	18%	20%
6	5%	8%	17%	20%	22%	18%	21%	19%	20%
7	6%	12%	20%	23%	25%	23%	21%	23%	21%
8	16%	20%	21%	24%	22%	18%	20%	21%	18%
9	5%	10%	13%	20%	23%	20%	21%	19%	18%
10	5%	9%	8%	16%	24%	21%	18%	16%	19%
11	12%	14%	14%	21%	20%	17%	19%	19%	19%
12	3%	5%	18%	22%	18%	17%	21%	16%	18%

SPECIFIC DYNAMIC ACTION OF PROTEIN									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
13	8%	8%	14%	21%	20%	22%	20%	18%	19%
14	5%	7%	13%	22%	24%	20%	15%	19%	17%
15	14%	15%	19%	23%	22%	20%	18%	22%	17%
16	18%	17%	20%	18%	22%	24%	20%	19%	19%
17	10%	11%	17%	23%	25%	22%	19%	18%	21%
18	4%	13%	22%	21%	24%	21%	23%	21%	22%
19	5%	10%	21%	23%	23%	19%	18%	18%	18%
20	11%	15%	16%	22%	17%	19%	19%	22%	20%
21	3%	11%	15%	21%	20%	20%	18%	21%	18%
22	11%	15%	18%	24%	19%	18%	21%	19%	20%
23	1%	14%	22%	26%	21%	19%	18%	19%	22%
24	14%	13%	20%	19%	21%	17%	17%	21%	17%

SPECIFIC DYNAMIC ACTION OF PROTEIN									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
25	8%	13%	19%	22%	21%	20%	20%	18%	19%
26	9%	7%	12%	14%	24%	21%	19%	20%	18%
27	5%	9%	20%	20%	22%	18%	18%	21%	20%
28	15%	15%	21%	23%	20%	20%	19%	21%	18%
29	6%	13%	21%	21%	20%	19%	20%	18%	21%
30	11%	10%	15%	21%	19%	21%	20%	22%	22%
31	4%	20%	24%	20%	18%	20%	19%	18%	19%
32	10%	12%	21%	19%	14%	19%	21%	16%	20%
33	3%	15%	22%	22%	20%	20%	19%	21%	11%
34	12%	20%	16%	20%	23%	19%	20%	18%	22%
35	11%	12%	20%	18%	20%	21%	16%	19%	21%
36	10%	10%	18%	19%	22%	16%	19%	22%	19%

SPECIFIC DYNAMIC ACTION OF PROTEIN									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
37	7%	9%	20%	24%	22%	20%	20%	21%	22%
38	2%	6%	18%	23%	20%	19%	22%	20%	22%
39	14%	13%	22%	21%	25%	20%	21%	20%	18%
40	6%	15%	20%	22%	21%	20%	22%	21%	22%
41	2%	13%	20%	25%	23%	19%	17%	21%	23%
42	15%	16%	21%	20%	19%	23%	20%	20%	19%
43	12%	14%	18%	23%	21%	22%	21%	22%	22%
44	1%	5%	18%	24%	24%	22%	22%	20%	21%
45	7%	12%	19%	22%	21%	20%	23%	20%	19%
46	8%	10%	18%	23%	22%	21%	21%	18%	22%
47	13%	18%	22%	25%	23%	20%	21%	22%	20%
48	17%	17%	21%	21%	24%	23%	20%	22%	21%

SPECIFIC DYNAMIC ACTION OF PROTEIN									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
49	4%	10%	18%	23%	23%	20%	22%	22%	20%
50	16%	18%	19%	19%	18%	20%	21%	19%	19%
51	12%	14%	21%	22%	21%	21%	20%	19%	22%
52	7%	10%	18%	25%	20%	21%	19%	19%	21%
53	4%	7%	14%	23%	21%	22%	20%	20%	19%
54	14%	18%	22%	21%	21%	20%	21%	20%	21%
55	10%	14%	21%	24%	22%	19%	19%	20%	22%
56	1%	7%	15%	23%	23%	21%	20%	21%	21%
57	12%	15%	19%	19%	18%	19%	18%	18%	18%
58	14%	14%	16%	17%	18%	19%	17%	18%	17%
59	16%	17%	20%	21%	20%	19%	21%	20%	19%
60	11%	19%	21%	23%	22%	20%	21%	19%	20%

