GENERAL PRINCIPLES GOVERNING THE TREATMENT OF UREMIA.

We are wont to treat uremia by stimulating the flow of urine, by purging and by sweating, with the intention of forcing the kidneys to resume their work, and of ridding the body of the urinary bodies that we imagine to be circulating in excess. In addition, we attempt to regulate the diet in such a way that there shall accumulate in the blood the smallest possible amount of residual nitrogenous bodies ("Harnschlacken"). If, now, uremia is not due to the circulation in excess of such bodies, the above therapy is wrongly directed.

It is questionable, moreover, whether any of the above measures can at best do more than rid the body of water, some sodium chlorid and possibly a little urea; the loss of water one might imagine to do more harm than good, for it should promote the concentration of the poisoned body fluids, and hence render them more toxic. There is surely no exact evidence to show that the sweat or the urine of uremic cases after the use of diaphoretics and diuretics becomes more toxic than before; nor has any one ever succeeded in demonstrating in such sweat or urine any of the albuminoid or alkaloid bodies that must be accused of causing the most fulminating symptoms of uremia.

The chief object of treatment should be to prevent the development of acute uremia by giving attention to those organs and functions that threaten to fail. In order to do this intelligently, *the renal idea should be relegated to the background*, and more attention should be bestowed in pre-uremic states on the liver and the general metabolism. The liver, above all, should have a rest. To stimulate the liver in chronic uremia is bad practice. The same principles should obtain here as in the treatment of a fatigued heart or a fatigued stomach or a fatigued nervous system.

First rest, then graduated exercise until the normal tone is regained. Stimulation should be reserved for emergencies and as a last resort. To accomplish this end all articles should at first be eliminated from the diet that can irritate the liver or stimulate it to increased functional activity; every effort should be made to reduce intestinal putrefaction to a minimum, for intestinal toxins as they reach the liver severely strain the disintoxicating function of the organ. No cholagogues should be administered.

After a period of rest—and starvation for a few days seems a rational plan—the liver may be gently stimulated in the hope that it may be coaxed gradually to resume its functions. This should be attempted by the carefully graded administration of salicylates, of bile acids, possibly of calomel; in addition, various dietetic and physical means may be adopted that we know to be capable of stimulating the various functions of the liver. All this treatment should be carried on with careful supervision and daily control of the effect of these measures on the functional activities of the liver as evidenced by the composition of the stools and the urine and the general condition of the patient. The details of the various means mentioned and of the symptomatic evidences of the state of the liver function can not be discussed within the narrow frame of this article. I content myself with establishing general principles.

The treatment of the acute uremic attack is always an ungrateful task; for it is immaterial whether we are dealing with a disorder that is primarily or in its ultimate consequences due to renal or hepatic or general

metabolic insufficiency, in any case we are dealing with a terminal syndrome, that is due to the crumbling of the whole cellular edifice. To arrest this collapse, essentially means to revive a dying organism. That this may occasionally be done for the time being can not be denied; and as the recuperative powers of the human body border on the phenomenal no effort should be spared to bring an acutely uremic patient back to life.

Of sweating, purging and the stimulation of the kidneys I have already spoken. The administration of liver stimulants by mouth seems hardly feasible, and I have never seen any good effects in uremia that I could fairly attribute to this practice. The most sensible procedure is blood-letting. This useful measure constitutes a lost art nowadays, and it is time that it should be revived; we are dealing in uremia with a toxemia (for no organic lesions that could explain uremia are discovered after death), and to eliminate some of the poisons that are present in the blood by bleeding is always indicated; whether the injection of a saline to replace the lost fluid is useful or necessary is not yet established; it can certainly do no harm, particularly if some saline is injected that can stimulate the hepatic function, e. g., salicylate of soda in normal salt, or a solution of sodium citrate or phosphate in appropriate molecular concentration. Symptomatically, the use of such infusions has been useful in my hands, and has occasionally caused the most alarming symptoms of an uremic attack to disappear when other measures, I think, would have failed.

100 State Street.

A CASE OF TRAUMATIC ANEURISM OF THE RIGHT RENAL ARTERY, WITH A REVIEW OF THE LITERATURE.

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PHILADELPHIA.

Because of its rarity and the few cases that have been successfully operated on, I report this case of traumatic aneurism of the right renal artery that occurred during my service as house surgeon at the German Hospital. This patient was operated on by Dr. John B. Deaver, with whose permission I present the report:

History.—J. D., male, aged 26, single, machinist, was admitted to the surgical wards of the German Hospital March 17, 1905. There is no hemophilic, tubercular, neoplastic, cardiac or nephritic history in the family. The man smokes constantly and has used alcoholic beverages freely until lately. He denies venereal history. His appetite has been variable; bowels have usually been regular.

