firmly at the angles of the wound (Fig. 4). The transverse incision in the bladder is sutured over this. No attempt is made to remove any of the bladder wall. This is better dealt with at a second operation.

After-Treatment and Results.

The ureteral catheters commence to drain within a few hours and become loosened within 5 or 7 days,

sutures. The transplanted ureters readily accommodate themselves to their new anatomical relations, and development is not interfered with.

At the provincial meeting of the Section of Diseases of Children of the Royal Society of Medicine held in Manchester in July, 1920, I showed a patient on whom I had performed this operation in October 1908. The uterus appears normally developed and she

FIG. 2.—P.R.W., Pouch of anterior rectal wall pushed through bladder incision by finger in rectum.

FIG. 3.—P.C.R., Peritoneum covering of rectum stitched to peritoneum covering of bladder; I.R., Incision into rectum.

FIG. 4.—Ends of ureters inserted into rectum. S.R.I., Sutures closing rectal incision.

when they are withdrawn. If either catheter ceases to drain before this it must be removed and can easily be loosened by twisting movements, traction being avoided. Hexamine and acid sodium phosphates are given for the reasons previously mentioned.

About six months later the mucous membrane of the bladder is excised and the raw surfaces brought together by under-running strong silkworm-gut

menstruates regularly. The rectum carries out its double function independently. Faecal evacuation usually occurs once daily and urine is voided separately, three or four times by day and not at all during the night. The diagrams have been made from photographs taken during an operation, and I am much indebted to Dr. W. E. Fothergill, who has kindly drawn them for me.

OBSERVATIONS ON THE UREA CONCENTRATION TESTS IN THE PSYCHOSES.

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THE primary objects of this investigation were to discover if there is any undue prevalence of renal inefficiency in the psychoses, as determined by the urea concentration tests in the blood and urine, and, if so, with what forms of mental disorder this condition is associated. During the progress of the investigation it was observed that several cases showed a low urea concentration in the urine with either a normal or sub-normal blood concentration. It was therefore thought desirable to estimate the daily excretion of urine with the total excretion of urea and ammonia and the percentage urea concentration in the same. The urea nitrogen and ammonia nitrogen ratio was also determined.

Concentration Tests in the Blood and Urine.

The tests employed were those described by H. MacLean and A. E. Russell,¹ and their instructions as to diet, &c., prior to the tests were strictly adhered to. The urine test commenced at 10 A.M.—i.e., about 2½ hours after a breakfast consisting of bread, butter, and tea. The patient was then put to bed and no further fluid permitted until the completion of the test. Printed instructions were issued on the occasion of every test. The blood was withdrawn between 11.30 A.M. and 12 mid-day—i.e., at the corresponding time, but either on the day prior to or following the urine test. Sufficient blood was always collected to enable a duplicate examination to be made, the average of the two estimations being taken as a measure of the urea concentration. The tests were repeated in a few cases, but as the results were more or less the same it was not considered necessary to do this in all cases.

Prior to and during the collection of a 24-hour specimen each patient received a fixed diet consisting of two pints milk, two eggs, milk pudding, with bread-

and-butter. The total excretion of ammonia was estimated by the formalin method. Albumin in all cases was tested for by the salicyl-sulphonic acid and heat tests. The systolic blood pressure was determined during the clinical examination of each case.

Before the results obtained in this investigation are considered, it is necessary to have a clear understanding as to what are considered the normal limits of urea-concentration in the blood and urine. In spite of the fact that W. MacAdam and Bentley Squire² give the maximum blood concentration of 25 mg. and 12.5 mg. per cent. respectively, I consider that MacLean's maximum of 40 mg. per cent. is none too high. In Tables I. and II. are cases with a much higher blood concentration with a urine concentration not only between the normal limits of 2 and 4 per cent. as set out by MacLean, but even greater than 4 per cent. Clinical as well as other evidence was contrary to a diagnosis of renal disease in each of those cases. The lowest and highest percentage concentration of urea in the blood found by me in cases showing no evidence of renal disease are 9 mg. and 83 mg. per cent. respectively. But basing my result on the normal standard percentages by MacLean—viz., 15 to 40 mg. per cent. in the blood and 2 to 4 per cent. in the urine, I find there is a large percentage of cases giving abnormal results in which the diagnosis of renal disease, apart from the tests referred to, is not justified.

