tage of country air. One-third of the urine passes by the urethra, the rest by the suprapubic opening. His health is excellent; he takes a daily walk, and as the healing process of so large a wound, greatly as it has already diminished in size, will probably progress better at home than in London, no objection is made to his return there.

July 14th.—He writes me that “almost all the water passes by the proper channel”; the wound, nearly healed, “would only just admit a cedar pencil”; that he is “in capital health, and walks two miles or more every day.”

In the woodcut in the preceding page the calculus is represented of the natural size. It measures 4½ in. in length

The largest calculus of uric acid which I have ever met with is one in St. Thomas’s Hospital museum. It was removed by autopsy from the bladder of Sir Thomas Adams, who died in 1672; it is said to weigh 25 oz. It was described, with many interesting particulars relating to its history, by Mr. Charles Williams of Norwich, in the *Path. Trans.*, vol. xxi. (1870), pages 267-270. Mr. Williams has been so good as to send me a report on the large calculi in the Norwich Museum. The first in the accompanying table (Harmer’s) is the only one of extraordinary size there. The next in order weighs 8 oz.; but while this is remarkable, it belongs to a more numerous class than that now under consideration.

TABLE OF CALCULI OF REMARKABLE SIZE REMOVED BY OPERATION IN ENGLAND.

Sex.	Age.	Nature of operation.	Operator.	Date.	Weight.	Result.	Source of record.
Male	48	“Marian operation.” Extracted entire.	Harmer, of Norwich.	1746	“Nearly 15 oz.” “Alternating layers.”	Lived five years, the wound remaining open.	Gooch’s Cases and Remarks on Surgery, p. 54. (London, 1758.) Now in the Norwich Museum.
“	—	Lateral operation Extracted entire.	Cheselden, of St. Thomas’s Hospital.	The end of last century	17 oz., consisting of three uric acid calculi united by phosphatic matter.	Death next day.	Catalogue of Calculi in the Museum, Royal College of Surgeons. A. c. 7, page 37, plate 3.
“	28	Lateral operation. Extracted in fragments.	Mayo, of Winchester.	1818	14 oz. 2 dr.	Recovered.	Paper in <i>Medico-Chirurgical</i> <i>Transactions</i> , vol. xi., p. 54. (1821.)
“	43	Lateral operation. Failed to remove.	Dalrymple, of Norwich.	1818	About 13 oz. at autopsy.	Death.	Earle’s Paper in <i>Medico-</i> <i>Chirurgical Transactions</i> , vol. xi., p. 71. (1821.)
“	43	Lateral operation. Extracted entire.	Astley Cooper, of Guy’s Hospital.	No date.	16 oz.	Death four hours after.	<i>Ibid.</i> , p. 73.

by fully 3 in. in breadth; the major circumference being almost 12 in., the minor 8 in. The weight is 14 oz. avoirdupois. There is a remarkable natural denudation of the layers of the calculus on each side, corresponding with the orifices of the ureters in the bladder. The entering currents of urine through these canals have clearly worn away the stone to a considerable extent.

The chief examples of calculi of remarkable size on record for which an operation has been undertaken in this country are given in the above table.

Phosphatic calculi of large size are far more common, and they sometimes attain a greater weight than any of the above-mentioned examples. In the well-known case of Sir Walter Ogilvie, the phosphatic mass, which Mr. Cline endeavoured to remove without success, was found at the autopsy to weigh 46 oz. troy, and was quite immovable by any operation practicable during life. It is in the collection of calculi at the museum of the Royal College of Surgeons, No. H 2; *Cat. Calc.*, part i., p. 116.

(To be concluded.)

ON THE
OCCURRENCE OF BLOOD IN THE URINE
IN GRANULAR KIDNEY.

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BLOOD in the urine in granular kidney is not, I believe, of very common occurrence, and may on that account lead to difficulties of diagnosis. It may be in sufficient quantity to give the urine a bright-red colour, or, as is less rare, a smoky or pinkish hue. The following cases have recently come under my observation.

CASE I.—A girl, aged twenty-one, came into the hospital with a history of fits for two years, attended with attacks of biliousness, giddiness, and sickness. She had suffered from childhood with a chronic discharge from the ear, and her hearing was considerably impaired. For the last few weeks she had to rise several times in the night to pass urine. On the evening of her admission she had one of the so-called fits. She did not lose consciousness, but became very excited, throwing herself about and complaining greatly of her head, sobbing and crying from the pain. She had severe retching, and pain in the cardiac region, and during the attack seemed to be in a condition of great general hyperæsthesia. Her eyes were examined, and double optic neuritis discovered, with abundant hæmorrhages, many recent, and with glistening white patches. The case had presented itself at first as one of intracranial disease—possibly, it was supposed, an abscess connected with the old ear mischief. But the eye changes, the condition of the arteries (thickened) and of the heart (hypertrophied), associated with the presence of albumen in the urine, led to the diagnosis rather of granular kidney.

