

# THE FREQUENCY OF ALBUMINURIA WITH CASTS IN EPILEPTICS FOLLOWING CONVUL- SIVE SEIZURES.

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It has frequently been stated that in epileptic individuals, albumin with casts is at times found in the urine voided immediately after attacks. Its presence is accounted for by several observers as probably due to admixture of semen liberated into the urine by pressure on the seminal vesicles during the convulsive movements. By others it is attributed to muscular contractions. In the first instance the condition would fall in the class of accidental albuminuria, in the second it might come under the heading of physiologic albuminuria. Textbooks on clinical pathology and diagnosis discuss the condition under neurotic albuminuria.

As to the frequency of abnormalities in postseizure urine in epileptics, Simon<sup>1</sup> states: "in a number of cases in which I had occasion to examine urine voided after an attack (epileptic), albumin was usually absent." In another place the same author states that the cases referred to were those exhibiting the petit mal attacks, and that one case which had been in the epileptic state for forty-eight hours showed albumin, semen being absent. Nothnagel<sup>2</sup> could not demonstrate any regularity in the occurrence of albuminuria in a number of cases of epilepsy under his observation, neither was he able to correlate the positive findings in some cases with the nature of the attack—grand mal or petit mal. Munson,<sup>3</sup> in speaking about the general treatment of epilepsies, mentions that about 20 per cent. of his cases showed the presence of albumin and casts following attack.

It is worth while to review here the physiologic conception as to how albuminous substances find their way into the urine in disease and in health so that we may be able to justify some conclusions drawn from the study in this paper. Sir William Osler<sup>4</sup> states substantially that under normal conditions of kidney function the glomerular epi-

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1. Simon, C. E.: *A Manual of Clinical Diagnosis*, Ed. 9, Philadelphia, Lea & Febiger, 1918, p. 383.

2. Nothnagel, cited by Simon, Footnote 1.

3. Munson, J. F., in White, W. A., and Jelliffe, S. E.: *Modern Treatment of Nervous and Mental Diseases* 2:266, 1913.

4. Osler, William: *Principles and Practice of Medicine*, Ed. 8, New York, D. Appleton & Co., 1914, p. 684.

thelial cells allow the passage of only water and salt from the circulating blood, and will not permit albuminous substances to filter through. Injury to these cells by disease results in free passage of albumin and other protein substances. According to all observers, in physiologic albuminuria, the epithelium is not impaired permanently and the occurrence of albuminous matter in the urine is, therefore, attributed to muscular contraction as, for instance, in the course of violent exercise during athletic engagements or possibly during convulsive attacks in certain diseases. Whether it be called physiologic, or as recent writers tend to call it, constitutional albuminuria, all agree that such a condition is probably outside the pathologic domain. Should the albuminuria following convulsive seizures in epilepsy be considered as physiologic?

This paper presents a study of a number of epileptics in our hospital where tests were made under favorable conditions. The study makes no claim to anything new but attempts to clear up a point of disagreement in that direction.

By request of the laboratory a specimen of urine was received from every case of epilepsy, following as soon as the patient regained consciousness after an attack. The specimens were examined as soon as practicable after reaching the laboratory. The presence of albumin was determined by the heat and acetic acid test and the microscopic work was done with a centrifugalized portion, using the flat mirror of the microscope. It was sought to determine the following points:

1. The general frequency of albumin with casts and other microscopic findings in the number of cases under observation. As already intimated, the frequency of positive urinary postseizure findings has been underestimated by some workers, and Simon concludes that albuminuria following seizures in epilepsy is the exception rather than the rule.

2. The length of time subsequent to an epileptic convulsive seizure that albuminuria with casts can be demonstrated. Does only the first urine after an attack contain albumin, or does the albuminuria persist for a longer period? Stated differently, does the period of unconsciousness hold any relation to the urinary findings?