Eighty-three cases have been investigated. Table III. gives these cases grouped according to their mental disorder with the findings in each. It is seen that 36 per cent. have a normal urea concentration in the blood and urine, according to the limits referred to above. This is a very low percentage. If the cases showing a normal blood concentration with a urine urea concentration below 2 per cent. in which the low urine concentration appears to be due to diuresis, that is, when the total urine excreted in the first and second hours together exceed 350 c.cm.—this diuresis is especially frequent in dementia præcox, and will be discussed later—are considered for the present to be consistent with a healthy condition of the kidneys, the percentage of normal cases is raised to 52. Again, if cases with a normal urine concentration and a blood concentration below 15 mg. per cent. are included for the same reason, the percentage of normal cases is raised to 57. Of the 43 per cent. of the cases remaining

¹ THE LANCET, 1920, i., 1305.

² Brit. Med. Jour., 1921, i., 290.

only four could reasonably be considered to be suffering from kidney disease (see Table IV.), and in this connexion it is worthy of note that only two of them have a blood urea concentration over 40 mg. per cent., while they all show a low urea concentration in the urine.

Tables V. and VI. give examples of the remaining unclassified 38 per cent. of the cases. Table V. deals with the cases showing a blood concentration over 40 mg. per cent. in all of whom the urine urea concentration is below 2 per cent. Table VI. deals with the cases having a blood concentration below 15 mg. per cent. and a urine concentration below 2 per cent. The question now arises: Should this 38 per cent. be regarded as explicable by kidney disease, no evidence, clinical or otherwise, being available other than that derived from the concentration tests to warrant such a conclusion? Two explanatory hypotheses are possible in this investigation. These tests were carried out in cases where a nervous or mental element was present as an extra or complicating factor, and perhaps there is in the psychoses, and more especially in dementia præcox, melancholia, and confusional states, a greater incidence of renal disease in a degree not revealed by the ordinary clinical methods than has hitherto been realised. The second and perhaps more plausible hypothesis is that in the psychoses there may be present some factor or factors other than kidney disease to account for the anomalous results obtained. The latter theory is strengthened by three other observations made in the cases of dementia præcox examined—viz., the coexistence of diuresis, polyuria, and acidosis.

Dementia Præcox.

Table VII. deals with the cases of dementia præcox in which it has been possible to compare the results of the

concentration tests with those found in the urine excreted in the 24 hours. Although it is wrong to make deductions from a small number of cases, it is worthy of notice that all cases of dementia præcox so far examined show, without exception, a moderate to a marked degree of acidosis, the ammonia nitrogen reaching as high as one-tenth of the urea nitrogen in 4 of the 8 cases. Acidosis was not found in mania, melancholia, and insanity with epilepsy, but a mild degree was found in all of the 8 cases of confusional insanity so examined, and a very severe degree in the only case of general paralysis examined, the ammonia nitrogen being as much as a fourth of the urea nitrogen.

From Table III. it will be seen that diuresis has occurred in almost half of the cases of dementia præcox. From Table VII. it is observed that a low urine urea concentration has been found not only in the concentration tests, but also in the 24-hour specimens. The low urine urea concentrations found in the cases of dementia præcox in Table VII. will confirm this observation. From Table VII. it is seen that there is a high urinary excretion in the 24 hours. In the other psychoses in which the 24-hour excretion of urine has been measured, the amount is found to be low and the urea concentration high. It is difficult to speculate as to the significance of these observations, other than that it may be more than probable that in dementia præcox there exists some general disturbance and not renal disease to account for these anomalous results, such as either a disordered protein metabolism or some form of endocrine disturbance implicating more particularly the pituitary gland.

Summary.

(1) The urea concentration in the blood in the cases examined is subject to wide variations, and therefore

TABLE I.—Cases without Kidney Disease.

Blood urea percentage above 40 mg., and urine urea concentration above 4 per cent.

Name.	Age and sex.	Urine conc. test. Amounts (c.cm.).		Percentage conc. urea in 2nd hour.	Specific gravity.	Reaction.	Albumin.	Blood urea %.	Total amount urine 24 hours (c.cm.).	Urea percentage.	Total urea in grammes.	Total ammonia in grammes.	Urea nitrogen and amm. nit. ratio.	Mental state.	Physical state, &c..
		1st hour.	2nd hour.												
J.W.P.	42, M.	70	36	4·8	1026	A	0	43	—	—	—	—	—	Confusional insanity.	Moderate health, S.B.P. 130 mm.
E.P.	21, M.	25	60	5·37	1025	A	0	50	510	2·2	11·27	0·291	21	Melancholia, dementia præcox, early stage.	Good health, S.B.P. 140 mm.
H.G.	51, F.	0	50	4·1	1015	A	0	83	360	5·0	18·0	0·547	18	Mania during excitement.	Good health, S.B.P. 150 mm.

