

10th.—The fits continued on the following day, and in the evening, the pulse being full and quickened, and the bowels torpid, he took—Calomel, gr. iij.; Pulv. Rhæi, gr. xv.; followed by a saline febrifuge mixture. Poulitice to the stump.

11th.—On the ninth day a fit occurred in the morning, followed by slight oozing of blood from the granulations of the wound, which had a greenish sloughy appearance. After three days, however, it assumed a healthy aspect, and the main ligature alone remained. Slight fits continued, but no fever or constitutional irritation whatever (beyond the epilepsy) resulted. Bowels kept open by occasional calomel purgatives. The edges of the wound supported by a bandage and adhesive plaster; an occasional poultice and Lotion Chlorid. Sodæ being applied.

16th.—Fits did not recur on the thirteenth and fourteenth days, and the wound was granulating healthily; but in the night following severe convulsions set in, and on the next day the wound was found much disturbed, its healthy appearance greatly modified, and some blood had oozed from the new vessels of the adhesive deposit. The ligature of the brachial artery came away with the dressings, having separated without hæmorrhage.

18th.—This evening (sixteenth day), the patient being tranquil and unaware of the circumstance, arterial blood was seen by the attendant flowing abundantly between the dressings. On my arrival, I found that a large quantity, four or five pounds or more, had escaped, deluging the bed, and a copious arterial jet was still propelled by the side of the dressings.

Having made pressure and adapted the tourniquet, I removed the dressings, and ascertained that the stream proceeded from a fistulous orifice the size of a large quill. Into this I immediately passed, on the point of a catheter, a portion of lint to the distance of an inch or more in the direction of the artery, pressing up with moderate firmness folds of the lint, and placed a thick dossil, supported by adhesive plaster, over all. I then made preparations for cutting down on the brachial artery below the axilla, but observing the hæmorrhage to be completely arrested, I determined to delay this step, holding myself in readiness should it become

necessary. On moving the patient afterwards, faintness and a weak epileptic paroxysm occurred.

20th.—By the evening of the 20th (48 hours after the rupture of the artery) there was neither return of hæmorrhage or epilepsy; the patient was cheerful, and made no complaint whatever of pain. The tourniquet was loosely retained.

21st.—On the next day (62 hours after the occurrence of hæmorrhage) the stump was dressed. The plug of lint was found forced to the surface by new granulations and deposit, and came away with the dressings. The wound was looking very favourable, healthy pus being secreted. There was no irritative fever whatever, or return of the convulsions. The tourniquet ordered to be tightened in the event of a fit, in order to check the impetus of the circulation through the artery.

22d.—No unfavourable symptom whatever, and the wound is healing.

24th.—An epileptic fit occurred today, inducing slight oozing of blood from the granulations.

25th.—A fit has occurred without appearance of blood on the dressings. The tongue is clean, and bowels moderately open; the pulse rather quick, having still the hæmorrhagic character.

28th.—Severe convulsions were repeated last night, inducing slight oozing of blood from the granulations, and impeding the process of cicatrization.

Sept. 4th.—Excepting epilepsy, there is no unfavourable symptom, and the healing of the wound, which is now small and unimportant, proceeds favourably.

Oct. 26th.—Owing to accidental bruising of the stump during the convulsions, the perfect cicatrization of the wound has been retarded to this date.

Unfortunately fungoid disease is developing itself at the lower extremities of the bones of the left forearm. The patient enjoys, however, moderate health; he rests well, takes exercise, and his appetite is good. Delusive and vague language is frequently used, but his general tone of moral feeling is of a healthy character, combining resignation to his sufferings with warm acknowledgment of the attention of those around him.

OBSERVATIONS.—During the epileptic paroxysms the muscles of the stump

LMG 3 (1846)

### SOME REMARKS ON ALKALESCENT URINE AND PHOSPHATIC CALCULI.\*

By JOHN SNOW, M.D.

Lecturer on Forensic Medicine at the Medical School, Aldersgate Street.

*Case in which a small quantity of urine remaining constantly in the bladder caused the decomposition of all that was secreted—experiments to shew that a very small quantity will have this effect—the bladder cannot be completely emptied of urine when it contains a foreign body: this is the reason why it becomes incrustated with the phosphates, and why these salts form the chief part of so many calculi—cause of alkaliescent urine in injuries of the spine, extreme old age, &c.—necessity of injecting the bladder with warm water in most cases of alkaline urine—benefit to be expected from this practice in stone in the bladder.*

In a state of health the urine is generally slightly acid; it may, however, be for a short time neutral, or slightly alkaline, from articles of food or drink which contain potash or soda in combination with a vegetable acid—as apples, pears, grapes, &c., and saline draughts made with the citrates, tartrates, or acetates; the vegetable acid is digested, and the alkali passes into the urine. This condition of the secretion, however, is but temporary, and when the urine is strongly alkaline, or remains alkaline for days together, this must be looked on as a departure from the physiological condition.

