

ART. IX.—*Case of Disease of the Bladder following an Injury. Presence of Carbonate of Ammonia in the Urine.* By CHARLES RANSFORD, M. D. Fellow of the Royal College of Physicians, and Physician to the Royal Public Dispensary, &c. &c. (Read before the Medico-Chirurgical Society of Edinburgh.)

ADAM BEGG, aged 80, had been for some months affected with numbness in his legs, attributed to old age and debility. On the night of Wednesday, April 23, 1834, in attempting to get out of bed, (raised scarcely two feet from the floor,) being, as he says, perfectly sober, he fell, but knew not upon what part of his body,—becoming for a short time insensible. The lesions perceptible were contusions on the right thigh and groin; the limb shortened, and the foot everted. He was unable to move either limb, or to turn himself in bed. I saw him first on Saturday, May 3d, and learnt that, since the accident, he had lain constantly upon the back, and passed urine in small quantities, accompanied with much irritation, the day after the injury. He did not suffer from complete retention until April 30th, when he sent for a surgeon in the neighbourhood at midnight. The contents of the bladder were drawn off, affording great relief. When I visited him three days afterwards, I found him suffering from retention, no urine having been passed or drawn off since the introduction of the catheter three days previously. Notwithstanding this, there was no distension of the bladder. The bowels had been freely opened in the morning by castor oil; there was a purulent discharge from the glans, and phimosis also existed; his general health appeared good. His requests to have the catheter passed were so urgent, that I introduced it immediately. Not more than twelve ounces of urine, of a dark-red colour, as if mixed with blood, were taken away, not in a continuous stream, but in jets, at intervals, assisted by the action of the abdominal muscles. He had perfect command over the *sphincter ani*, and did not complain of tenesmus. Six leeches were directed to be immediately applied to the right groin, and afterwards warm fomentations; and he was ordered to have at bed-time ten grains of Dover's powder, and one ounce of castor oil next morning.

May 5th, Bowels freely opened; the bladder is very irritable; some drops of urine escaped at intervals. The bladder had been twice emptied by the catheter on the preceding day, with temporary relief. No mucus nor deposit of any kind was at this time perceptible; and upon testing the urine with litmus-paper, it was found to be slightly acid. He complained of great pain about six inches down the urethra, aggravated by the introduction of the catheter, which suffered at this spot slight obstruction, overcome, however, without any force being necessary, but not of any, on

pressure over the pubes. Five grains of the soap and opium pill were ordered every four hours, and mucilaginous drinks to be freely given.

May 6th, Considerable relief was experienced after taking one pill; slept four hours; the pain, however, returned, and no further benefit resulted from the repetition of the opiate. The pulse was quick; the tongue furred; the skin hot and dry; and the bowels confined. The urine drawn off yesterday was of a dark colour, and turbid, not decidedly bloody. He was ordered immediately to have an ounce of castor oil, and a pill consisting of one grain of calomel, one grain of ipecacuan, and half a grain of opium, was ordered immediately, and to be repeated at the end of six hours. Blood was also directed to be drawn from the loins by cupping.

May 7th, 9 o'clock P. M. On account of his position, the cupping was performed with great difficulty; only four ounces of blood were taken. He had passed urine since last evening, but spent a very restless night. The urine was dribbling incessantly into a tin vessel kept constantly applied. He was sweating profusely; with the pulse at 100; and he had rigors about six o'clock. The pill of calomel, ipecacuan, and opium was directed to be repeated.

May 8th, Mr Syme saw the patient with me. He had slept well after taking one pill. Febrile symptoms were much abated; the tongue moist; and the pain and irritability of the bladder considerably diminished. Mr Syme carefully examined the bladder, and drew off about six ounces of turbid, dark-coloured urine still acid, and a small quantity had been passed naturally before the visit. He was ordered immediately half an ounce of castor oil; and the pill of calomel, ipecacuan, and opium, to be repeated.

May 11, Appeared much sunk; complained of constant pain about the perinæum and pubes; pulse 80; tongue dry; urine dribbling away constantly. Leeches were applied to the perinæum. The powder of *Arbutus uva ursi*, with carbonate of potass, was ordered, with extract of hyoseyamus at bed-time, and an anodyne injection if necessary.