Remarks.—The above three cases show a high blood concentration with a high urine concentration. It is noteworthy that the total urine for the 24 hours is low, as well as the total urea output; that the total urine excreted as a result of the ingestion of 15 g. of urea in 100 c.cm. water is low; that the blood pressure is raised in all cases; that the chief mental symptom is a combined psychological and motor excitement.

TABLE II.—Cases without Kidney Disease.

Blood urea percentage above 40 mg. and urine urea concentration between 2 and 4 per cent.

M. F.	52, F.	90	80	2·1	1022	A	0	73	650	3·1	20·46	0·472	25	Confusional insanity.	Fair health. Glycosuria 2·5 per cent.*
W. F.	58, M.	95	100	2·1	1020	alk.	0	50	—	—	—	—	—	" "	Fair health. S.B.P. 136 mm.
E. B. L.	35, F.	—	65	3·5	1032	A	0	57	—	—	—	—	—	Melancholia.	Moderate health; slight glycosuria. S.B.P. 102 mm.

* Optic and peripheral neuritis. Noteworthy that acidosis not present.

Remarks.—Three cases showing a high blood urea concentration, with a normal urine urea concentration. It is noteworthy that glycosuria is present in two cases. The explanation other than kidney disease may be that an excessive protein metabolism coexists, with a disordered carbohydrate metabolism. The type of mental disorder predominating is confusion with a moderate degree of excitement.

TABLE III.—Number of Cases Examined in each of the Psychoses, with the Findings.

Mental disorder.	No. of cases examined.	Blood urea below 40% and urea in urine above 2%.	Blood urea below 40%.	Urine urea above 2%.	Urine urea concentration below 2%, with diuresis.	Mental disorder.	No. of cases examined.	Blood urea below 40% and urea in urine above 2%.	Blood urea below 40%.	Urine urea above 2%.	Urine urea concentration below 2%, with diuresis.
Mania	13	5	12	5	2	Dementia præcox	22	7	17	8	9
G.P.I.	3	3	3	3	0	Confused states ..	16	8	12	11	2
Insanity c. epilepsy	7	5	7	5	1						
Melancholia... ..	22	12	15	15	3	Totals	83	40	66	47	17

TABLE IV.—*Cases of Kidney Disease.*

Blood urea above 40 mg. per cent. and urine urea concentration below 2 per cent.

Name.	Age and sex.	Urine conc. test. Amount of urine (c.cm.).		Percentage conc. urea in 2nd hour.	Specific gravity.	Reaction.	Albumin.	Blood urea %	Total amount urine 24 hours (c.cm.).	Urea percentage.	Total amount urea in grammes.	Total ammonia in grammes.	Urea nitrogen and amm. nit. ratio.	Mental state.	Physical state, &c.
		1st. hour.	2nd hour.												
J. E.	76, F.	250	96	1'03	1010	A	0	54	—	—	—	—	—	Melancholia.	Fair health; no symptoms. S.B.P. 220 mm. Hypertrophy left ventricle
J. M.	60, M.	35	60	1'43	1017	A	Tr.	43	600	3'09	18'54	0'599	17	Melancholia with confusion.	Fair health; marked arterio-sclerosis. S.B.P. 160 mm. Slight degree of acidosis.
H. C.	58, F.	145	165	0'87	1010	alk.	0	19	—	—	—	—	—	Recurrent mania during attack of excitement.	Fair health; general arterio-sclerosis. S.B.P. 130 mm.
M. G.	62, F.	46	48	1'46	1018	A	0	11	—	—	—	—	—	Mania with confusion.	Fair health; arterio-sclerosis. S.B.P. 140 mm.

Remarks.—All cases of interstitial nephritis. It is noteworthy that only two cases show a blood concentration over 40 mg. per cent.—one a normal blood concentration and one subnormal.

TABLE V.—*Cases without Kidney Disease.*

Blood urea above 40 mg. per cent. and urine urea concentration below 2 per cent.

