

ART. IV.—*Case of Phosphatic Deposits, terminating in Deposition of Lithic Acid and Lithate of Ammonia.* By A. V. LESLEY, M. D., Brooklyn, New York.

———, while residing in the country in 1840, severely injured his back by lifting a heavy weight. The immediate effect was pain, which confined him to bed for several days. From this time a constant pain was experienced in the loins, especially severe at the fourth and fifth lumbar vertebrae. This was borne by habit, and but little was done after the first few months, in which plasters of Burgundy pitch and stimulating lotions were used without effect. A recumbent position allayed the pain, which was aching and exhausting. General health good, though being exposed to miasma, he became a victim to intermittent and remittent fever. Occasionally during the succeeding years he noticed that the urino was very turbid, and portions issued milky from the urethra; still, as no acute pressing symptoms occurred, no attention was paid to it until the summer of last year (1846), although in 1843 he had experienced three attacks of gravel, passing a small white calculus at the close of each. On recovering last summer from a *coup de soleil*, the urine attracted notice by its almost uniformly turbid appearance. The pain in the back still continued, but not so violent as before. Having been actively engaged in professional pursuits in this city during the past winter, with fair appetite, and no perceptible cause for the gradual loss of strength and comfort, he applied to me for relief.

*May 10th.* After a superficial examination of his case, I commenced a full series of observations on the then condition of the secretion, previous to adopting any plan of treatment. This series consisted in a record of the temperature and weather, the quantity of urine passed immediately on rising from bed, after breakfast, before dinner, after dinner and at night; the specific gravity of each portion; from these the amount for the day, the average specific gravity, and the solid contents of the urine were obtained; the state of the pulse, the microscopic appearances, the diet, amount of exercise, &c. The microscope used was an excellent achromatic of one-tenth inch focus.

At this time he had been married three years, was between twenty-five and thirty years of age—weight 134 lbs.—appetite very variable, generally large, sometimes insatiable. There was a considerable degree of thirst; the skin acted very freely on slight exercise; the bowels moved regularly, inclined to costiveness; the nervous system was excessively irritable—the mind morbidly active, occasionally gloomy; great vigilance, and sleep was short and unsatisfactory; slight noises caused violent painful palpitations of the heart, and a steady pain was experienced between the fifth and sixth ribs over the heart, whenever he was exhausted by fatigue. At the same time the brain suffered at times from the sun's rays. The pain in the back had diminished, but was very annoying. The pulse was somewhat hard, full and irregular, beating about sixty-five morning and night, which was above his natural range; from this it mounted, from slight causes, to eighty and even ninety, quickly subsiding again. Strength steadily diminishing, although under good exercise and diet.

The urine, during the period of examination, was, with the exception of some few mornings, always turbid, and often very offensive in odour. It was feebly acid generally, on some occasions neutral, and but once found

to be alkaline. The specific gravity varied from 1.026 to 1.051, generally above 1.030. The deposit was copious, white, and consisted of the phosphates of ammonium and magnesia. It subsided rapidly after passing, and in fully one-third the number of passages, the phosphates issued either at the beginning or termination of the turbid stream, dense and milky. The urine displayed the iridescent pellicle in a few minutes after standing, and putrefaction began in from four to twenty hours.

The crystals were generally of the ordinary prismatic form, though repeatedly beautiful specimens of the foliaceous and stellar varieties were observed, either mingled with the prisms, or constituting the entire type of the specimen examined.

The diet consisted of the full range of the table, the proportion of meat being large, and a glass of beer two or three times a week; a moderate amount of tobacco was consumed both by smoking and chewing.

Rest, sleep, and abundance of water diminished the turbid character, and of course the specific gravity, but did not appear to influence the quantity of deposit. On the other hand, fatigue, a high range of the thermometer, reduced allowance of water, increased quantity of tobacco, raised the specific gravity, increased the quantity of deposit, and precipitated it before leaving the bladder.

The average specific gravity before treatment commenced, was 1.03851—average quantity  $\bar{z}$ xxxvj—average quantity of deposit grs. 1839.084.

