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REPORT OF A CASE OF DIABETES INSIPIDUS WITH MARKED REDUCTION IN THE AMOUNT OF URINE FOLLOWING LUM- BAR PUNCTURE *

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This case of diabetes insipidus is reported because of the remarkable effect of lumbar puncture in diminishing the amount of urine and raising its specific gravity. A man of 43 had for four years the typical manifestations of diabetes insipidus. The urine varied in amount from 7,500 to 11,000 c.c., and was always of low specific gravity (1.001). Lumbar puncture was made and less than 5 c.c. of fluid withdrawn, the fluid escaping slowly under low pressure. Within forty-eight hours the daily amount of urine had dropped to 660 c.c. Headache, pain in the back of the neck, anorexia and vomiting, with a feeling of general weakness, followed the puncture. Morphin was given for pain. Almost no fluid or food was taken for three or four days. But after the prostration following the puncture had disappeared, when morphin was stopped, and when food and water were freely taken, there was no thirst as before, the amount of urine for a period of four weeks, during which he was under observation, never exceeded 1,800 c.c. for twenty-four hours, and the specific gravity averaged 1.015, ranging from 1.005 (one record) to 1.031 (single specimen). The tabular record of the urine as well as the detailed history are given below. In the history it will be noted that in this patient, as in others, there are symptoms pointing suggestively to a cerebral origin for the diabetes insipidus. It was for the purpose of obtaining the cerebrospinal fluid for investigation by Dr. Dean D. Lewis, who was working on disease of the hypophysis, that the lumbar puncture was made. The result of the puncture suggests a certain relation between some cerebral condition and the polyuria. It also has a bearing on the theory of diabetes insipidus, which makes the disease largely dependent on the inability of the kidney to secrete a concentrated urine. A case like this would seem to show that under certain conditions the kidney of diabetes insipidus can, at least temporarily, pass a concentrated urine. The possible origin of the disease in this patient in a lesion of the brain, as in the hypophysis, and the very remarkable diminution in the amount of urine following lumbar puncture, which urine was of high specific gravity,

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with the bearing of this clinical experiment on questions of the pathogenesis of diabetes insipidus, are my reasons for making this brief report.

I append the history, with some minutiae that are perhaps unimportant but which may, in the light of later investigations, be seen to be of some significance. No attempt is made to classify this case as one of primary polyuria or of primary polydipsia, nor is any explanation of the phenomena volunteered, nor is there presented any review of the subject of the pathogenesis of diabetes insipidus. The theory of the inability of the kidney to secrete a concentrated urine — primary polyuria — is ably advocated by Erich Meyer.¹ The correctness of this view has been, in part, questioned by some, e. g., Finkelnburg,² and Forschbach and Weber.³ Meyer,⁴ however, still maintains that his notion is correct. The relation of the disease to lesions of the pars intermedia of the hypophysis has lately been discussed by E. Frank.⁵ Carbohydrate tolerance in connection with disease of the hypophysis has been considered by Goetsch, Cushing and Jacobson.⁶

CASE REPORT

Onset.—The patient was, at the time of onset, and had been for five years previously, a mail-carrier in the rural free delivery service, having to ride thirty miles daily over rough roads. There was some exposure to cold, but not excessive. Four years ago, in the spring, he first noticed frequent urination, both diurnal and nocturnal. This rapidly increased in frequency, until it became embarrassing. He would have to stop every half hour or even more frequently while on his route. Any attempt to suppress this tendency resulted in great misery. The quantities were large at each urination. There would be four or five nocturnal micturitions. The quantity was several quarts a day. His mouth and throat felt constantly parched, in spite of the great amounts of water drunk. The tongue was dry. Bulimia also developed in the spring.

These symptoms persisted all summer, and became more marked in the fall, when there were superadded others. There had been noticed during the summer some lessened physical endurance, but this became actual weakness. Lumbar pains became annoying. These usually began as a dull pain extending across the "small of the back." At times this radiated along the left gluteal region and down the left thigh following the course of the sciatic nerve; this radiation downward was very sharp and severe, much more so than the bilateral lumbar pain. These pains seemed to be precipitated by the jolting of the mail-cart. He would often get out and walk for relief. He had very little or no pain at night, and none after lying down for a little while.

1. Meyer, Erich: Ueber Diabetes Insipidus und andere Polyurien, Deutsch. Arch. f. klin. Med., 1905, lxxxi; also Fortschr. d. Deutsch. klin., 1910, ii, 271.

2. Finkelnburg: Ueber die Konzentrationsvermögen der Niere bei Diabetes insipidus nach organischen Hirnerkrankungen. Deutsch. Arch. f. klin. med., 1910, c, 33.