C. J.	28, M.	—	135	1'68	1015	A	0	48	1230	1'5	18'45	0'702	14	Dementia præcox.	Fair health. S.B.P. 108 mm.*
C. H.	17, M.	285	80	1'93	1018	A	0	59	1560	1'21	18'87	0'912	10	" "	Fair health. S.B.P. 136 mm. A marked degree of acidosis.
S. R.	25, M.	60	90	1'2	1015	A	0	46	—	—	—	—	—	Melancholia.	Good health. S.B.P. 140 mm.
T. E.	31, M.	50	70	1'14	1015	A	0	52	—	—	—	—	—	Mania with confusion.	Fair health. S.B.P. 110 mm.
J. B.	21, M.	295	185	1'85	1016	A	0	50	690	4'0	27'6	0'830	15	Melancholia. ? Dementia præcox.	Fair health. Slight degree of acidosis. S.B.P. 145 mm.
K. J.	23, M.	210	50	1'01	1015	A	0	42	—	—	—	—	—	" "	Good health. S.B.P. 135 mm.

* The U and N ratio signifies that a moderate degree of acidosis was present.

Remarks.—The above six cases should be regarded as cases of renal inefficiency according to the urea concentration tests. It is noteworthy that in three of the cases where the urea N and ammonia N ratio has been determined a condition of acidosis is found to coexist; that they are all adolescents with ages ranging from 17 to 31 years; that the total urea output is within normal limits in each case examined; that dementia præcox is well established in two cases and in the early stages in two others, in all of whom the systolic blood pressure is above normal.

TABLE VI.—*Cases without Kidney Disease.*

Blood urea below 15 per cent. and urine urea concentration below 2 per cent.

Name.	Age and sex.	Urine conc. test. Amounts.		Urea percentage in 2nd hour.	Urine—		Albumin	Blood urea %.	Mental state.	Physical state, &c.
		1st hour.	2nd hour.		Sp. gr.	Reaction.				
M. D.	45, F.	90	190	1'06	1010	Alk.	0	15	Melancholia.	Good health. S.B.P. 130.
A. S.	30, F.	320	115	1'42	1014	A	0	11	Dementia præcox.	" " 126.
G. E.	37, F.	175	175	1'09	1010	A	0	12	Melancholia.	Fair health. S.B.P. 110.
C. G.	28, M.	415	160	1'5	1016	A	0	15	Dementia præcox.	Good health. S.B.P. 114.
E. H.	35, F.	70	30	1'6	1020	A	0	9	" "	" " 118.
W. G.	26, F.	285	130	1'2	1010	A	0	14	" "	" " 125.
W. G. N.	32, M.	150	135	1'21	1021	A	0	10	" "	Moderate health. S.B.P. 112
A. M.	31, M.	290	160	1'5	1015	A	0	12	Confusional insanity.	Fair health. Alcoholism. S.B.P. 118.

Remarks.—The cases of dementia præcox in the above table show a low blood concentration and a low urine concentration. Diuresis is present in all except one case. The low blood and urine concentrations may be due to a lower rate of metabolism, especially that of the protein moiety. This is noteworthy in connexion with dementia præcox.

TABLE VII.—*Dementia Præcox.*

The presence of kidney disease has been excluded by clinical and other available methods.

Name.	Age.	Urea in urine conc. test.	Diuresis present.	Urea percentage in blood.	Total urea output in grammes.	Urea and ammonia nitrogen ratio.	Total amount of urine in 24 hours.	Percentage urea concentration in 24 hours' specimen.
J. B.	21	1'8	No.	50	27'5	15	690	4*
L. R. J.	22	2'6	No.	25	29'5	11	1140	2'59
C. H.	17	1'93	Yes.	59	18'8	10	1560	1'21
C. J.	28	1'68	No.	48	18'4	14	1230	1'5
T. R. R.	26	1'3	Yes.	23	20'2	10	1620	1'25
D. M.	21	3'03	No.	18	17'6	12	1350	1'31
E. G. L.	23	4'5	No.	18	24'8	10	1590	1'56
C. C.	24	1'7	Yes.	17	17'5	10	1000	1'7

* An early and doubtful case of dementia præcox.

Remarks.—All the cases are adolescents. The total daily urea output is within normal limits, but there is an increase in the total ammonia excreted. The urea nitrogen and ammonia nitrogen ratio is normal and points to the presence of a state of acidosis. There is a low urine urea concentration in the urine excreted in the 24 hours as well as in that of the concentration test associated with polyuria and diuresis. The urea concentration in the blood is variable.

is an unreliable guide as to the state of health of the kidneys.

(2) The urea concentration in the urine gives more reliable information. A low concentration should be regarded only as a confirmation of other evidence.