SPECIFIC DYNAMIC ACTION OF PROTEIN									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
61	13%	15%	20%	23%	21%	20%	19%	21%	20%
62	9%	10%	18%	21%	21%	22%	20%	23%	22%
63	11%	16%	21%	24%	22%	21%	19%	22%	21%
64	15%	15%	18%	21%	20%	19%	18%	19%	19%
65	10%	18%	23%	26%	21%	22%	23%	21%	22%
66	8%	10%	13%	22%	23%	21%	20%	18%	20%
67	16%	16%	21%	20%	19%	20%	20%	19%	20%
68	19%	20%	21%	20%	19%	18%	20%	21%	21%
69	16%	20%	23%	24%	20%	18%	18%	19%	19%
70	12%	14%	19%	21%	20%	20%	20%	18%	21%
71	3%	9%	22%	23%	21%	20%	21%	19%	22%
72	17%	16%	17%	19%	19%	18%	17%	19%	19%

SPECIFIC DYNAMIC ACTION OF PROTEIN									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
73	16%	18%	22%	22%	21%	19%	20%	19%	18%
74	8%	10%	20%	22%	21%	20%	20%	21%	20%
75	2%	12%	22%	23%	20%	20%	21%	20%	19%
76	6%	8%	21%	22%	21%	20%	20%	19%	20%
77	14%	15%	18%	20%	19%	18%	20%	18%	19%
78	15%	20%	22%	22%	21%	20%	21%	22%	22%
79	11%	14%	18%	19%	19%	20%	19%	18%	19%
80	10%	14%	21%	22%	20%	21%	20%	20%	21%
81	12%	14%	19%	21%	19%	19%	20%	19%	19%
82	17%	20%	22%	23%	21%	22%	22%	21%	20%
83	9%	14%	20%	22%	21%	20%	19%	19%	20%
84	18%	18%	20%	23%	21%	19%	16%	18%	18%

SPECIFIC DYNAMIC ACTION OF PROTEIN									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
85	10%	12%	21%	22%	21%	22%	19%	21%	20%
86	5%	6%	12%	14%	18%	16%	16%	14%	17%
87	17%	17%	18%	21%	20%	18%	18%	20%	19%
88	3%	12%	19%	23%	22%	20%	21%	20%	22%
89	14%	16%	19%	22%	22%	20%	20%	18%	20%
90	8%	13%	18%	21%	20%	20%	19%	20%	19%
91	14%	16%	19%	19%	18%	19%	20%	18%	19%
92	9%	17%	21%	22%	21%	20%	21%	20%	21%
93	15%	20%	21%	21%	20%	19%	20%	22%	21%
94	20%	21%	22%	22%	21%	22%	21%	20%	20%
95	16%	18%	20%	19%	19%	20%	20%	21%	20%
96	12%	16%	19%	21%	21%	20%	19%	21%	21%

SPECIFIC DYNAMIC ACTION OF PROTEIN

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
97	7%	12%	20%	22%	20%	21%	20%	21%	22%
98	13%	16%	21%	22%	20%	21%	21%	19%	21%
99	12%	14%	20%	22%	21%	22%	20%	20%	20%
100	5%	10%	16%	23%	23%	22%	22%	21%	20%
AVERAGES OF THE ABOVE READINGS									
	10%	13%	18%	21%	20%	19%	19%	19%	20%

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
1	115	-	100	-	84	84	83	-	84
2	110	-	98	-	98	94	93	-	92
3	125	-	110	-	95	90	91	-	94
4	118	-	105	-	89	89	90	-	90
5	112	-	110	-	96	95	96	-	96
6	124	-	108	-	87	89	89	-	88
7	114	-	98	-	94	93	94	-	95
8	110	-	100	-	98	97	99	-	98
9	127	-	102	-	85	85	84	-	85
10	126	-	105	-	87	86	85	-	86
11	113	-	108	-	101	100	100	-	99
12	127	-	103	-	86	85	85	-	84

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
13	119	-	101	-	94	93	93	-	94
14	121	-	99	-	96	95	94	-	93
15	109	-	100	-	98	97	97	-	96
16	106	-	105	-	99	98	98	-	97
17	112	-	96	-	89	88	88	-	89
18	123	-	92	-	84	83	83	-	82
19	125	-	98	-	82	83	82	-	82
20	115	-	99	-	98	98	97	-	99
21	122	-	96	-	81	80	82	-	80
22	118	-	91	-	90	92	93	-	91
23	130	-	110	-	98	95	94	-	95
24	118	-	96	-	92	91	92	-	92

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
25	122	-	89	-	85	83	85	-	84
26	115	-	93	-	90	89	88	-	89
27	127	-	98	-	89	88	87	-	86
28	115	-	100	-	92	91	90	-	89
29	122	-	96	-	90	90	89	-	90
30	119	-	98	-	92	93	93	-	91
31	123	-	87	-	86	85	85	-	86
32	125	-	91	-	90	90	89	-	88
33	128	-	97	-	96	97	99	-	125
34	112	-	102	-	91	90	90	-	89
35	114	-	99	-	95	94	93	-	93
36	123	-	89	-	85	85	84	-	85