When healthy urine is allowed to remain in a vessel, it is well known that it becomes alkaliescent from decomposition; the urea it contains becoming changed into carbonate of ammonia. In paralysis of the bladder, when it remains constantly distended, and the urine dribbles away to make room for what is secreted, it is known to become offensive and ammoniacal. The same change of the urine takes place also in some cases of paraplegia, of enlarged prostate, and of stricture, when the bladder remains full for some time.

In the latter part of 1842, I had a patient suffering from incontinence of urine after a very tedious labour: when

\* Read at the Westminster Medical Society Nov. 9, 1846.

### PRESENCE OF LEECHES IN THE FOUNTAINS OF ALGERIA.

FROM some interesting observations recently communicated by Dr. Trollet, principal physician of the Civil Hospital at Algiers, it appears that many of the fountains of Algeria swarm with a small kind of leech, numbers of which are frequently swallowed accidentally by men and animals drinking at these fountains. Occasionally these creatures attach themselves to the back of the pharynx, to the velum palati, or the epiglottis, where they gorge themselves with blood, until they often acquire the size of a medicinal leech. The latter situation is the most dangerous, and Dr. Trollet records cases in which considerable hæmorrhage, impending suffocation, and even death, has resulted from their presence there. Sometimes they are ejected by vomiting. When they fix themselves to the mouth and fauces, it is tolerably easy to seize and remove them; but when they get into the pharynx, or attach themselves to the epiglottis, it is almost impossible to get hold of them, and they often remain a considerable time, causing considerable hæmorrhage, which may prove fatal, or give rise to so much irritation as to produce phthisis. Their presence on the epiglottis is frequently made known by a constant hæmorrhage from that part, by paroxysms of cough, alteration of the voice, a feeling of suffocation, and the sensation of a foreign body in the pharynx.—*Journ. de Médecine et de Chirurgie*, Oct. 1846.

It was applied to about the circumstance, I found the urine very ammoniacal, and containing a good deal of phosphate of lime in a state like mortar, the patient suffering much from excoriation of the genital organs. On introducing a catheter I found that about a table-spoonful of urine remained constantly in the bladder. After this viscus had been injected with warm water, the urine which flowed all the remainder of the day was free from alkalescence, and tolerably healthy. Here was a case, then, in which the continuance of about half an ounce of urine in the bladder caused the decomposition of all that passed through it. In order to see the bearing of this circumstance on a number of cases in which the bladder cannot be completely emptied, including, as I shall presently show, stone in the bladder, it became desirable to ascertain if a still smaller quantity remaining in that organ might not have a similar effect. With this view I performed experiments in the following manner. About half a pint of newly-voided urine was put into a glass vessel which terminated at the lower part in a tube of minute calibre, through which it dropped into a glass jar below, at the rate of about twelve drops in a minute, which is about an ounce and a half in an hour, that being not far from the quantity usually passing into the bladder from the ureters. The vessels were kept near the fire at the temperature of 100°. At the end of six or eight hours, when the urine had all dropped into the lower vessel, it was emptied, all but about thirty drops, and the upper glass, which served as a funnel, again replenished. It was found that the urine in the lower vessel became decomposed generally in about twenty-four hours—in about the same time, in short, as urine preserved at the same temperature from the beginning of the experiment, the time varying according to the quality of the urine. It generally became quite foetid in two or three days, at all events highly alkalescence, and remained so as long as the experiment was continued, always fresh and acid in the upper vessel, provided it was washed out occasionally, and always decomposed in the lower one, although the urine, except a small fraction of it, was of the same age in both.

It is well known that an alkalescence

state of the urine, and a deposition of the phosphates, usually coexist. The decomposition of urine, whether it takes place in or out of the bladder, is accompanied by the precipitation of the earthy phosphates. The ammonia resulting from the decomposition of the urea and animal matter of the urine combines with the phosphate of magnesia naturally present in solution to form the insoluble triple phosphate; it also combines with part of the phosphoric acid, which holds the lime in solution as a superphosphate, leaving a neutral phosphate of lime, which is insoluble. I have observed that minute crystals of triple phosphate very often begin to appear, as a delicate cloud, in urine that is kept before it has lost the property of reddening litmus. This observation I consider of importance, as it shews that the presence of these minute crystals in acid urine at the moment it is voided does not necessarily depend on an excess of phosphates. When the decomposition of the urine takes place to any great extent in the bladder, so that it becomes strongly ammoniacal, it irritates the mucous membrane, and causes it to secrete a quantity of phosphate of lime, or of phosphate and carbonate of lime, mixed with the mucus; this comes away with the urine, if there is no calculus or other foreign body in the bladder to which it may adhere. In the case of incontinence of urine to which I have alluded, the mucous membrane of the upper part of the vagina also secreted a quantity of phosphate of lime, apparently from the irritation of ammoniacal urine coming in contact with it. Dr. Chowne examined this patient with me.