(3) Anomalous results, both as regards urea concentration in blood and urine, apart from kidney disease, are as demonstrable by available methods common in the psychoses.

(4) In dementia præcox a low concentration of urea in the urine is found to coexist with polyuria and a state of acidosis.

A CASE OF OSTEITIS FIBROSA,

TREATED BY RESECTION OF FOUR INCHES OF HUMERUS
AND INSERTION OF BOILED BEEF-BONE GRAFT.¹

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It is an accepted fact that for bridging wide gaps in adult bones it is necessary to make use of autogenous bone grafts, but the work of Gallie and Robertson² showed that for short gaps, even in healthy bones, boiled grafts might be used with the expectation of the gap being ultimately bridged by living bone. König's work³ on the use of massive ivory grafts showed that these became firmly united to the living bone, the surface of the graft being soon pitted by ingrowth of granulation tissue. Barth⁴ showed many years ago that dead bone and ivory could heal into the tissues and become incorporated with or substituted by the living bone.

In children the conditions differ from those of adult bone, especially when the gap is situated near the growing end of the diaphysis, and when proliferation of subperiosteal bone cells is already present as a result of inflammation or injury; in such cases it is reasonable to expect that a dead graft will be as efficient as a living autogenous one, for it becomes rapidly united to the living bone, and surrounded by new bone from the periosteum.

In the case described below use was made of a boiled beef-bone graft to fill a gap of four inches left by resection of the upper part of the humerus for osteitis fibrosa.

FIG. 1.—Showing localised rarefaction and expansion, with fracture. (Nov. 5th, 1920.)

FIG. 2.—One month after operation. Beef-bone graft united to humerus; much new bone from periosteum on the inner aspect, and small areas of new bone externally. (Jan. 6th, 1921.)

FIG. 3.—Three and a half months after operation. Showing dense new bone surrounding the graft. (March 24th, 1921)

The notes of the case are as follows:—

A. C., a girl of 10 years and 9 months, admitted to Paddington Green Children's Hospital on Nov. 25th, 1920.

History.—Four days previously she fell prone, and the right arm became useless. In February, 1919, she had been admitted to another hospital for pain in the arm following a fall; X rays showed a localised area of rarefaction in the upper part of the humerus. An operation was performed, the bone being opened, and an area of soft tissue in its interior was removed by the curette. Microscopic examination showed this to be fibrous tissue.

Family history.—One child died from bronchopneumonia, another from convulsions. Two others are alive and healthy. No miscarriages. No other family illness.

Condition on admission.—Signs of fracture (pain, crepitus, slight deformity) of the upper end of the right humerus, with little displacement. X rays (Fig. 1) showed a rarefied and expanded area in upper third of humerus, with pathological fracture.

Nov. 29th, 1920: Plaster case made in two pieces, including arm, forearm, and thorax, the arm being in a position of abduction flexion and external rotation.

Operation (Dec. 7th).—Six-inch curved incision at the anterior margin of the deltoid. The bone was extensively destroyed and replaced by fibrous tissue, there being a thin shell of compact bone (fractured) postero-internally; the periosteum was absent anteriorly for one-third of the circumference of the bone, the muscles forming a pseudo-capsule for the fibrous mass. The bone was divided above and below the diseased part, after the remaining periosteum had been separated, four inches of the humerus being removed. The beef-bone graft was then inserted, its lower peg extending into the medulla of the lower fragment of humerus, its upper end being wedged into the cancellous bone above. This graft had been cut from the tibia of an

ox and was macerated and boiled for about 48 hours; it consisted of compact bone, and was 5 in. long, 7/8 in. wide, 1/3 in. thick; it was shaped by an Albee's saw and by filing, and drilled by multiple holes transversely, and also longitudinally at each extremity. The muscles and periosteum were sutured round the graft with catgut, and the wound closed without drainage; the plaster cast was then reapplied. On the 14th stitches removed, primary healing. From the end of the third week the plaster was removed each day to allow of careful active movements; the bone appeared to be firmly united within three weeks of the operation. The patient left hospital in the plaster on Jan. 5th, 1921.

Jan. 6th: X rays showed considerable formation of new bone on the inner aspect and small areas of new bone

¹ Shown at meeting of Clinical Section of the Royal Society of Medicine, April 8th, 1921.

² Brit. Journal of Surg., October, 1919, vol. vii., No. 26, p. 211.

³ Beitr. z. klin. Chir., 1913, xlii., p. 353.

⁴ Arch. f. klin. Chir., 1893, xlv., p. 409.