Present Illness.—When 12 years of age he was thrown from a horse and landed heavily on the ground, the brunt of the blow being received in the right lumbar region. The patient went to bed on account of shock, and complained of sharp, cutting pain in the right lumbar region, followed by hematuria. There was no vomiting. After being confined to bed for about twenty-four hours, the patient got up and went about his business. About a month after the accident he was seized again with a sharp, cutting pain in the right lumbar region, which lasted about two hours. He has had similar attacks of pain, usually with intervals of five days; often six months would elapse without any symptoms whatsoever. Each attack was severer than its predecessor.

The patient has never vomited, except after a hypodermatically injected dose of morphin; has never passed a calculus; he has never had a chill during an attack; he has never had a protracted cough, nor has he noticed any loss of weight. He was never jaundiced and never passed a gallstone.

The present attack began suddenly four days before admission to the hospital, with a colicky pain in the right lumbar region, which was referred down along the course of the right ureter to the end of the penis. Two days before admission he passed a moderate amount of blood through the urethra. This is the third attack in which blood was so passed.

Examination.—The patient was found to be of medium size and well nourished. Careful examination of the body revealed no pathologic condition, except that in the right lumbar region, where there was a moderate degree of bulging of the walls of the ilio-costal space, together with tenderness and pain rigidity.

There was a fixed tumor laterally between the ninth rib above and the iliac crest below, posteriorly reaching the right erector spinæ muscle, and anteriorly extending to a point 3 cm. external to the right linea semilunaris. Dullness was obtained over this area. The tumor was apparently cystic. No thrill or expansile pulsation could be felt, nor could a bruit be heard. The area of liver dullness showed a displacement of the liver upward for about 4 cm.

Blood Examination: Hemoglobin, 60 per cent.; red blood cells, 2,790,000; white blood cells, 11,700; color index, 1.0.

Urine Examination: Total amount in twenty-four hours, 620 c.c.; color, dark brownish-red; reaction, acid; sp. gr., 1.029; albumin, trace; glucose absent; urea, 2 per cent. Microscopically, abundant red blood cells, epithelial cells, phosphates and leucocytes were seen. No tubercle bacilli were found.

Diagnosis.—The history of a fall from a horse, landing on the right side, followed by pain in the right lumbar region and by hematuria, with moderate disability, suggested trauma of the kidney. The subsequent history of periodical attacks of pain, several of which were accompanied by hematuria, and the presence of a yielding tumor led us to suspect a hemato-nephrosis.

No signs were elicited that would reveal the presence of an aneurism. The duration of the condition, fourteen years, taken in conjunction with the negative family history, the absence of metastases or of cachexia, and the very moderate constitutional disturbances, led us to exclude malignancy, the secondary anemia present being accounted for sufficiently by the latest hemorrhage. Hydronephrosis was also excluded. So, too, the history and findings of the case made the presence of a renal calculus an improbability.

Operation.—The patient was etherized and the operation performed by Dr. Deaver on March 18, 1905.

An oblique incision 10 cm. in length was made in the right ilio-costal space, and the perirenal fat exposed. The right kidney was palpated and found to be enlarged sufficiently to warrant an extension of the incision anteriorly about 7.5 cm., carefully avoiding the peritoneum. While attempting to deliver the kidney, its lower pole ruptured, allowing about 200 c.c. of partly clotted blood to escape. The ureter was clamped and ligated. The kidney was delivered by successively clamping and cutting the adhesions surrounding it. The renal artery was palpated and found to be 1.5 cm. in diameter and the site of a tubulated aneurism. It was clamped close to the aorta and opened distal to the clamp, permitting the escape of fresh blood. The renal vein also was clamped. In freeing the upper pole of the kidney it was found necessary to go as high up as the ninth rib. The kidney was removed, but that part of the renal artery between the clamp and the pelvis of the kidney was left in place. Oozing from the bed of the kidney was controlled by a piece of iodoform gauze; four clamps were left in, the handles projecting through the incision, which was closed in the usual manner.

Postoperative History.—The patient was on the operating table forty-five minutes, and when removed to bed the temperature was 99.6, the pulse 128, and the respirations 28. There was no sign of shock.

The clamps that were left in the wound for forcipressure

were removed on the fifth, the gauze on the sixth, and the stitches on the ninth day after operation.

The patient had an uneventful recovery, with the exception of a mild delirium on the fourth, fifth and sixth days after operation, and was discharged, cured and in excellent condition, on May 2, 1905, forty-five days after operation.

Of interest in determining the permeability of the left kidney after operation by gauging its intensity of elimination is the appended urinary table for the two weeks following operation:

POSTOPERATIVE URINARY FINDINGS.