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
37	128	-	88	-	84	82	83	-	82
38	129	-	100	-	94	93	95	-	94
39	113	-	84	-	82	81	82	-	80
40	127	-	103	-	98	97	97	-	98
41	130	-	98	-	92	92	93	-	94
42	110	-	89	-	87	87	88	-	86
43	115	-	96	-	94	94	93	-	92
44	129	-	102	-	93	93	93	-	93
45	126	-	98	-	96	95	93	-	94
46	125	-	94	-	92	92	93	-	92
47	117	-	98	-	94	93	91	-	90
48	109	-	100	-	101	100	100	-	99

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
49	127	-	87	-	85	85	84	-	84
50	111	-	102	-	99	100	100	-	98
51	114	-	99	-	96	95	93	-	95
52	121	-	93	-	87	86	88	-	87
53	128	-	95	-	91	91	92	-	90
54	113	-	102	-	101	99	100	-	101
55	123	-	99	-	95	95	96	-	93
56	131	-	104	-	96	96	99	-	98
57	122	-	100	-	99	98	98	-	95
58	113	-	96	-	95	96	99	-	100
59	112	-	99	-	98,	95	94	-	96
60	124	-	99	-	92	91	90	-	93

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
61	112	-	97	-	95	95	94	-	92
62	125	-	103	-	101	99	98	-	99
63	121	-	94	-	92	92	93	-	93
64	112	-	100	-	98	97	98	-	96
65	126	-	89	-	87	86	86	-	87
66	129	-	99	-	94	93	95	-	96
67	111	-	101	-	99	98	96	-	96
68	105	-	102	-	100	99	99	-	102
69	120	-	103	-	98	99	98	-	99
70	119	-	101	-	99	100	100	-	101
71	131	-	99	-	96	96	95	-	96
72	113	-	104	-	102	103	102	-	104

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
73	118	-	99	-	95	95	96	-	96
74	122	-	100	-	98	98	97	-	96
75	128	-	102	-	96	95	94	-	94
76	126	-	101	-	99	96	94	-	95
77	112	-	104	-	103	105	102	-	101
78	112	-	105	-	101	100	98	-	99
79	121	-	99	-	96	95	96	-	96
80	129	-	103	-	97	94	95	-	94
81	119	-	101	-	99	98	94	-	95
82	108	-	103	-	102	101	102	-	100
83	125	-	104	-	96	95	94	-	97
84	110	-	99	-	97	97	99	-	99

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
85	124	-	102	-	96	96	96	-	95
86	127	-	119	-	110	111	109	-	105
87	109	-	100	-	102	101	99	-	99
88	132	-	99	-	85	85	84	-	84
89	122	-	103	-	98	94	95	-	96
90	126	-	100	-	98	99	94	-	95
91	112	-	100	-	99	96	95	-	97
92	124	-	98	-	92	90	93	-	94
93	113	-	99	-	99	98	98	-	97
94	109	-	107	-	106	107	108	-	109
95	111	-	102	-	98	97	94	-	95
96	118	-	99	-	96	96	97	-	98

LEVEL OF FASTING BLOOD SUGAR (mgm. %).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
97	122	-	100	-	91	93	93	-	93
98	107	-	98	-	96	96	94	-	92
99	117	-	103	-	99	98	98	-	99
100	122	-	99	-	83	82	83	-	84
AVERAGES OF THE ABOVE READINGS									
	119	-	99	-	86	93	93	-	92

PAROTID SECRETORY RATE (cc. per 5 mins).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
50	0.01	-	0.03	-	0.04	0.03	0.02	-	0.03
51	0	-	0.01	-	0.04	0.04	0.03	-	0.03
52	0	-	0.02	-	0.05	0.04	0.03	-	0.03
53	0	-	0.05	-	0.04	0.04	0.03	-	0.03
54	0	-	0.04	-	0.04	0.03	0.02	-	0.02
55	0	-	0.05	-	0.04	0.04	0.03	-	0.03
56	0	-	0.04	-	0.06	0.03	0.03	-	0.03
57	0	-	0.03	-	0.04	0.03	0.02	-	0.02
58	0.01	-	0.02	-	0.03	0.02	0.02	-	0.03
59	0.01	-	0.03)	0.02	0.02	0.02	-	0.03
60	0	-	0.03	-	0.04	0.04	0.03	-	0.03
61	0	-	0.02	-	0.04	0.03	0.02)	0.03