The day after admission the urine was of a bright-red colour, and contained much recent blood. The albumen was abundant, about one-fourth, but the presence of blood made it difficult to estimate the exact quantity. The urine continued to contain much blood for sixteen days, when it disappeared and the colour became normal, and then the urine contained one-third albumen. During this time the patient had had several of the “attacks” described, and for three days had severe epistaxis. The hæmorrhages, also, in the retina increased in number and size. Shortly afterwards a systolic cardiac murmur, thought to be hæmic, was detected. The patient’s condition did not materially change during the next two months, except that she became by degrees profoundly anæmic, and as this developed she began more and more to complain of cardiac pain and dyspnoea. Two months after her admission she had another attack of epistaxis, and a few days later some small purpuric spots appeared on the backs of the hands and legs, which had been for some days slightly oedematous. She now became very noisy and delirious, and continued in this state till her death, which took place about ten weeks after admission. There had been no return of blood in her urine. The post-mortem examination disclosed the typical lesion of well-marked granular kidney. The kidneys were greatly contracted. The left weighed only three ounces, and the right was converted into a small fibrous capsule, with hardly any trace of kidney substance remaining. It measured an inch and a half by three-quarters of an inch. The arteries and veins on this side were also much smaller than on the opposite. No obstruction existed in the course of the ureters, the bladder was healthy, and there was no trace of calculus either in kidney or bladder. The heart was hypertrophied and weighed 15½ oz., a very large size for so small and slenderly built a young woman, for her weight could hardly have been more than 6 st. The arteries were much thickened. The brain was oedematous, but otherwise quite healthy. The case was, therefore, one of well-marked granular disease of the kidney.

CASE 2.—Another case I have met with recently—viz., that of a young man of nineteen, a warehouseman, who believed himself to be in good health until three months before admission, when he suffered from hæmorrhage from the bowels, and was confined to bed for five weeks. He seemed to get well, and remained in his usual health until two days before admission (Jan. 14). He then had a sore-throat and felt sore all over, and in the evening he noticed that his urine was very dark coloured. He had a little pain in the back, and during the night felt hot, then shivered and perspired. There was no history of chill or of any cause for the attack. The patient was pale and of a pasty complexion, with slight herpes on the lips. The right tonsil was slightly ulcerated. There was no oedema anywhere. The urine was porter-coloured, acid, sp. gr. 1014, and contained one-quarter of albumen. The arteries were thickened and the tension raised. The microscopical examination of the urine showed the presence of numerous red blood-cells, with triple phosphate crystals and a few fragmentary granular casts. The quantity of urine passed was on the average above normal. The temperature on admission was 101° , but it fell the next day to normal and remained normal afterwards. The throat affection rapidly disappeared, so that the rise of temperature depended probably upon this condition. Oedema was completely absent. The urine contained blood for a week after admission, and continued to contain albumen, though only a very faint trace, until his discharge nearly three months later. The history of recent sore-throat with albumen and blood in the urine led me to think at first that the case was probably one of diphtheria associated with nephritis, but the condition of the arteries, the long persistence of albumen, and the absence of oedema, convinced me later that the case was one of granular kidney. This conclusion was confirmed by the subsequent course of the case, for the urine for the last two months of his stay was characteristic, being large in quantity (80-100 ounces), of low specific gravity, and with but a trace of albumen.

CASE 3.—Edw. P—, aged thirty-four, was admitted into the Royal Free Hospital as a case of acute nephritis. He had been a free liver and had drunk much beer, but was in good health until one month before admission. Then his legs swelled, and a fortnight later his toes also. On admission there was slight general oedema. The urine was reduced in quantity and contained one-half albumen with granular casts, and was smoky. The eyes were normal on ophthalmoscopic examination. The arteries were slightly thicker than normal for his age. The case ran the ordinary though protracted course of acute nephritis, ending in convalescence. On several occasions while the oedema persisted the urine contained blood, being sometimes bright-red in colour, at other times only smoky. These alterations could not be traced to any cause, for they occurred during the time that the patient was kept entirely in bed. After about two months the oedema completely disappeared, and continued absent till the patient's discharge from the hospital. The albumen was at times completely absent, and at most times there was only a trace; and on several occasions after the oedema had gone the blood returned in the urine, generally to the extent of giving it a smoky tint, but occasionally the colour was bright-red. Generally at these times there was an increase also in the amount of albumen over and above what the blood would account for. The duration of these attacks was about two or three days, during which there was no other change in the patient's condition. The arteries, however, were distinctly thicker and harder on leaving the hospital than they were on admission. I was led to regard the case as one probably of old granular change, with an intercurrent attack of acute nephritis. At any rate, at the time of leaving the case presented the characteristic features of granular kidney.

