THE AMMONIUM CHLORIDE TREATMENT OF SCHIZOPHRENIA*

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Introduction.

Meduna introduced the cardiazol treatment of schizophrenia, following an observation of the supposed rarity of the coexistence of epilepsy and schizophrenia and an observation of improvement in two schizophrenics who developed convulsions. Since then other drugs akin to cardiazol have been introduced, and recently electrically induced convulsions have been tried. It is generally agreed that there are certain complications and many objections to the use of cardiazol as a convulsant. Extreme apprehension and fear of treatment are present in almost every case. In some cases the patients' apprehension is so great that they decline treatment, saying that their dread of it makes them worse. It is a great obstacle preventing co-operation in the treatment. The other complications are the dislocation of the jaw, shoulder or hips, fractures of the arms or leg, sometimes the thigh, fracture of the spine and decalcification; cerebral haemorrhage and rarely lung abscesses and embolism have been reported.

For these reasons attempts have been made to find a drug which will give mild convulsions. Bertolani in 1938 succeeded in this attempt when he found that epileptiform convulsions can be produced by intravenous injection of a solution of ammonium chloride. Mazza (1938) treated 27 cases of schizophrenia in this way, and reported 22 per cent. complete remission and 15 per cent. marked improvement, and 63 per cent. unaffected. Dax (1940) reported that he treated 24 patients with ammonium chloride but his results were not good. I was encouraged to try this method by the fact that it costs almost nothing as compared to cardiazol treatment and the cost is a great problem in a poor country like India.

Method.

A 5 per cent. solution of pure ammonium chloride is freshly prepared, every day before injections. If the solution is old, the ammonium chloride decomposes and no action takes place. A 10 c.c. syringe with a wide bore needle, No. 10 or 12, is sterilized and the ammonium chloride solution is also boiled before injection. The patient lies in a bed with durrie or mattress covered with a sheet made of strong dasooti cloth. Patient keeps on his usual clothes, but they are loosened. Patient lies flat on his back and an intravenous injection of 10 c.c. of the solution is given quickly. This injection is given in the early morning before the patient has taken any food. There is no need for any mouth gag during the fit, and the jaw need not be held. No one touches the patient during the fit, and if there is any likelihood of his falling off the bed, all that is done is to raise the edge of the sheet. In order to avoid thrombosis of the vein injected, the forearm should be flexed and extended a number of times in quick succession. If the blood escapes from the vein the patient complains of pain. It can be relieved by suction or by massage.

The Fit (described).

There are three stages to the fit: (1) pre-convulsive, (2) convulsive, and (3) post-convulsive or recovery.

* Read at the Triennial Meeting of the Indian Division of the Royal Medico-Psychological Association held at Agra on November 4–5, 1941.

(1) *Pre-convulsive Stage.*

In about five seconds the face of the patient becomes red; he may show slight apprehension and complain that he is "going off." Sometimes he catches the bed-sheet in apprehension. There is no cough, which is generally present in cardiazol treatment. In about 10 to 20 seconds there is hyperpnoea and deviation of the eyes and the head either to the left or right. The pupils dilate and cease to react to light. The corneal reflex is lost. This stage lasts for 10 to 20 seconds, to be followed by the second stage.

(2) *Convulsive Stage.*

The fit is a very mild one. There may be a typical epileptic fit, but more usually there is some twitching of the muscles or extension and flexion of the legs and arms. There is no biting of the tongue, no cyanosis, no incontinence of urine or faeces, and no stoppage of respiration as is the case in cardiazol. This stage lasts about 15 to 20 seconds.

(3) *Post-convulsive Stage.*

Generally consciousness is regained before the muscular movements have ceased and soon the patient regains his normal appearance, but in some cases he may be bewildered and confused, not realizing where he is; he may sit up and attempt to leave the bed. Sometimes there is uncontrolled weeping. An Anglo-Indian patient used to weep and abuse his parents after the fits. I have observed nausea and vomiting in one girl. However, in about 5 to 15 minutes the patient becomes well enough to sit up and leave the bed, and can even have his breakfast.

Clinical Findings.

1. Pupils are dilated and often oval and eccentric and not reacting to light; the corneal reflex is abolished.

2. Reflexes are brisk after the fit and the plantar reflex is flexor.

3. Pulse remains regular; it generally increases during the fit but settles down in 3 to 5 minutes.

4. Urine: Ammonium chloride is given to make the urine acid, which is the normal reaction of the urine. It is also known that acidosis lessens the fits of epilepsy, for which ketogenic diet is given. Thus increase of acidosis will decrease the fit rather than produce it when there is none. Decrease of pH value in blood and urine is therefore not likely to be the cause of the fits; probably the ammonium chloride produces fits, not by changing the pH value, but by its irritant effect on the wall of the blood vessels of the brain causing constriction of the vessels. I have already pointed out that if the solution is not freshly prepared the salt decomposes and the ammonia evaporates and no fit is produced. It is the ammonium radicle which is important, as shown by the fact that other salts of ammonium also produce the fit, e.g. ammonium thiocyanate.