PAROTID SECRETORY RATE (cd. per 5 mins).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
62	0	-	0.03	-	0.05	0.04	0.03	-	0.03
63	0	-	0.04	7	0.05	0.03	0.02	-	0.03
64	0.01	-	0.02	-	0.03	0.02	0.02	-	0.02
65	0	-	0.05	-	0.05	0.04	0.03	-	0.03
66	0	-	0.04	-	0.05	0.04	0.03	-	0.03
67	0.01	-	0.03	-	0.03	0.02	0.03	-	0.02
68	0.02	-	0.03	-	0.03	0.02	0.02	-	0.02
69	0.01	-	0.03	-	0.04	0.03	0.02	-	0.02
70	0	-	0.04	-	0.04	0.03	0.03	-	0.03
71	0	-	0.05	-	0.04	0.04	0.03	-	0.03
72	0.01	7	0.04	-	0.04	0.03	0.02	7	0.02
73	0	-	0.04	-	0.03	0.04	0.02	-	0.03

PAROTID SECRETORY RATE (cc. per 5 mins.).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
74	0	-	0.05	-	0.04	0.03	0.03	-	0.04
75	0	-	0.06	-	0.06	0.05	0.04	-	0.03
76	0	-	0.05	-	0.05	0.04	0.04	-	0.03
77	0.01	-	0.03	-	0.04	0.02	0.02	-	0.03
78	0.01	-	0.04	-	0.03	0.03	0.02	-	0.02
79	0	-	0.03	-	0.03	0.02	0.02	-	0.02
80	0	-	0.04	-	0.05	0.03	0.03	-	0.03
81	0	-	0.03	-	0.04	0.04	0.03	-	0.02
82	0.01	-	0.04	-	0.04	0.03	0.02	-	0.03
83	0	-	0.05	-	0.04	0.04	0.03	-	0.03
84	0.01	-	0.03	-	0.02	0.02	0.01	-	0.02
85	0	-	0.05	-	0.05	0.05	0.04	-	0.03

PAROTID SECRETORY RATE (mg. per 5 mins.).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
86	0	-	0.01	-	0.04	0.02	0.02	-	0.02
87	0.01	-	0.03	-	0.04	0.03	0.02	-	0.02
88	0	-	0.02	-	0.05	0.03	0.03	-	0.03
89	0	-	0.03	-	0.02	0.02	0.03	-	0.02
90	0	-	0.03	-	0.04	0.02	0.03	-	0.02
91	0	-	0.03	-	0.02	0.02	0.03	-	0.02
92	0	-	0.04	-	0.05	0.04	0.03	-	0.03
93	0.01	-	0.04	-	0.02	0.03	0.02	-	0.03
94	0	-	0.05	-	0.04	0.03	0.03	-	0.04
95	0.01	-	0.03	-	0.02	0.02	0.02	-	0.03
96	0	-	0.03	-	0.04	0.03	0.03	-	0.02
97	0	-	0.05	-	0.05	0.04	0.03	-	0.04

PAROTID SECRETORY RATE (cc. per 5 mins.).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
98	0.01	-	0.04	-	0.04	0.03	0.03	0.02	0.02
99	0	-	0.04	-	0.05	0.03	0.04	-	0.03
100	0	-	0.04	-	0.05	0.03	0.03	-	0.02
AVERAGES OF THE ABOVE READINGS									
	0	-	0.03	-	0.04	0.03	0.02	-	0.02

WEIGHTS OF PATIENTS (in pounds).

After the undermentioned number of convulsions

A .	0	1	2	3	4	5	8	10	B.
1	120	-	122	-	124	126	126	-	127
2	116	-	120	-	124	125	126	-	126
3	140	-	140	-	141	142	144	-	145
4	99	-	102	-	106	108	109	-	108
5	121	-	123	-	125	126	126	-	125
6	132	-	133	-	136	136	140	-	139
7	90	-	94	-	98	98	100	-	110
8	108	-	110	-	112	112	114	-	115
9	112	-	113	-	115	115	116	-	117
10	127	-	127	-	128	128	129	-	130
11	141	-	143	-	145	145	147	-	147
12	123	-	124	-	125	125	126	-	126

WEIGHTS OF PATIENTS (in pounds).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
13	110	-	112	-	115	115	116	-	117
14	124	-	124	-	125	125	127	-	130
15	144	-	144	-	145	145	147	-	148
16	139	-	140	-	142	143	146	-	147
17	135	-	137	-	137	138	138	-	138
18	120	-	122	-	123	123	125	-	124
19	143	-	148	-	149	149	150	-	148
20	134	-	136	-	137	137	138	-	140
21	121	-	123	-	125	126	130	-	135
22	138	-	138	-	139	138	141	-	140
23	135	-	136	-	138	137	139	-	138
24	129	-	130	-	134	134	137	-	140

WEIGHTS OF PATIENTS (in pounds).