When there is nothing to interfere with the healthy function of the bladder, it completely empties itself at intervals of a few hours by a vigorous contraction; and if we examine into the various circumstances which may prevent the complete emptying of the bladder, we shall find that they are all liable to be followed by an alkalescence state of the urine and deposit of phosphates. We will take, first, the instances of foreign bodies in the bladder. One of the symptoms of their presence is the occasional sudden stoppage of the stream of urine before the bladder is emptied; in addition to this, it is evident that the bladder can seldom con-

tract around a foreign body so exactly as completely to expel all the urine; and moreover, calculi, and nearly all other foreign bodies which gain admittance to the bladder, are porous, and contain urine imprisoned in their pores; accordingly it is a general law, with extremely few exceptions, that foreign bodies in the bladder become incrustated with the earthy phosphates. The usual explanation of this phenomenon, in which Dr. Prout, Sir B. Brodie, and others, agree, is that the foreign body causes chronic inflammation of the bladder, accompanied with a secretion of alkaline mucus which decomposes the urine: but a pea, or a bit of fibrine, or any other substance not of a nature to cause even irritation, is as certain to form the nucleus of a phosphatic calculus as the most hard and angular; and in most recorded cases there has been a total absence of symptoms of chronic inflammation at the time a foreign body was becoming incrustated; consequently, whilst I am ready to admit that the usual explanation may be true in some cases, and may act as a secondary or an auxiliary cause in others, there can be no doubt that the explanation now given is the correct one for most instances, as it shews a physical cause which can scarcely fail to be in operation. Vesical calculi are themselves foreign bodies, and consequently we find that every calculus, whatsoever its nature, is liable to become incrustated with the earthy phosphates; even the strongly acid state of the urine which usually prevails where there is uric acid calculus being generally overcome; whilst, on the other hand, the phosphatic incrustation is scarcely ever covered with any other deposit, but goes on increasing, the phosphatic deposition, when once it has commenced, being a cause of its own continuance. Mr. Taylor only alludes, in the Catalogue of the Calculi in the College of Surgeons, to two phosphatic calculi which became covered by another deposit, one in the museum of the College, in which the secondary deposit is oxalate of lime, and the other in the museum of St. Bartholomew's Hospital, in which it is uric acid.

When a catheter is introduced, if the bladder is not paralysed, it will contract as the urine flows, and be completely emptied, or nearly so; but if

the catheter is left in the bladder, this viscus does not of course continue constantly in a state of active contraction, but is collapsed, and no doubt allows a small quantity of urine to remain in it, more or less, according to the position of the patient and the catheter: consequently we find that a catheter can seldom be left for two or three days in the bladder without inducing an alkalescence state of the urine, and becoming incrustated with the phosphates.

Dr. Prout, Sir B. Brodie, and numerous observers since, have remarked that injuries of the spine are liable to be followed by alkaline urine. This has usually been thought to depend on an altered secretion by the kidneys, arising from impaired nervous influence; it has been found, however, in various cases of disease and injury of the spine, that the urine, although alkaline in the bladder, is acid when first secreted by the kidneys. Dr. Golding Bird\* accounts for this change by supposing that the healthy bladder preserves its contents from decomposition by its vital endowments, and that this property of the bladder is impaired by injuries and other affections of the spine; and Mr. Curling† supposes that, when the bladder loses its sensibility from spinal lesion, it begins to secrete unhealthy alkaline mucus, which decomposes the urine. Now I have observed that healthy urine will keep fresh out of the body at blood-heat as long as it ever remains fresh in the bladder; and, with respect to the change in the mucus, there is every reason to believe that in these cases it is the consequence, and not the cause, of the alkalescence of the urine. Since the experiments I have related, we are in a position to give a more satisfactory explanation, and one which fortunately suggests a remedy of easy application. The explanation is, that the detrusor urinæ, like other muscles, is liable to various degrees of loss of power, besides total paralysis; and that, when it is weakened, along with the other muscles, by injury or disease of the spine, it can empty the bladder in a great measure, but cannot contract in that vigorous and complete manner necessary to expel the last drops of urine; and that thus a source of the

\* MED. GAZ. vol. xxxii. page 10; and Urinary Deposits, 2d edition, p. 222.

† Ibid. vol. xiii. p. 76.

decomposition exists. It is not improbable that, when the bladder is long occupied by highly alkaline urine, the decomposition may be propagated in course of time in a retrograde manner along the ureters to the kidneys, and ultimately destroy the patient. This seems the best solution of certain cases in which phosphatic calculous matter is found in the pelvis of the kidney after death in persons who have suffered from injury or disease of the spine.