5. Increase of appetite and gain in weight is very noticeable.

Cases Treated.

I treated 29 male cases and 10 females as in-patients and also two early cases, one male and one female, as out-patients. Both the out-patient cases did very well. Out of 29 male cases, 11 were cured, 8 improved, and 10 otherwise; and out of 10 female cases, 3 were cured, 2 improved, and 4 otherwise.

Table.—*Showing the Cases Treated, with Results.*

	Males.				Females.			
	Total.	Cured.	Improved.	Not Improved.	Total.	Cured.	Improved.	Not Improved.
Under 1 year	13	5	2	6	4	3	1	–
Over 1 year	9	2	3	4	6	1	1	4
Not known	7	4	3	–	–	–	–	–
Total	29	11	8	10	10	4	2	4

It appears from the above that 35 per cent. cases were cured, 25 per cent. improved, and 40 per cent. were not improved.

Case Histories.

No. 1.—A young Muslim girl, aged 19, from Badaun was brought to me in December, 1940. Her family history is free from insanity. Father is healthy and accompanied the girl, and her grandfather also came with the girl, and looked an intelligent old man. They stated that the mother's family is healthy. The girl looked very healthy physically, with a tendency towards fatness. Her illness started with pain in the abdomen. She described the pain to me as if her intestines were being trampled as the army of Yezed trampled the body of Imam Husein in the tragedy of Kerbela. This description of her pain itself was enough to arouse suspicion, but she was first treated with all sorts of carminatives and stomachics, first at Badaun, then at Dehra Dun, and later at Lucknow. One incident that happened at Lucknow is very interesting. She was treated by a private practitioner who had returned from England, and is an ear specialist. He was consulted for buzzing noises in the ear. He was sitting near the girl when she asked for water. She drank half the water and poured half over her head, but when she was pouring the water on her head she leaned forward, preventing her body and clothes from getting wet. This point appealed to this ear specialist very much, and he assured the father of the girl that she was mentally perfectly sound, as she poured water on her head not sitting erect, but leaning forward. I need not point out to you that this very act is suggestive of mental abnormality.

Examination.—On examination I found her lacking in modesty, apathetic, disinterested in the surroundings and smiling in an inane manner. She had the delusion that her intestines were crushed and trampled as the body of Imam Husein was, and she had definite hallucinations of hearing. On these points a diagnosis of schizophrenia was made and shock treatment as an in-patient was advised. Parents made strong objections to her admission owing to the strong stigma attached to mental hospitals. They were keen that I should treat her as an out-patient and as I am a great believer in out-patient treatment for early cases, I persuaded my Superintendent to agree to it. She used to come twice a week for intravenous injections, and I gave her 16 injections of 10 c.c. of 5 per cent. solution of ammonium chloride. She made a wonderful recovery and six months after the injections were stopped I heard from her grandfather that she was absolutely normal.

No. 2.—A Mohammedan, aged 35, excise inspector in U.P., was seen by me in April, 1941. His family history is tainted, as one of his aunts was insane, and died in this mental hospital. Personal history showed nothing abnormal—he was a shy type of man, hard-working and studious and read up to M.Sc. He fell in love with a prostitute, which was resented by his family. This made him suspicious against them. Later there was a change of reality; he began to think that he was female, and when talking to anyone he always spoke in the feminine gender. A local doctor advised that if he married, his mental condition would improve. Consequently he was married to an educated girl. He began to suspect that she was not chaste and that she had illegal connections with his brothers.

On examination I found that he was dull and apathetic, taking no interest in his own body or in the surroundings. He remained unshaved for days, although previously he used to shave himself daily. His nails were long and he was unclean and untidy. He had great suspicions about the chastity of his wife and other members of the family. He would lock all the doors of the room in which his wife used to live. He had hallucinations of taste which led to the belief that he was being poisoned. He would not eat anything unless cooked by himself, or got some parched grain from the bazaar. I advised admission to the mental hospital, but the relatives refused and requested me to give injections at home. I started giving 10 c.c. of ammonium chloride 5 per cent. solution intravenously twice a week. He accused me of poisoning him by injections in conspiracy with the brothers. However, after two injections he began to take food properly and gave up the idea that he was poisoned through food. He was very apprehensive about the injections, and in his fright he ran away from home with his wife to Sitapur after six injections. He was making good progress, and I have heard that he rejoined his service after getting a certificate of fitness from the civil hospital of Lucknow.

I wish to thank Dr. Das, Superintendent of Agra Mental Hospital, for permitting me to use the clinical material and for all the help and advice he has given me.