24th. The first step toward treatment was the withdrawal of the tobacco, substituting gentian root, and the effect was visible in a diminution of deposit. The amount of vegetable food was curtailed, it then forming about one-third the whole diet—the patient was sent to the country to obtain rest and freedom from business. After an absence of a fortnight, he returned in the same state, and immediately after ran down with great rapidity. Coffee and tea were forbidden, pale ale being substituted at breakfast and supper; gentian, quassia and camomile taken regularly; the supply of vegetables was still further reduced.

The deposit still continued, but in a reduced quantity, the strength, however, failing rapidly.

June 17th. Made the diet purely animal, with the exception of lettuce twice during the week, to relieve the tedium of constant meat diet. The urine now became clear except after dinner; all the specimens yet showing the triple phosphates.

25th. Eight days after the entire withdrawal of bread and vegetables, lithate of ammonia was deposited after dinner, and the next morning lithic acid; the phosphates in the middle of the day and at night. After a few days of alternation, in which the phosphates were rapidly diminishing, the lithic acid and the lithate usurped completely the place of the former. During this period of treatment, the specific gravity averaged 1.03426; the quantity  $\bar{z}$ 34.58; the mean quantity of solids grs. 1379.23. The state of the patient was about the same; the pulse being rather more irritable, and standing in the morning sixty-nine, in the evening sixty-six.

The meat diet was kept up until the phosphatic tendency was supposed to have been overturned by the lithic acid, and rice, salads, and a little potato were introduced. The strength began to recruit; the pain of the back was sensibly diminished. Oxalate of lime was now deposited constantly in large octahedra; on three days the oxalate assumed the form of dumb-bells. On the 5th and 6th July, the patient had a slight attack of diarrhoea, after which the oxalate disappeared entirely.

During this period, from the disappearance of the phosphates to the 6th July, 11 days, the average quantity of urine was  $\text{℥}25.7$ ; mean specific gravity, 1.0313; the solid contents had fallen to grs. 1030.09.

The case now became one of lithic acid, and lithate of ammonia. The symptoms were increased gradually in severity, the temporary gain during the deposit of the oxalate was lost, a severe darting pain in both kidneys was added, and a morbid vigilance prevented sleep. The weight fell to 123 lbs. Business, which had been attended to previously, was thrown completely aside, and the carbonate of iron given three times per day, gr. x, rubbed up with conserve of roses. With this the following prescription was ordered: R.—Tr. gent., tr. einchonæ, tr. hyoscyami,  $\text{ãã} \text{ʒj}$ ; tr. camphoræ  $\text{ʒj}$ ;—a teaspoonful to be taken before each meal and at bed-time. The iron given with the conserve soon disgusted, and the ammonio-citrate in doses of gr. x substituted. Cold sponging to the loins was persevered in throughout the whole of this period.

The carbonate of soda was also used. The diet was principally vegetable; meat allowed in small quantities; acids withdrawn, and tobacco was resumed. Little or no improvement took place for some ten days, when the specific gravity slowly fell, the deposits took place less frequently, the pain of the kidneys declined, and that of the back was less severe, though the strength was stationary. The country was again resorted to, and the patient remained there about a month, during which the same course was pursued. There was a slight improvement during his absence.

The urine at this time was always clear in the morning, high-coloured, of high specific gravity, the acid preponderating. After breakfast, urine pale, turbid, depositing the acid and the lithate; after dinner, the lithate constituted the bulk of deposit, which was copious, always *white*, frequently issuing in a thick, milky stream; some of the particles at times aggregating into little firm masses of the size of pins' heads. At night the secretion was clear again, the salt predominating.