May 15th, Much better, but still suffers from pain in perinæum and pubes. Urine comes away involuntarily, and exhibits a mucopurulent deposit. It is decidedly alkaline, having a very strong smell of carbonate of ammonia, though by no means offensive. The following analysis was made at this period by my friend, Mr Russell, under the superintendence of Dr Gregory.

“*Analysis of urine.*—We first filtered four ounces, then added to the filtered liquor muriate of lime so long as any precipitate appeared. The muriatic acid combined with the ammonia, existing in the urine in the state of carbonate, and the lime with the carbonic acid, forming the insoluble carbonate. The carbonate on being collected and dried weighed 50 grains carbonic acid, 22 × lime 28, but 22 of carbonic acid combine with 17 of ammonia which might be thus expressed;

5 16 3 14

C. + 2 Ox. + 3 H. + Nit. subtracting an atom of water, there remains

8 8 2 14

C. + Ox. + 2 H. + U. = 33 grains of urea.

This is nearly 2 per cent. the usual quantity found in healthy urine."

May 16th, On account of the typhoid symptoms now present, the sulphate of quinine and diluted sulphuric acid, with wine, and full opiates by the rectum were administered. He continued nearly in this state until June 1st, the opiates failing to procure sleep. The diluted sulphuric acid was regularly taken three times in the day; but though the carbonate of ammonia disappeared, the urine continued alkaline; and the quantity of mucus deposited was much increased, with the addition of the earthy phosphates. In the evening of June 1st, a sudden accession of pain took place, and infiltration of urine into the scrotum, and gangrene rapidly succeeded. He died within eighteen hours afterwards.

Post mortem appearances forty-two hours after death.—The bladder contained about eight ounces of urine mixed with mucus; its cavity was much diminished by the coats being nearly four times thicker than usual; the rugæ upon the inner surface were strongly marked; the triangular pouches between them were deep and well-defined. The mucous membrane was highly vascular, and softened at the prostatic portion only. The prostate was healthy, not containing any calculi or sabulous matters. The parts in the neighbourhood of the infiltration, particularly the coats of the bladder, were much softened. The scrotum and penis were in a state of gangrene. The former with the testes had decomposed so rapidly after death, that a rupture had taken place, and urine mixed with blood escaped on the bed. From this circumstance, we could not discover the ulceration by which the urine had escaped into the scrotum. The right kidney was softer than usual, and some congestion was observed in the cortical part. The left kidney was natural.

I was informed by his son, that he had been occasionally subject to irritability of the bladder, after any excess in drinking, in which he sometimes, though not frequently, indulged. The patient positively assured me that he never had suffered from syphilis or gonorrhœa. On examining the right hip-joint, we found the neck of the femur fractured in two places. One fracture extended through the trochanter, the other round the head of the bone. Upon the capsular ligament was some osseous deposition. But there was no attempt at reunion.

That carbonate of ammonia was occasionally secreted by the kidneys, was first presumed, I believe, by Nysten, who relates a case of ascites, in which the urine contained carbonate of ammonia, but not a trace of urea.* Dr Graves announced the same facts some

* Nysten, *Recherches de Chimie et de Physiologie Pathologiques*. 8vo. Paris, 1811, quoted by Willis on *Urinary Diseases and their treatment*. London, 1838.