3. The relation of accidental albuminuria, as evidenced by the presence of semen, to albuminuria due to the convulsive seizures *per se*. As noted above, semen as a contaminating agent in the causation of albuminuria following convulsive attacks of epileptics has probably been given undeserved prominence as an accidental agent. While it is true that in the presence of semen the albuminuria is quantitatively increased, the presence of albumin in the absence of semen is comparatively greater. From the number of examinations recorded in

Table 1, the author is inclined to believe that seminal fluid, as an albuminuric factor in epilepsy following seizures, plays a rôle of no great significance. The following statement by such a reputable observer as Simon is of particular interest in this connection, as it conveys the impression that semen is the only agent causing albuminuria in postepileptic seizures. "The seizures in those cases were comparatively slight and unfortunately an examination for semen was not made in those urines in which traces of albumin were demonstrated." Admitting that there may be present a small quantity of semen in the urine of every epileptic individual subsequent to seizures, we cannot always attribute the albuminuria to this cause, as the quantity of urine voided will readily change the albuminuria index: the greater the quantity of urine, the amount of semen remaining constant, the less the chances for demonstrating the albuminuria with our present qualitative methods. Furthermore, the presence of granular casts along with albuminuria is *prima facie* evidence that it is not of accidental origin through admixture of semen.

4. The possibility of differentiating true epileptic seizures from hysteria or epileptiform convulsions. Simple and unadorned as such a laboratory procedure might prove to be in such diseases as epilepsy and hysteria requiring psychologic study, this point was nevertheless kept in mind as the examination of the material proceeded.

From Table 1 it will be seen that two cases (P. B. and D. M.), whose urine was examined ten and nine times, respectively, corresponding to the same number of attacks, have shown no albumin and no casts to any degree; they were diagnosed clinically as hysteria. This number of cases is entirely too small for differential diagnostic study. Observation of a large number of cases over a long period would seem essential. Perhaps, taking the view of the general frequency of albuminuria in the number of cases studied as physiologic and apparently due to muscular contraction effected during the seizures, we may probably account for the absence of urinary findings in the hysteria cases, as the hysteric individual often does not present the typical convulsion of the genuine epileptic; the hysteric frequently simulates the epileptic in his seizure manifestations, especially when brought to live in contact with the epileptic. There would, moreover, seem to be no physiologic cause for albuminuria in hysteria as the hysteric is perhaps physically not concerned in his apparently epileptiform spells. This consideration would suggest an affirmative answer to the question brought forth in this paper as to whether the albuminuria with casts in postepileptic seizures is physiologic. The subject of physiologic albuminuria in general would thus find a supporting point. The summarized table also shows that forty cases, or 66 per cent., have shown albumin with casts after every attack; 193 specimens were examined