3. Forschbach and Weber: Beobachtungen über die Harn- und Salzausscheidungen bei Diabetes insipidus, Ztschr. f. klin. Med., 1911, lxxiii, 221.

4. Meyer, Erich: Bemerkungen zu der Arbeit von Forschbach und Weber, Ztschr. f. klin. Med., 1912, lxxiv, 352.

5. Frank, E.: Ueber Beziehungen der Hypophyse zur Diabetes insipidus, Berl. klin. Wchnschr., 1912, xlix No. 9.

6. Goetsch, Cushing and Jacobson: Carbohydrate Tolerance and the Posterior Lobe of the Hypophysis Cerebri, Bull. Johns Hopkins Hosp., 1911, xxii, No. 243.

Headaches, mostly occipital, though at times radiating to the frontal and ophthalmic regions, have annoyed him frequently for the last two years. These headaches were rarely severe. In the fall three years ago, after a long railroad journey, he had a severe headache which persisted twenty-four hours; he felt very weak, and could not sleep for pain. During this day he became very dizzy at any attempt to stand up, or even raise the head from the pillow; several times it "became black before his eyes." Once during the day, on attempting to rise, he fainted, and believes he was unconscious for three-quarters of an hour, during which time his wife tried to revive him with dashes of cold water. Ever since this day (he thinks) he has been much weaker. Often since then, and up to the present time, he has had transient attacks of vertigo, lasting a few seconds; he is sure he is never unconscious. These occur especially when he raises up suddenly after stooping over. There is a blackness before the eyes, and a sense as of everything being "faraway."

On comparatively slight exertion he has from this time up to the present noticed that the pulse is rapid and that he is conscious of the throbbing of the heart. Two months ago he had to stop three times while pushing a wheelbarrow 100 yards. He timed his pulse; it was 135. There were accompanying sensations of dyspnea and general nervousness. Mental emotion is also liable to bring on palpitation.

For over two years he has occasionally noticed transitory edema. Usually this would come on at night, would be noticed in the arm, and would disappear an hour or two after he arose, sometimes in the face, especially cheeks and eyelids; sometimes in the hands or feet. This has not increased lately in severity or frequency. This edema described by the patient was not seen while he was in the hospital.

For the last year or two he has had mild and variable paresthetic sensations, especially noticed when he awakes in the night, such as a sense of numbness involving the limbs or even whole body. Oftener a localized numbness involving some special, but variable, area on the fingers or toes. Thus once there was an involvement of the distal part of the left index and middle fingers, lasting perhaps half an hour. Very often this takes the form of a prickling, as with needles and pins. He has noticed these paresthesias perhaps six times the last month.

The skin has been abnormally dry for about four years; also cold. Even in hot weather he sweats but little. Pruritus was marked two years ago; as also an oily condition of the skin. The last year there have occasionally appeared on the instep of the foot very minute (miliary) vesicles, filled with clear serum. There is intense itching. He scratches them until they bleed.

There are few gastro-intestinal disturbances, though he says the abdomen is at times distended with gas in the bowels.

For over thirty years he has found it impossible to read long without glasses. Even with lenses he often has to stop after reading five or ten minutes, on account of blurring of vision and pain in the eyeballs. But he has never been fitted by an oculist. No amblyopia, diplopia or scotomata.

For many years he thought he "had no nerves;" the last four years he has frequently felt very nervous; these attacks of weakness, nervousness and even trembling come on with physical exertion, or even slight mental excitement.

Attacks resembling petit mal occur. He and his family have noticed the last year that while reading or talking he will occasionally stop abruptly for a few seconds and cease all activities. This lapse will terminate abruptly. These attacks have nothing in common with the attacks of vertigo.

He has been a light sleeper all his life; the last four years this condition has been decidedly aggravated; apparently, this is due largely to the necessity of awakening for urination. The patient was worried much lately because he thinks his mentality has been affected.

After the development of the symptoms four years ago, the conditions became gradually more marked. Three years ago a physician was consulted, especially

on account of the lumbar pains, which finally rendered work almost impossible. There was polyuria, with low specific gravity; no sugar; no albumin. Treatment was of no avail.

The patient was very sick for ten days following vaccination at age of 15. When 7 or 8 years of age the patient had to stop school on account of some paralysis of the legs. He remembers having been carried around for weeks. He was well otherwise. He used crutches later. There was no pain. (Poliomyelitic?)

The patient had "yellow jaundice" when a child, bronchopneumonia at 9, scarlatina at 10, otorrhea once (cannot remember which ear); earache often. At 23 he had a severe diarrhea with hemorrhage—sick in bed four or five days. Eleven years ago he had "walking typhoid"—fever 104 F. Some headache and diarrhea. Seventeen years ago he had extensive furunculosis.