Dr. Prout\* has taught us that a state of great nervous irritability and depression is characteristic of the phosphatic diathesis, and leads to the secretion of alkaline urine by the kidneys. Now I have observed that an alkaline state of the urine kept up by a local cause in the bladder leads to great depression and debility; and it is not improbable that general nervous and muscular debility may be a cause of alkaline urine by preventing the proper emptying of the bladder; consequently, whilst I do not dispute the existence of the phosphatic diathesis in the proper sense of the term—viz. the secretion of the phosphates in excess by the kidneys—I am inclined to believe it rare. The urine is often alkaline in the decrepitude of extreme old age. We can now perceive the reason, since the muscular tunic of the bladder must of course partake of the debility common to all the voluntary muscles.

Simon, of Berlin, has noticed an alkaline state of the urine in typhus, generally when comatose symptoms are setting in. Now, since sensation and volition, as regards the bladder, are often totally lost in typhus, it is almost certain that this organ must frequently suffer a partial loss of function, when, although still able to void the urine, it will not expel it completely. Under these circumstances the urine ought to be alkaline in the bladder, and continue so till during convalescence the patient is able to empty the bladder properly.

The indications of treatment arising from these views of the subject are obviously to do for the bladder what it is incapacitated for doing of itself: to remove that little leaven of decomposition which alters the whole of the

urine as fast as it flows into the bladder. The way to do this is to introduce a catheter, and inject warm water, to wash the bladder thoroughly out. The operation of injecting the bladder is, I believe, but little practised except in some states of disease of its mucous membrane; but I have no doubt it will be found the most efficacious treatment in nearly all cases of alkaline urine. Mineral acids may be a very useful adjunct to this practice, but hitherto they have been far from successful in what has been called the phosphatic diathesis; and it is not to be expected that any quantity of acid, which can safely enter the circulation, and be separated by the kidneys, will be able to counteract such a powerful cause of phosphatic urine as I have pointed out. In the case of incontinence of urine to which I have alluded, the injection of the bladder, by removing the ammoniacal state of the urine, at once relieved the greater part of the patient's sufferings, and its repetition every day for a few weeks, until the bladder began to regain the power of retaining and expelling its contents, preserved the urine in a pretty healthy condition, and no doubt prevented inflammation, thickening, and contraction of the bladder, and perhaps spreading of disease to the kidneys. We may expect, at least, as much benefit in injuries of the spine, and numerous other cases; we may hope to prevent the formation of phosphatic calculi in many instances, and may reasonably expect to have a much greater power over vesical calculi of every kind than we have hitherto possessed without a serious operation. We may hope not merely to prevent their enlargement, but to get them to dissolve. Dr. Prout is of opinion—and there is every reason to believe it is a sound one—that healthy urine is the best solvent of all kinds of calculi which we can hope to possess; and washing out the bladder occasionally will undoubtedly be a great means of keeping the urine in a healthy state in cases of stone. The effect of injecting the bladder every day, or every other day, will be at once extremely beneficial on phosphatic calculi if the kidneys are secreting acid urine, as in most instances there is reason to believe they

## MEDICAL GAZETTE.

FRIDAY, NOV. 20, 1846.

VARIOUS circumstances have hitherto prevented us from noticing the Twelfth Annual Report of the Poor Law Commissioners. This Report contains but little to interest the profession in a medical point of view; the only subject which calls for especial notice is that which refers to the diffusion of vaccination.

We learn from the Report that the progress of vaccination during the year 1845 has been highly satisfactory, there having been 362,087 persons vaccinated, and the operation having proved successful in 347,765 cases, the successful cases being equal to 96 per cent. on the number vaccinated.

The following Table shews the numbers vaccinated, and the births in the unions from which returns have been received, for the years ended respectively 29th September, 1844, and 1845:—

Years.	No. of Unions and Parishes.	No. of Persons Vaccinated.	No. of Persons successfully Vaccinated.	No. of Registered Births.	Ratio of Persons Vaccinated to the No. of Births.	Ratio of Persons successfully Vaccinated to the No. of Births.
1844	542	290,453	278,192	452,235	100 in 156	100 in 163
1845	580	362,087	347,765	486,632	100 in 134	100 in 140

In order to ascertain whether the number of children vaccinated under one year of age approximated to the number of births, a form of return was framed so as to shew the number vaccinated under and above that age, and the numbers were as follows:—

	Under One Year.	Above One Year.	Total*
Vaccinated . . . . .	154,031	204,242	362,087
Successfully vaccinated . . . . .	147,958	196,216	347,765

The number vaccinated under one year of age is 43 per cent. upon the total

number vaccinated, and 32 per cent. upon the number of births.

In every union in which the number vaccinated under one year of age did not nearly approximate to the number of

\* These totals do not correspond, in consequence of the ages of the persons vaccinated not being distinguished in some of the returns.