Date.	Amount in 24 hr.; c.c.	Sp. Gr.	Color.	Albumin.	Urea: per cent.	Microscopic Findings.
Mar. 17	1629	029	Dark brown...	Trace...	2	Numerous red blood cells.
" 18	700	1032	Reddish brown..	Trace...	2	No tubercle bacilli.
" 19	1110	1025	Yellow...	Absent...	2	Phosphates, urates.
" 20	950	1028	Amber...	Faint trace.	2	Phosphates, uric acid.
" 21	875	1028	Yellow...	Very faint trace.	2.7	Phosphates, urates.
" 22	630	1034	Reddish yellow.	Absent...	2.2	" "
" 23	829		Cloudy yellow.	Trace...	2	" "
" 24	750	1030	Yellow...	Very faint trace.	3	" "
" 25	400*	1032	Yellow...	Absent...	3.3	" "
" 27	1890	1013	Yellow amber...	Absent...	1.2	" "
" 28	1400	1015	Pale yellow...	Faint trace.	1.7	" "
" 29	1310	1012	Pale yellow...	Faint trace.	1.2	" "
" 30	1290	1014	Yellow...	Faint trace.	1.2	" "
" 31	800	1026	Yellow amber...	Very faint trace.	1.8	" "
April 1	700	1021	Yellow...	Faint trace.	1.9	" "

* Plus.

N. B.—Glucose always absent. Reaction invariably acid.

Examination of Kidney.—The kidney was examined by Dr. A. O. J. Kelly, who kindly furnished the following report:

The kidney, when removed, was fragmented and partly disorganized, and measured 11x6x4 cm. The lower two-thirds were surrounded by, and lay flattened against, the sac of a false aneurism. The kidney tissue in this region consisted almost exclusively of cortex, and varied in thickness from 4 to 8 mm., but was very much attenuated at the extreme lower pole, where rupture had occurred. The tissue was much compressed, and immediately adjacent to the blood clot it was quite fibroid. The cortex of the kidney elsewhere than immediately surrounding the false aneurism contained a few small cysts. The renal artery, having been cut off close to the kidney, could not be further studied.

Microscopically, areas of chronic parenchymatous nephritis, with moderate fibrosis and round-cell infiltration, were found.

By consulting the literature, I find that in all twenty-two cases of aneurism of the renal arteries have been detailed by other writers. Keen¹ described a nephrectomy for a large aneurism of the right renal artery, and gave a résumé of twelve previously reported cases of renal aneurism.

Morris² described a case of aneurism of the left renal artery, and gave abstracts of twenty-one previously reported cases.

P. Ziegler³ gave a general résumé of the subject of renal aneurisms, together with abstracts of twenty cases which he had collected.

Through the kindness of the librarian in the surgeon-general's office, Major-Surgeon Walter H. McCan, I have collected four more cases, and these, together with the case here reported, bring the recorded cases up to twenty-seven. This is the fifth patient who has been operated on; of the other four, one died.

Ziegler³ has described the etiology, symptomatology, diagnosis, prognosis and treatment of renal aneurisms

1. Keen: Philadelphia Med. Jour., 1900, vol. v, p. 1038.

2. Morris: Lancet, 1900, vol. II, p. 1002.

3. Ziegler: Centralb., f. d. Grenzgeb. d. Med. u. Chir., Jena, 1903, vol. vi, pp. 2-8

so well that I would deem this article incomplete should I not quote him:

"Of aneurisms, those of the renal arteries are among the rarest, and . . . are rarer than splenic aneurisms. Their aneurism is small, it may possibly give no symptoms and perhaps will only be relieved accidentally during the course of an operation. Later it may produce a tumor and bring about atrophy of the kidney, finally rupturing into the renal space, accompanied by severe hemorrhage, causing death, or not progressing so rapidly, a sac is formed at the false aneurism, in which repeated small hemorrhages lodge.

"The bleeding can become fatal before a tumor has made its appearance. . . . Sooner or later a tumor will always form, and this is, besides the hemorrhage, the most serious symptom. The tumor may give rise to no pain or may be accompanied by most excruciating pains; the size of the tumor may vary from that of a fist to a man's head. . . . Pulsation is absent in renal aneurisms, since the artery is too small in proportion to the size of the sac for the impulse of the blood to be great enough to expand the sac sufficiently that it may be made manifest; so, too, auscultation rarely gives results. The ordinary symptoms that arise from the escape of blood or from the pressure of the tumor are very unreliable; mistakes are very readily made with neoplasms, hydronephrosis and hemato-nephrosis. In neoplasms, rapid growth, followed by emaciation and mild bleeding, are characteristic, and, in the presence of metastases, the diagnosis is clearer. In hydronephrosis, which also can be of traumatic origin, bleeding is seldom met with.

"The prognosis is extremely unfavorable. All cases in which no operation was done terminated fatally, and of these the cause of death was hemorrhage into the renal space, venter or retroperitoneal space.