When a boy (up to the age of 17 or 18) he had sick headaches frequently (about once a month), frontal and temporal, and very violent in one eye (he cannot remember which). He went to bed with these.

At 17 suffered a violent head trauma (thrown out of wagon on head); was unconscious a short time; headache a few days.

The patient was a carpenter for many years. For the five years preceding the onset of these attacks he was a rural mail-carrier.

Formerly he used beer and a little whiskey, very moderately; latterly no alcohol. He used coffee excessively for many years (five to eight cups a day). He quit after the onset of the present illness and the symptoms ameliorated for a month or two (first summer).

The patient's mother died of puerperal fever, his father at advanced age of a slowly advancing paralysis following a "stroke" ten years before.

He was married at 21. His wife has had four healthy children and two miscarriages—her third and fourth pregnancies, and early in each pregnancy. He has noticed no failure of sexual power. He denies venereal disease.

Present Status.—Polyuria marked—seven to ten quarts a day; polydipsia, with excessive thirst and dryness of mouth; appetite voracious; weakness marked. Two blocks of fast walking would fatigue him, and also bring on dyspnea and palpitation. Headache—occipital—frequent, but never severe. Transient vertigo and occasional attacks resembling petit mal; general nervousness; paresthesias; dry skin; lumbar pains only if he over-exerts.

He has gained fifteen pounds the last four years and weighs now 154 pounds. There is no disturbance of taste, smell or audition (?), no paralyses, no dysuria, no cough, no jaundice, no sore throat.

Physical Examination.—He was a moderately thin, healthy-looking man, who, while saying he felt rather weak, yet walked into the hospital. He impressed one as neurotic, dwelling on and magnifying trifling symptoms, but not acting as an hysterical patient. And no hysterical somatic stigmata were found on any examination. His color was good, the skin a little tanned as from exposure to the weather. There was no wasting of the subcutaneous fat. No rashes, ecchymotic spots or suspicious (luetic) scars were found. He was not icteric. The skin was dry. There was no adenopathy.

The reflexes were normal—pharyngeal, epigastric, hypogastric, cutaneous, cremasteric, patellar, Achilles. There was no Babinski; no ankle clonus; no Romberg. Sensory disturbances could not be made out.

The heart was not enlarged on percussion. Its apex impulse was inside the mamillary line; its tones were pure; its beat rhythmic. The peripheral vessels were not thickened or tortuous. The radial systolic pressure was 123 mm. Hg (Riva-Rocci, modified by Stanton).

The examination of the scalp and cranium gave normal findings, as did that of the ears, nose and mouth. Hearing was perhaps a little dull. The eyes were examined with especial care (Dr. W. H. Wilder), and found normal except for a marked arcus senilis in each eye. The reactions of the iris to light and in

accommodation and consensually were active. No exophthalmos, nystagmus, ptosis or paresis of the external muscles could be made out. Ophthalmoscopic examination and testing of the fields of vision revealed normal conditions. Some of the optic nerve fibers were medullated. No scotomata. An x-ray examination of the cranium showed a sella turcica that appeared smaller than normal. In other respects the radiograph was negative.

There was no enlargement of the thyroid gland and no dulness to suggest a sub-sternally enlarged thyroid or thymus gland. The chest was well-formed, with normal pulmonary resonance and free excursion on respiration. Breath sounds were normal; no râles.

The abdominal examination revealed nothing abnormal. The spleen and kidneys were not palpable, the liver not enlarged, the stomach apparently in normal position and of normal size. The genitalia were normal. Rectal examination was negative.

The blood count was 5,088,000 red corpuscles; 6,450 whites; hemoglobin, 84 per cent. The varieties of white corpuscles were in normal proportions.

February 17. Wassermann (Dr. Nicoll) negative.

February 18. Patient states that he is positive he is passing more urine since entering the hospital; attributes this to the fact that at home he rests a great deal in a spring-chair inclined at an angle of 145 degrees. He believes the kidneys are more congested by his use of the hospital chairs (upright).

February 19, 11 a. m. Lumbar puncture. Less than 5 c.c. of cerebrospinal fluid removed; perfectly clear; came out under normal or somewhat reduced pressure. Within five minutes after the withdrawal of the fluid he complained of a headache and pain in the back of the neck. It rapidly radiated upward to the occiput and downward along the spine, growing more intense, so that within half an hour it was the most violent headache he had ever had. The occipital, temporal, frontal and vertical regions of the scalp were also involved. The pains also radiated down the arms to the elbow. The slightest movement of the body, neck or even fingers, resulted in exacerbations of the headache. The neck was somewhat rigid (seemingly held so voluntarily to avoid pain). There was no pain on pressure over nerve trunks. Kernig sign somewhat positive. There was also a feeling of soreness deep in the lower substernal and epigastric regions. No nausea.