The microscopic appearances were very varied; the usual character of crystal was that of the lozenge, alternating and mixed with the square and the hexagonal table, the latter at times of great thickness, producing the appearance of hexagonal prisms. The varying forms were curious, and could not be explained by the circumstances of the day; sometimes a specimen would contain but one shape, another would have two, three, or four varieties; on one occasion, no less than eight forms of the acid were found in one drop. After the lozenge, the most frequent variety was that of slender half-lozenges deposited upon large spherical masses of lithate of ammonia; then the same upon a large lozenge, disposed very irregularly, giving a vicious, chain-lightning appearance; after these, long delicate needles with beveled ends, elongated tables, and many complicated platforms, all having the lozenge for a basis of construction, were constantly in view.

The lithate of ammonia was in the usual form, rows or networks of minute globules, or collected into opaque masses or enlarged into colourless, flattened spheres of twice or thrice the diameter of blood discs.

During three days the lithic acid assumed the form of red sand,—the crystals being so large that their character could be determined by the eye; at this time the acid amounted to  $12\frac{1}{2}$  grains per day, by actual weight.

The chloride of sodium was found some half-dozen times in dagger and crosslet form, but more frequently in large, splendid dodecahedral crystals,

with a beautiful play of colours. Oily globules were occasionally spread over the field and collected in a band around the border; many hair-like fibres were also repeatedly noticed.

This period, extending from July 6 to August 1, when the patient left the city, gave the following results: Average quantity of urine  $\text{℥}28\cdot28$ ; specific gravity  $1\cdot02714$ ; solid contents grs.  $951\cdot87$ .

From August 2 to August 20, while in the country, the averages were, specific gravity  $1\cdot01701$ ; quantity of urino  $\text{℥}36\cdot8$ ; solid contents grs.  $802\cdot123$ .

On the return to the city, and for two or three days previously, the patient was subject to great fatigue, heat, and loss of sleep. The system was deranged, and all that had been gained, seemed lost. The urine was high-coloured, burning the urethra in passing, varying in specific gravity from  $1\cdot025$  to  $1\cdot049$ ; the renal pain returned, and was very severe, and a dull, worrying pain, at times very sharp, appeared behind the pubes. There was urgent thirst; the tongue, clean at the tip and margin, was furred in the middle; bowels costive, great vigilance was present, and the weight fell rapidly to 120 lbs. From eating unripe fruit, an attack of diarrhœa came on, which lasted three or four days; this was followed by a period of rest.

The specific gravity mounted, during this period, to  $1\cdot02575$  average. The quantity of urine was  $\text{℥}xxxv$ . The solids had increased to  $897\cdot855$  grs. The pulso was very variable, ranging from 50 to 70 in the morning before rising, and from 55 to 70 at night.

After resting a few days, and observing the same course of treatment as before, with moderate exercise after breakfast, a diminution of every symptom took place, which went on rapidly towards a state of health, until the last of September, when all treatment was laid aside. The pulso (Oct. 1) was natural, ranging from 48 to 63. The deposit, whenever it occurred, which was seldom, was in urino passed from three to four hours after dinner, the specific gravity about  $1\cdot022$ , quantity about  $\text{℥}xxxv$ . During the last period of treatment, the quantity was  $\text{℥}xxx$ , mean specific gravity  $1\cdot02347$ , average solid contents  $870\cdot068$  grs.

Several points of interest occurred in this case, one of which was the rapid changing of the specific gravity in the course of a single day, *e. g.*, June 23, before dinner,  $\text{℥}viii$ ,  $1\cdot035$ ; after dinner,  $\text{℥}ivss$ ,  $1\cdot022$ ; at bedtime,  $\text{℥}vj$ ,  $1\cdot013$ . Aug. 23, 4 P. M., a pale turbid specimen of  $\text{℥}ix\frac{1}{4}$ , specific gravity  $1\cdot008$ ; in the evening,  $\text{℥}iv\frac{1}{4}$ , clear, high coloured; specific gravity  $1\cdot0221$ . Aug. 28, before breakfast,  $\text{℥}xiiij$ ; specific gravity  $1\cdot030$ ; two hours afterward,  $\text{℥}ij$ ; specific gravity  $1\cdot021$ ; three hours later,  $\text{℥}xiv$ ; specific gravity  $1\cdot005$ .