Since this case I have also seen several others of a similar kind, in which the diagnosis of granular kidney seemed clear, and during the course of which the urine on many occasions contained blood, sometimes only sufficient to give to it the smoky tint for a few days, but at others sufficient to make it bright-red in colour. It is not easy to determine the part of the urinary tract from which the hæmorrhage comes. In the second and third cases it was, in all probability, from the kidney; but in the first the very bright colour and quantity of the blood seemed to suggest its origin from the lower part of the urinary tract. The quantity in this case was so large as to suggest even calculus, but none was present. The difficulty in diagnosis between this condition and calculus has actually occurred, as in a case

related to me by Dr. Sharkey of St. Thomas's Hospital. The patient, a young girl, passed so much blood with the urine that the bladder was sounded, and, failing to find a stone, dilatation of the urethra and digital exploration of the bladder was suggested. To this Dr. Sharkey did not, for good reasons, consent; and the patient dying, no stone was discovered on the autopsy, but markedly granular kidneys.

In less severe forms the chief difficulty in diagnosis is from cases of acute nephritis. The second and third patients both had, during the latter part of their illness, a considerable amount of albumen in the urine, and as on most occasions the urine was smoky and not often bright-pink in colour, and also contained a few casts, the diagnosis of acute nephritis was natural, but they presented these points of difference from ordinary acute nephritis: (1) the absence in one case and the existing small amount in the other of general oedema; (2) the great fluctuation in the amount of blood and albumen at different times; (3) the subsequent course of the cases, the diagnosis of granular kidney becoming clear as they progressed.

The hæmorrhage which takes place from some part of the urinary tract in these cases of granular kidney, though uncommon, is not peculiar, except so far as regards its source. The explanation is probably the same as must be given to the hæmorrhage which occurs from other parts in this disease. Epistaxis, often very severe and difficult to control, is one of the commoner epiphenomena. The first case suffered severely from it on several occasions, and once at the same time that the urine also contained blood. Of hæmorrhage from the respiratory tract in granular kidney I know nothing; but bleeding occurs occasionally from the bowels. The first symptom of illness in the second case was such a hæmorrhage from the bowels, which confined the patient for five weeks to bed; and although the cause of this hæmorrhage is not certain, its association is at any rate suggestive. Hæmorrhage into the eye and brain are among the commonest of incidents in the course of granular kidney, so much so that retinal hæmorrhages are of recognised diagnostic value, while brain hæmorrhages explain the apoplexy with which such cases not rarely terminate, and in both organs miliary aneurysms are frequently found. In the cases in which the hæmorrhage occurs actually in the kidney it is possible that there is another explanation. It may prove to take place especially in those cases of granular kidney in which the cirrhotic change is most marked round the Malpighian bodies, and the bleeding may then possibly be the result of the mechanical obstruction to the circulation in the Malpighian tufts. But I know of no observations bearing on this point. On the whole, however, we may with greater probability regard the hæmorrhage from the urinary tract as part of the general vascular changes which occur in this disease, and, if so, it is remarkable that hæmaturia is not of more frequent occurrence in granular kidney than it appears to be.

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REMARKS ON

THE CIRCULATION OF THE BLOOD.

MECHANISM OF THE ESTABLISHMENT OF VASCULAR CONGESTION: AN EXPERIMENTAL RESEARCH, DEDICATED TO STUDENTS OF MEDICINE.

By T. WHARTON JONES, F.R.C.S., F.R.S.

Mechanism of the establishment of vascular congestion in a wounded part.—By means of a lancet a wound was inflicted on the ear of a rabbit, dividing an artery, a vein, and capillaries. A small quantity only of blood escaped at first owing to constriction of both segments of the artery by the contraction of their muscular coat, which was excited at the place of section and for some distance beyond; but the arterial walls relaxing in a few seconds, bleeding came on, and continued freely for a time, when it ceased. This suppression of the hæmorrhage was produced by blood coagulating around the retracted ends of the divided artery, and stopping up their constricted orifices; whilst the full stream of blood became diverted into the first considerable branch above. Between this branch and the orifice of the artery, now stopped up by the *external* clot, the materials of an *internal* clot collected, comprising plasma with a number of