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
25	150	-	152	-	154	155	157	-	160
26	126	-	127	-	129	129	130	-	131
27	125	-	126	-	126	128	131	-	129
28	121	-	124	-	125	126	130	-	141
29	128	-	129	-	129	129	132	-	131
30	129	-	131	-	134	134	134	-	133
31	142	-	142	-	144	144	145	-	146
32	136	-	137	-	138	138	140	-	141
33	120	-	121	-	122	122	124	-	127
34	129	-	131	-	134	134	136	-	139
35	131	-	132	-	133	133	135	-	141
36	118	-	122	-	124	125	127	-	129

WEIGHTS OF PATIENTS (in pounds).

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
37	122	-	125	-	126	128	129	-	133
38	143	-	144	-	146	147	149	-	148
39	132	-	134	-	136	138	139	-	138
40	134	-	135	-	137	138	141	-	135
41	120	-	122	-	123	123	124	-	125
42	118	-	119	-	121	122	123	-	121
43	117	-	119	-	120	122	123	-	124
44	141	-	143	-	146	147	149	-	140
45	145	-	146	-	148	149	151	-	149
46	129	-	130	-	133	134	134	-	132
47	131	-	132	-	133	134	135	-	140
48	129	-	129	-	131	133	135	-	136

WEIGHTS OF PATIENTS (in pounds).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
49	134	-	133	-	135	135	137	-	132
50	99	-	102	-	105	106	107	-	110
51	127	-	130	-	131	132	134	-	137
52	134	-	135	-	135	136	138	-	136
53	135	-	136	-	138	137	138	-	139
54	141	-	142	-	144	145	147	-	150
55	142	-	142	-	143	143	146	-	140
56	133	-	134	-	135	136	137	-	138
57	127	-	127	-	129	131	129	-	130
58	131	-	130	-	132	134	133	-	136
59	129	-	131	-	132	133	134	-	137
60	108	-	109	-	111	112	114	-	120

Weights of patients (in pounds).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
61	123	-	123	-	124	124	126	-	127
62	127	-	129	-	131	131	132	-	130
63	134	-	137	-	136	138	139	-	140
64	139	-	138	-	139	141	142	-	139
65	136	-	136	-	137	137	139	-	140
66	122	-	124	-	126	125	126	-	125
67	130	-	128	-	131	132	134	-	135
68	117	-	119	-	121	121	123	-	125
69	123	-	124	-	125	125	126	-	127
70	140	-	140	-	142	140	144	-	142
71	136	-	139	-	139	140	142	-	149
72	122	-	124	-	125	127	128	-	129

WEIGHTS OF PATIENTS (in pounds).									
After the undermentioned number of convulsions									
A.	0	1	2	3	4	5	8	10	B.
73	124	-	124	-	127	127	129	-	125
74	131	-	133	-	136	137	139	-	138
75	136	-	137	-	139	139	139	-	142
76	135	-	134	-	137	138	140	-	139
77	129	-	131	-	134	136	137	-	135
78	109	-	109	-	112	115	119	-	125
79	132	-	134	-	136	137	140	-	138
80	135	-	135	-	134	137	139	-	138
81	127	-	129	-	133	132	134	-	133
82	143	-	144	-	144	146	146	-	147
83	133	-	134	-	136	137	139	-	140
84	132	-	133	-	140	139	142	-	144

WEIGETS OF PATIENTS (in pounds).

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
85	122	-	124	-	125	127	129	-	125
86	127	-	130	-	132	133	133	-	135
87	126	-	127	-	129	129	129	-	130
88	134	-	135	-	136	138	140	-	142
89	134	-	134	-	137	136	138	-	138
90	136	-	137	-	139	139	140	-	144
91	139	-	139	-	141	140	142	-	146
92	127	-	128	-	131	133	136	-	139
93	126	-	126	-	129	128	129	-	125
94	122	-	124	-	125	125	126	-	128
95	118	-	120	-	122	123	127	-	126
96	133	-	132	-	134	135	135	-	139

WEIGHTS OF PATIENTS (in pounds).

After the undermentioned number of convulsions

A.	0	1	2	3	4	5	8	10	B.
97	116	-	120	-	124	122	123	-	125
98	129	-	129	-	131	133	132	-	137
99	119	-	122	-	124	124	124	-	130
100	123	-	125	-	127	129	133	-	132

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