The specific gravity, although depending, in a great measure, on the quantity of urino, would sometimes maintain its height, even when the amount of urino was large, obeying a law of increment and decrease through the day, rather than that of concentration and dilution; for, during each day, a regular fall and rise were observed, the course being as follows:—from the morning density it fell after breakfast, rose at noon, but not to the height of the morning; fell to its lowest point about 4 P. M.; then rose gradually till midnight, falling again a little to the morning; so that, where the afternoon quantity was small, and of low density, it would still rise in the night urine, although the quantity might be very large.

Another point of interest was the appearance of diarrhœa at the end of the oxalic period, and also at the end of the period in which travelling had disturbed the system, after which the case proceeded to a cure.

The disappearance of the oxalate of lime in the one case, and the immediate improvement and cure following the second, would indicate that catharsis, produced by sulphate of magnesia, or other saline purgatives, might likewise produce a crisis which would be followed by health.

Another interesting observation was the effect of coffee upon the crystals of lithic acid. When taken at breakfast, whatever the type of crystals had been the previous night, or in the morning urine, that passed about noon, or from four to six hours after the coffee, the crystals assumed the ragged half lozenge on a mass of lithate of ammonia. It also had the effect of increasing the quantity of hair-like fibres, to such a degree, that sometimes the specimen appeared as if it had been exposed to a dusty room, and in such case the hairs were studded by the crystals like rock candy on a string. A glass of whisky punch, drunk when the case was near its termination, rendered the urine turbid, giving copious deposits throughout the following day.

From this case, with its treatment, I am led to infer that the shortest method of putting an end to the deposition of the triple phosphates, is to cut off at once the supply of material in the food, and to build up the system by tonics, meeting the peculiar symptoms according to circumstances; for, until the diet was made absolutely animal, but little advance was made, and in eight days after a pure animal diet, continuing the tonics, the lithate of ammonia made its appearance, soon, with lithic acid to take the place of the phosphates entirely. A circumstance which occurred about ten days after the disappearance of the phosphates, adds force to the inference; the patient, being strongly tempted, ate three ginger snaps, of not more than half an ounce weight; this (eaten at 11 A. M.) produced a beautiful display of the stellar and winged crystals of the triple phosphates.

After lithic acid, with the lithate of ammonia, has appeared, should they be in excess, sufficient to constitute disease, restore gradually the vegetable diet, continue cold bathing, or the cold douche to the loins, the ammonio-citrate of iron, bitter tonics, a sedative at night, with moderate exercise in the morning. The mind of the patient should be freed from anxiety about his case, and he should not be permitted to learn the particulars of any examination, except in the most general terms. The following table exhibits at a glance the results of the observations:

Period.	Quan. $\frac{Z}{3}$	Sp. gr.	Specific Gravity.						Diet.	Deposit.
			Solid conts. Gr.	Before break.	After break.	Before din.	After din.	Night.		
May 10 to May 22	30	1.0355	1830.081	1.0358	1.0353	1.0377	1.0349	1.0318	no change	triple phosphates.
May 22 to June 25	31.59	1.03496	1370.232	1.039	1.02916	1.03005	1.0277	1.0361	mixed, animal food preponderating	ditto.
June 26 to July 6	25.7	1.0313	1039.099	1.0323	1.0245	1.0255	1.0333	1.0329	pure animal food	lithic acid, oxal. of lime lith. amm.
July 0 to Aug. 1	23.287	1.02714	051.878	1.0261	1.013	1.0255	1.0247	1.0305	mixed	lith. acid, lithate of amm.
Aug. 2 to Aug. 20	36.807	1.01701	802.123	1.0175	1.0143	1.0192	1.0143	1.0214	mixed, principally veget.	" "
Aug. 20 to Sept. 0	35.022	1.0257	897.555	1.0293	1.023	1.0245	1.01575	1.0239	mixed, irregular	" "
Sept. 7 to Sept. 30	30.120	1.0234	870.068	1.0313	1.0233	1.023	1.0229	1.0273	mixed, regular	" "