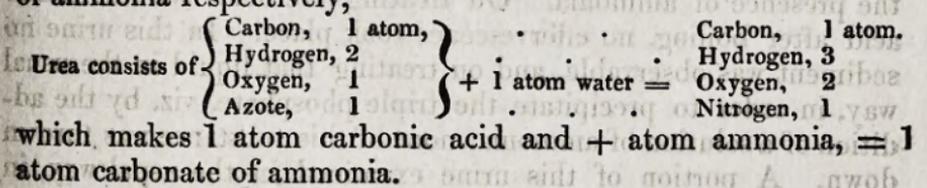
years since, in two cases under his care. In one this carbonate was discovered in the *recently* voided urine of a fever patient, in whom, as the health improved, the ammonia disappeared. In the second case by Dr Graves symptoms of anasarca and intestinal inflammation, attended with deposition of the earthy phosphates, terminated fatally. The urine was perfectly limpid when voided, and had not the slightest putrescent smell. In both of these cases the salt was found in urine passed within half an hour and two hours after the bladder had been completely emptied. In this, as in all the instances in which carbonate of ammonia has been present, no traces of urea could be discovered. The kidneys, as the right one in Begg's case, were found to be enlarged and turgid with blood, but the mucous membrane of the bladder was healthy. In two cases of *diabetes mellitus*, treated in the Royal Infirmary of Glasgow, and the particulars of which are well described by Mr M'Gregor in the London Medical Gazette, (Vol. xx. p. 268,) during the course of the disease, and whilst opium was exhibited to the extent of three grains daily, the urine became strongly alkaline, containing carbonate of ammonia but no urea; the specific gravity of the urine of one of these patients is mentioned 1.044. After a week the carbonate of ammonia was replaced by urea.

My friend Dr Irvine, when acting as clinical clerk in the Royal Infirmary of this city, during the winter of 1833, observed the same secretion of carbonate of ammonia in the urine of several patients suffering from continued fever of a typhoid nature, and likewise in one case of dropsy. The urine in which the salt was present, on being treated with any diluted acid, instantly effervesced briskly. In the case of dropsy the urine was of a light nut-brown colour, of specific gravity 1020. Litmus paper previously reddened being introduced, indicated an alkaline re-action; it had a strong ammoniacal smell, and effervesced with acids. On being boiled, and a rod dipped in muriatic acid held in contact with the vapour, copious white fumes were produced, indicating the presence of ammonia. On treating the urine with muriatic acid after boiling, no effervescence took place. In this urine no sediment was observable, and on treating that liquid in the usual way, in order to precipitate the triple phosphate, viz. by the addition of a solution of ammonia, none of this substance was thrown down. A portion of this urine examined in the usual way, in order to ascertain whether it contained any urea, gave no indication of the presence of that substance.

Dr Irvine kindly favoured me with the particulars of one of the fever cases. In this urine a dark-coloured sediment was perceptible, it effervesced strongly with acids, and had a distinct alkaline reaction on litmus-paper. The gas disengaged during the addition of acids was the carbonic acid. On passing a stream of it

through lime-water, a thin pellicle was found on its surface. The urine was boiled, and a slip of litmus-paper, moistened and previously reddened by a weak acid, was held in contact with the vapour, and indicated the presence of an alkali; a rod dipped in muriatic acid, and held over the boiling fluid, instantly detected the presence of ammonia, forming with the vapour dense fumes of muriate of ammonia. After boiling, the introduction of muriatic acid into the urine caused no effervescence; a portion of urine set apart and treated with a solution of ammonia gave no trace of the triple phosphate. Another portion was examined in the usual way for urea, but was found not to contain any.

The labours of many eminent chemists and pathologists have established beyond dispute the fact, that material changes take place in the fluids of the body during disease. The subject is daily increasing in interest, and when we take a retrospect of all that has been already effected, it is not unreasonable to anticipate the most important results from the cultivation of this department of chemistry. Amongst so many celebrated works on the chemical composition of the urine, there is very slight mention of the subject which comes under our notice in these cases. Dr Willis, in his lately published valuable work on urinary diseases, has collected all the information which he believes we possess, on the presence of carbonate of ammonia in the urine of persons labouring under disease. He combats the opinion entertained by some of his predecessors, that the presence of this salt is owing to the decomposition of urea in the bladder. In those cases of diseased prostate, and of inflammation of the mucous membrane of the bladder, in which the urine is ammoniacal, it is highly offensive, and is most probably due to the rapid decomposition of the urea during its sojourn in the bladder. From the facts which I have now related, there does not appear to me room for hesitation that it is in the kidneys that the change takes place; and it does not appear so remarkable when we consider the chemical constitution of urea and carbonate of ammonia respectively,



We cannot explain the reason why, instead of urea, carbonate of ammonia should be formed, and can only refer the change to the general disorder of all the functions which takes place during the febrile state, which is evident from the vitiated and deficient secretions. The digestive organs are especially at fault, their functions with those of assimilation being much injured.

November 1838.