"As to treatment, nephrectomy alone is to be considered, and, by all means, the transperitoneal method is to be preferred on account of the ease with which the renal vessels may be quickly ligated."

Ziegler then gives abstracts of twenty cases which had been reported up to January, 1903.

I have collected the following four cases:

1. Fulton⁴ writes of a woman, aged 36, with a history of severe pain in the right side with more or less collapse a day or two before admission to the Rhode Island Hospital. The diagnosis of extrauterine pregnancy was considered the most probable one, but the patient was not operated on because of her extreme condition, and she died shortly afterward. There was found at autopsy an enormous hemorrhage, retroperitoneally, on the right side, extending from the diaphragm to the brim of the pelvis. The kidney lay in the midst of this mass of blood clot. About one inch from the origin of the renal artery, there was an aneurismal dilatation of that vessel; this had ruptured, causing the hemorrhage.

2. Abbott⁵ reports on a specimen showing a small saccular aneurism on an accessory branch of the right renal artery. The history, in brief, is that of a woman, aged 56, who two years previously fell heavily, injuring her back, and who had never felt well since. Eighteen months later the patient sustained another heavy fall. A year ago she began to suffer from the renal insufficiency, which caused her death. Postmortem examination revealed a general anasarca and advanced chronic interstitial nephritis. The renal arteries were distinctly calcareous; the other arteries showed beginning atheroma. The right kidney showed four cicatrices, and, microscopically, advanced chronic interstitial nephritis, with marked periglomerulitis and atrophy of the tubules. In the medulla were hemorrhagic areas.

Of interest in this case is the association of three possible causative factors: a heavy fall, in which the patient injured her back; a chronic interstitial nephri-

tis, and marked calcareous degeneration of the renal arteries. The specimen, described by Abbott, shows a small aneurism on an accessory branch of the right renal artery, just beyond its origin, which presents a small excrescence, the size of a marrow-fat pea, on the posterior surface of the vessel. The contents of the sac were a single free, homogeneous blood clot. At the proximal end of the sac there was beginning fatty degeneration. There were no symptoms of aneurism of the renal artery present.

3. Barnard⁶ reports a very interesting case of a small calcified and cured aneurism of the right renal artery that caused the death of the patient in a peculiar manner. A boy, aged 9, was thrown from a runaway horse, falling heavily to the ground on his back and right side. On account of signs of hemorrhage into the venter, he was operated on the next day, and about 750 c.c. of black fluid blood were removed from the peritoneum, and a rent in the right lobe of the liver was found and packed. Death occurred the following day.

The postmortem examination revealed an aneurism, the size of a hazel nut on the upper of two branches of the right renal artery, the contents of which had partially calcified and had thus brought about a cure. The heart revealed a stenosis of the mitral valve, an embolus from which probably caused the aneurism.

Of further interest in this case are the facts not only that the aneurism and renal artery escaped uninjured, but also that the aneurism conducted the violence from the loin to the duodenum and liver, bruising the duodenum, and causing a stellate fracture of the liver that radiated from the renal impression, and a wedge-shaped area of pulping of the hepatic tissue, the apex of the wedge corresponding with the calcified aneurism. The base of the wedge appeared on the surface of the liver and allowed the free escape of blood into the peritoneum.

The kidney itself had escaped injury, but between the true and the fatty capsule of the right kidney, on its posterior surface, was a considerable hematoma, and this extended around the posterior surface of the aneurism.

4. Barnard⁶ cites the case of a little girl, whom he examined. The child was dying of malignant endocarditis and developed suddenly a large, diffuse swelling in the left loin behind the colon. At necropsy, this was shown to be a large collection of blood which had escaped from a ruptured aneurism of the left renal artery.

I emphasize Morris² valuable warning that as soon as the nature of the tumor is ascertained, the renal pedicle should be reached, and the renal artery ligated before attempting to empty or to remove the sac. The wisdom of this dictum is self-evident. The text-books do not mention aneurisms of the renal arteries, an error of omission that, I believe, should be corrected.

In cases in which a fall from a height with evidences of resultant injury to a kidney has occurred, and in which there is hemorrhage, it would be well to consider the diagnosis of aneurism of the renal artery, which is a diagnosis more definite than that of essential kidney hemorrhage.

In closing, I call attention to the fact, more of interest than of practical importance, that of all the arteries of the body the renal, when the site of a symptom-producing aneurism not involving the abdominal aorta, is one of the few that offers an ideal cure—total extirpation of the artery (and kidney) without interfering with the blood supply of any other part of the body.

4. Fulton: Providence Med. Jour., 1904, vol. v, p. 9.

5. Abbott: Philadelphia Med. Jour., 1900, vi, p. 959.

6. Barnard: Jour. Path. Soc. Lond., 1900-1901, vol. III, p. 254.