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ON THE SPECIFIC GRAVITY OF THE URINE DURING
ANÆSTHESIA AND AFTER SALT-SOLUTION ENEMATA.

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Although it is known that under certain conditions a decrease in the specific gravity of the urine is seen, as notably in conditions of hysteria and neurasthenia, yet it is difficult to obtain definite information regarding the amount of this diminution; and to determine the exact decrease under certain conditions has been the object of this investigation, which was undertaken at the suggestion of Dr. Howard A. Kelly.

I.—DURING ETHER ANÆSTHETIZATION. (*See Chart I.*)

The first series of experiments, twenty-five in number, was carried on in the Gynecological Operating Room of the Johns Hopkins Hospital, and was designed to study the effect of ether anæsthesia upon the urinary specific gravity. The instrument used was the ordinary urinometer, tested and found to be accurate before the commencement of the experiments. In these cases from thirty to fifty minutes usually elapsed from the beginning of the administration of the narcotic to the catheterization of the urethra and the emptying of the bladder just before the commencement of the operation. As the patients had not been catheterized *immediately* preceding the anæsthetization, there was presumably present in the bladder a certain quantity of urine. In most cases, however, this was very small, as either catheterization or natural voiding had taken place recently, and the urine was not in sufficient quantity to affect very materially the result.

In certain cases, however (cases VI, IX, XVIII, XXI, XXIII), the amount of urine present in the bladder was so great—as evidenced by the fact that by catheterization thirty

minutes later, from two to five hundred cubic centimeters were obtained—that the comparatively small quantity secreted during anæsthesia had but little effect upon the specific gravity, and we had for examination urine differing but slightly from the normal urine of the patient, the specific gravity of which was decreased but slightly below the average of that especial case, and the color of which differed but slightly from that of normal urine.

In the remaining twenty cases, on the other hand, the quantity obtained was small, varying between thirty and one hundred cubic centimeters, probably a large part of which was secreted during the administration of the ether. In these cases the urine appeared quite differently; the color varied from a pale straw to that of water barely tinged, and the examination of the specific gravity showed that there was a marked decrease, from 1.0177 (the average of the average specific gravities of the urines of the twenty cases taken on several occasions previous and subsequent to the operation) to 1.0066, the average specific gravity of the urines after the administration of ether.

In one of the cases the specific gravity of the just catheterized specimen of urine, *i. e.* at the body temperature, was .999, though on being allowed to stand until it acquired the temperature of the room, at which all the specific gravities were determined, it rose to 1.002. It will thus be seen that one of the effects of ether narcosis is a marked diminution in the urinary specific gravity, and that this is not a typical hydruria can be concluded from the fact that the quantity of urine secreted was not large, being no more than one would expect within the thirty to fifty minutes occupied in the administration of the narcotic.

From this it can be surmised that the effect of the ether upon the kidneys is to diminish markedly the secretion of the solid constituents, while the elimination of water is, in a certain number of cases at least, not so markedly affected. It is of interest, however, to note that in some cases the quantity obtainable was very small—less than ten cubic centimeters, and in these cases, evidently, water-elimination as well as solid constituent-excretion has been very much decreased. It was impossible in this investigation to draw any conclusions regarding the rôle played by the nervous element, as the

decrease in the specific gravity was quite as marked in those who took the ether with a stoical calm as in especially neurotic patients.

II.—AFTER NORMAL SALT-SOLUTION ENEMATA.

(See *Chart II.*)

The second series of experiments—ten in number—were designed to determine the effect of enemata of normal salt solution upon the specific gravity of the urine.

The method employed was as follows: the patient, immediately after voiding urine, was given five hundred cubic centimeters of normal salt solution through a rectal tube passed as far up as possible. In all but one of the cases this quantity was easily retained and caused the patient no discomfort. The patient was not allowed to drink water or any other fluid during the next four hours, and during this period the urine passed was carefully collected. In some cases urine was voided but once, in other cases twice during the four hours, but in them all between two hundred and fifty and four hundred cubic centimeters were voided, *i. e.* between one-half and four-fifths of the quantity given by rectum. The specific gravity fell markedly in all cases, the average fall being .008, from 1.016, the average specific gravity of the urines of the ten cases (each taken several times previously) to 1.008, the average of the specific gravities of the urines voided within four hours from the time the enemata were given. The color of the urine in these cases was exceedingly pale. These cases are in all probability true cases of hydruria, where the diminution in specific gravity is due not to a decreased excretion of solid constituents, but to a marked increase in the elimination of water. While the first series of experiments are of more interest from a scientific standpoint, the second series, showing as they do such rapid elimination of water with decreased specific gravity, suggest the possibility of giving rectal enemata of normal salt solution or water, to increase the flow of urine, and thereby probably to stimulate diuresis in some affections of the kidney, and as a method of internal irrigation, as it were, in some cases of cystitis.

CHART I.

SHOWING THE EFFECT OF ANÆSTHETIZATION UPON THE SPECIFIC GRAVITY OF THE URINE.

Case.	Average sp. gr.	Sp. gr. after anæsthesia.	REMARKS.
I	1.015	1.006	
II	1.020	1.005	
III	1.015	1.004	
IV	1.022	1.007	
V	1.012	1.010	
VI	1.021	1.015	Very large amount of dark-colored urine in bladder.
VII	1.019	1.002	
VIII	1.015	1.007	
IX	1.026	1.018	Large quantity of deeply pigmented urine in bladder.
X	1.025	1.009	
XI	1.022	1.002	
XII	1.022	1.003	
XIII	1.020	1.005	
XIV	1.020	1.010	
XV	1.013	1.008	
XVI	1.008	1.011	
XVII	1.028	1.018	
XVIII	1.018	1.017	Large amount of dark-colored urine in bladder.
XIX	1.013	1.005	
XX	1.018	1.005	
XXI	1.022	1.021	Large amount of dark-colored urine in bladder.
XXII	1.023	1.006	
XXIII	1.022	1.020	Large amount of dark-colored urine in bladder.
XXIV	1.012	1.009	
XXV	1.012	1.010	

Average of av. sp. grs. of the 25 cases.	Average of the sp. gr. after anæsthesia of the 25 cases.
1.01852	1.00932

Average of average sp. grs. of all cases except VI, IX, XVIII, XXI, XXIII.	Average of sp. gr. after anæsthesia of all cases except VI, IX, XVIII, XXI, XXIII.
1.0177	1.00665

CHART II.

SHOWING THE EFFECT OF SALT-SOLUTION ENEMATA UPON THE
SPECIFIC GRAVITY OF THE URINE.

Case.	Average sp. gr.	Sp. gr. of 1st specimen voided after enema.	Sp. gr. of 2nd specimen voided after enema.	Sp. gr. of urine voided under 4 hrs. after enema was given.
I	1.015	1.005	1.009	1.007
II	1.021	1.012	1.010	1.011
III	1.015	1.007	...	1.007
IV	1.012	1.008	1.006	1.007
V	1.014	1.008	1.005	1.006
VI	1.019	1.010	1.012	1.011
VII	1.014	1.006	...	1.006
VIII	1.018	1.008	1.008	1.008
IX	1.014	1.005	1.007	1.006
X	1.020	1.013	1.012	1.012
	Average of average sp. grs. of the 10 cases.	Average sp. gr. of the 1st voided specimens of the 10 cases.	Average sp. gr. of 2nd voided specimens of the 10 cases.	Average sp. gr. of urine voided within 4 hrs. after giving of enema in the 10 cases.
	1.0162	1.0083	1.0086	1.0081