TABLE 1.—SHOWING THE FREQUENCY OF ATTACKS, DURATION AND NUMBER OF SEIZURES AND URINARY FINDINGS

Case	Average Time After Seizures, Hours	Approximate Duration of Seizures, Minutes	Number of Seizures During Six Months' Residence			Albumin	Casts	No. Times Examined	No. Times Negative	Semen
			Diurnal	Nocturnal	Total					
E. Z. ....	9	10	1	7	8	+	+	5	2	—
J. E. ....	3½	10	10	7	17	+	+	3	0	—
S. G.* .....	12-15	15	7	10	17	+	+	4	0	—
V. McC. ....	11-19	15	5	3	8	+	+	3	1	—
F. J. ....	21	15	1	3	4	+	+	1	0	+
W. S. ....	12	120	3	—	3	—	—	1	1	—
W. R. ....	2-6	15	37	26	63	+	+	7	0	+
J. D. ....	11	15	2	1	3	+	+	1	0	—
E. W. ....	18	10	1	4	5	+	+	2	1	—
F. S. ....	10-18	10	3	2	5	+	+	2	1	—
J. O'R. ....	6-7	5	6	15	21	+	+	6	0	—
E. O'C. ....	15	5	1	0	1	+	+	1	0	+
R. W. ....	9	10	1	1	2	+	+	2	0	—
R. B. ....	9	15	2	3	5	+	+	2	0	—
A. P. ....	10	10	4	2	6	+	+	1	0	—
C. H. ....	5-12	10	1	7	8	+	+	3	0	—
L. A. ....	6	10	5	3	8	+	+	3	0	—
G. W. ....	9-12	50	8	7	15	+	+	4	0	—
E. C. ....	8	15	26	14	40	+	+	3	0	—
C. L. ....	4-9	15	5	4	9	+	+	3	0	—
D. S. ....	6	10	2	4	6	+	—	2	0	+
J. L. ....	8	15	1	2	3	—	—	1	1	—
F. F. ....	11	15	1	4	5	+	+	2	0	—
A. M. ....	8	2	49	21	70	+	—	2	0	—
J. S. ....	12	120	21	9	30	+	+	1	0	—
F. J. ....	12	7	0	1	1	+	+	1	0	—
R. W. ....	?	20	0	6	6	+	+	1	0	—
H. G. ....	13	15	0	2	2	+	+	1	0	—
H. B. ....	14	30	4	4	8	—	+	1	0	—
B. D. ....	?	60	17	17	34	+	+	2	0	—
W. L. ....	1-10	15	29	5	34	+	+	10	0	—
J. R. ....	3-9	10	1	4	5	+	+	4	0	+
C. D. ....	9	20	1	3	4	+	+	1	0	+
J. B. ....	9-10	20	15	39	54	+	+	3	0	+
B. H. ....	9	20	3	0	3	—	—	3	3	—
O. B. ....	6	15	13	4	17	—	+	2	1	—
D. P. ....	21-24	15	4	1	5	—	—	2	2	—
W. E. ....	4-24	10	18	8	26	+	+	4	2	—
P. W. ....	4-15	15	17	11	28	+	+	6	2	—
A. C. ....	15	15	11	15	26	+	+	3	1	—
E. W. ....	7	10	1	3	4	+	+	2	0	—
J. P. ....	6-9	15	1	7	8	+	+	3	1	—
H. C. ....	6-12	15	5	10	15	+	+	4	1	—
C. W.* .....	8-9	10	15	30	45	+++	++	10	0	—
L. S. ....	3-9	10	2	8	10	+++	++	5	1	—
F. M. ....	3-6	15	3	25	28	+++	+	6	0	—
G. L. ....	4	10	4	4	8	+	+	2	0	—
T. E. ....	4-9	15	1	11	12	++	+	6	0	—
D. M. ....	12-18	8	9	15	24	++	—	9	9	—
W. T. ....	4-6	15	7	25	32	++	+	8	0	+
W. C. ....	9	10	17	13	30	++	+	1	0	—
J. F. ....	6-13	50	25	6	31	+	—	2	1	+
W. B. ....	5	20	1	4	5	+	+	2	0	+
E. J. ....	12-16	10	15	9	24	+	+	3	2	—
W. H. ....	10-12	12	2	61	63	+	+	9	0	+
R. H. ....	8-15	15	8	10	18	+	+	7	5	—
L. A. ....	12	10	55	5	60	+	+	6	0	—
D. A. ....	22	10	7	—	7	+	+	—	0	—
M. W. ....	14	3	1	1	2	+	+	1	0	—
H. H. ....	3-10	15	1	3	4	+	+	3	0	—
S. P. ....	3-5	10	1	2	3	+	+	3	0	+
P. B. ....	6-9	5	14	31	45	—	—	10	10	—

\* Positive Wassermann reaction.      + = Beyond a trace.      ++ = Appreciable trace.