February 20, p. m. (thirty-six hours). The head and backache somewhat easier, provided patient lies perfectly quiet. Any slight motion of the trunk, neck, head or limbs is followed by intense exacerbation of the pain. The patient "suffered agony" yesterday and this morning. The Kernig has disappeared. There has been some nausea and vomiting.

February 25 (notes on days February 20-25). The headaches have gradually cleared up during the last two or three days. Patient has noticed a great change in physical and mental condition. Since the lumbar puncture his skin has been moist and warm (verified often by Dr. Kirk, the intern) in contrast with the dry condition of the last two or three years. Patient feels relieved mentally; the depression is gone and he feels very much encouraged. The soreness of the muscles and in the neck incident to the puncture has worn off. Has never passed so little urine in four years.

The patient left for home and re-entered the hospital after being absent for nine days. He reports that the headaches have gradually worn off, so that at present they are not so severe. The thirst has been less marked; not more than two quarts of liquid a day, being taken. The urine has been noticeably small in amount, one day about three pints. Also the frequency of micturition is much less. Since the lumbar puncture, he has often gone from six to twelve hours without urinating. He states definitely that up to the time of the puncture he for four years urinated at least every two hours—often every hour, or more frequently. Since the puncture the appetite has been decidedly less. He believes his appetite is now about that of an average man. At times he feels rather

nauseated on attempting to eat certain foods, as eggs. The skin has been decidedly more moist ever since the puncture. He has had no more of the attacks resembling petit mal. Has had slight vertigo several times, on suddenly raising the head after lying down. The tingling in the arms has come on a few times, lasting five or ten minutes each time. He believes the weakness is more marked than before the puncture. Sleeps better. The lumbar pains have been experienced a few times, as before the puncture. Physical examination the same as before: the systolic radial blood-pressure is 122. Skin normally warm and moist. Ophthalmoscopic examination again shows normal retina.

Sugar toleration was tested with the following result:

March 8. 100 g. glucose this p. m. March 9, no glycosuria.

March 9. 200 g. glucose. March 10, no glycosuria.

March 10. 300 g. glucose. No glycosuria.

An imperfect chlorid toleration test was made, the results of which are not given.

URINARY CHART

Dates	Amount	Specific Gravity	Remarks*
.....	c.c.	(Approx.)	.....
February, 1912			
14	6,750 (18 hrs.)	1001	.....
15	8,920	"	.....
16	10,180	"	.....
17	7,740	"	.....
18	11,320	"	.....
19	11,380	"	.....
20	10,710	1000.5	11 a. m.; lumbar puncture
21	4,220	1001	.....
22	660	1017	.....
23	1,490	1014	.....
24	1,410	1014	.....
March	Single		
6	admission specimen	1031	.....
7	1,280	1018	.....
8	905	1016	.....
9	1,310	1015	100 g. glucose yesterday
10	1,520	1015	200 g. glucose yesterday
11	1,340	1007	300 g. glucose yesterday
12	1,440	1010	.....
13	1,560	1010	.....
14	1,800	1010	Pituitrin started; all 2 doses (15 m. sub-cut., and 2 m. intravenously) were given on the 14th and 15th days.
15	1,460	1050	.....
16	1,000	1024	.....
17	1,720	1014	.....
18	905	1023	M. iii pituitrin given intravenously twice.
19	980	1015	M. vii given twice intravenously to-day.
20	860	1020	None given since; KI started, gr. x, t. i. d.
21	1,280	1013	.....
22	1,020	1014	.....
23	620 (?)	1027	.....
24	1,160	1006	.....
25	920	1012	.....

*At no time, even after the glucose, was sugar found in the urine. There was never albumin. No casts or other pathologic microscopic structures were found. Diacetic acid and acetone were tested for often, but were never detected. The urine was always acid. After the lumbar puncture it was of darker color than before and at times was a little turbid.

March 14. Two doses of 15 m. pituitrin (P. D. and Co.) given hypodermatically.

March 15. M. ii given intravenously.

March 18. M. iii given intravenously; blood-pressure ten minutes later, 133. Repeated in evening.

March 19. M. vii given intravenously twice to-day.

Blood-pressure 124 before; 155 afterward (five minute).

March 25. Present Status: (a) No thirst; (b) no polyuria; (c) no attack resembling petit mal; no nausea; no vomiting; (d) irregular headaches (severe at times), some lumbar pains, some left sciatic pain. Eyesight just about same as before (occasional visual disturbances, as formerly). The patient at this time left for home. No word has since come from him.⁷

122 South Michigan Avenue.

7. As this goes to press I am told by a neighboring physician who is familiar with the case that the old symptoms have been returning.