with an average of 3.1 per patient. In thirteen cases the urine was positive after some attacks and negative after others in the same individual. While the regularly positive cases include several whose urine was examined after one or two attacks and perhaps would have become irregular as far as the urinary findings are concerned, it is believed that the irregular cases would have been considerably reduced if in many instances the first urine voided after an attack had reached the laboratory. A patient who is seized in the early evening hours is likely to have voided once before the next morning's specimen is taken. Frequent changes in attendant personnel on the wards would tend toward the same error. I have not been able to find any relation between frequency of seizures and regularity of positive findings in the urine subsequent to the seizures. Table 2 shows nine cases whose frequency of attacks during a period of six months' residence in the hospital ranged numerically from 21 to 70. At no time after seizures was the urine free from albumin and casts. Several of these cases have tended to persist in showing abnormal urine for from twenty-four to forty-eight hours subsequent to the attack. It seems reasonable to assume that very frequent seizures would tend to produce an unfavorable renal condition. This fact was emphasized by Munson when speaking of specific therapy for those giving indications for treatment.

TABLE 2.—SELECTED CASES FROM TABLE 1. FREQUENCY OF SEIZURES DURING SIX MONTHS IN HOSPITAL, AND URINARY FINDINGS

Case	Number of Attacks	Number Urine Positive	Number Urine Negative	Persistence of Urinary Abnormalities. Hours
F. J. ....	1	1	0	Negative
J. O'R. ....	21	6	0	Negative
E. M. ....	28	6	0	24
W. T. ....	32	8	0	24
W. L. ....	34	10	0	24
C. W. ....	45	10	0	48
J. B. ....	54	3	0	24
W. H. ....	63	9	0	48
W. R. ....	63	7	0	24

TABLE 3.—SUMMARY OF TABLE 1

Total Number Cases	No. Cases Regularly Positive	No. Cases Regularly Negative	Number Irregular Cases	Total No. Specimens Examined	Average per Patient	No. Cases Semen Present
60	40 (66%)	4 (6.6%)	13 (21.6%)	193	3.1	12 (22.6%)

A glance at Table 3 will also show that the incidence of semen with albuminuria as a probable factor of contamination was found to be 22.6 per cent. in a series of sixty cases. While these cases have shown

a slight increase in the quantity of albumin over those whose urine did not contain that element, casts were simultaneously demonstrated. Other quite constant findings were those of amorphous urates and phosphates. Since the material was examined during the winter months, these findings would be of no significance. I have not been able to demonstrate glycosuria in a number of the specimens obtained after attacks, though some workers have reported sugar to be present in the urine in epileptics following seizures.

#### CONCLUSIONS

1. In a series of sixty cases of epilepsy, two-thirds, or 66 per cent., have shown albuminuria with granular casts after every seizure. Two cases of this series who were diagnosed clinically as hysteria, gave no evidence of either albumin or casts in the urine after repeated examinations following epileptiform seizures.

2. Albuminuria with casts persist for from twenty-four to forty-eight hours subsequent to attacks in some genuine epileptics.

3. The frequency of seizures, while apparently holding no relation to positive urinary findings, tends in general toward regularity of urinary abnormalities after attacks.

4. The duration of seizures seems to bear no relation to subsequent albuminuria.

5. Seminal fluid as a contaminating factor giving rise to albuminuria after epileptic seizures does not play a very great rôle.

6. An investigation into the frequency of nephritis in epilepsy is suggested.

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#### CORRECTION

In the article by Dr. Charles Frazier, which appeared in the August issue of the *ARCHIVES OF NEUROLOGY AND PSYCHIATRY*, the tracts in the illustration of the cord, on page 139, were incorrectly outlined. This illustration was inadvertently sent with the manuscript. The correct illustration appears in the reprint, a copy of which may be secured by sending a stamped, addressed envelope to the author.

The author also calls attention to an error in his manuscript: "latterly I have chosen the sixth cervical segment." This appears in the nineteenth line from the top of page 140. It should read: "latterly I have chosen the sixth thoracic segment."