ing portion of the gland was soft and could be impressed, indicating the existence of a small cavity; however, not much secretion could be expressed. The urine was perfectly clear; there were no subjective symptoms present, but the seminal emissions did not show any perceptible diminution of frequency. On August 17 a steel sound, No. 28 Fr., was introduced in the bladder without any difficulty. On account of the condition of the general health the patient went into the country immediately afterward, and I have neither seen him again myself nor have I been able to get any further information in regard to his condition from his then family physician.

The literature on the subject is not very profuse. The following cases have been collected. The authority, number and weight of the stones and under what conditions found are given:

TABLE OF CASES OF PROSTATIC CALCULI.

Authority.	No.	Size and weight.	Remarks.
Berard	35	Not given	Found at autopsy.
Bird, Gilding	139	Not given	
Chopart	69	Millet seed	Spontaneous evacuation.
Cooper Astley	84	Not given	
Caspar	1	Size of pea	Autopsy.
D'Altona	1	40 gms.	Operation.
Erdmann	50	Millet seed to pump- kin seed	Operation.
Ferreri	1	120 grs.	Operation.
Goggrund	100	Not given	
Longut	1	Right lobe of gland size of peach pit.	Autopsy.
Louis	6	Not given	Operation.
Malteste	4	Not given	Operation.
.....	22	Not given	Operation.
.....	30	Not given	Operation.
.....	1	33 by 38 by 8 mm.	Operation.
Mander	50	Not given	Operation.
Marcat	109	Not given	Operation.
Marssmeu	2	10 grs.	Operation.
Nelaton	1	Entire right lobe.	Autopsy.
H. Thompson	20	Not given	Operation.
Voillennir	1	Plum-pit	Autopsy.
White	10	230 grs.	Spontaneous.

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THE HEART'S ACTION PRECEDING AN EPILEPTIC SEIZURE.*

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The etiology of epilepsy has been a subject of comment and investigation from the most ancient times to the present day, yet but little light has been shed on its mysteries. The recognition of the cortical origin of the convulsion, and, more important than this, the new viewpoint being adopted by epileptologists, which regards the convulsion or other paroxysmal manifestation of the disease as the symptom and not as the disease itself—these have been the most important steps in advance.

Out of the recognition of the symptomatic character of the attack has grown the idea that the disease is not a unit—is not due to the same cause confined to the same part of the body in every case. Instead, it may be said that every case is an epilepsy by itself; certain it is that there will be found to be several epilepsies.

In regarding the disease as a group of conditions, and not as a unit, we have to meet this question: How do different causes acting on the same cells bring forth the same action? Do they act directly or do they act indirectly through some condition produced by all in common?

Dr. Albert E. Russell, of London, has discussed this question¹ and answered it by suggesting cerebral anemia as a common condition produced by all the underlying causes of the seizure. Dr. Russell suggests that arrest

of the heart's action may in some cases be the immediate cause of the anemia, the arrest taking place just before the onset of the convulsion, *i. e.*, before consciousness is lost and muscular contraction sets in, the failure to pump blood producing the anemia of the brain. In support of this assumption he cites cases, and I may be permitted to briefly summarize the material he presents:

He first quotes two cases (p. 42) with slow pulse, in which convulsions were preceded by cessation of the heart's action. His third case is one in which subacute rheumatism had set in. Benham, the attending physician, was informed one morning that the patient had had several fits, and while taking the pulse it stopped and a convulsion set in. This was repeatedly observed. The urine after these seizures contained albumin, but this soon subsided. The fourth case, in which myocardial disease seemed absent, was reported by Webster. Cessation of the pulse, shown by sphygmographic tracings was accompanied according to duration, by sleep or convulsion.

Russell next quotes a case of cardiac dropsy, and one of uremia (both Moxon's), in which severe epileptic convulsions were preceded by stopping of the heart's beats. A case of epilepsy, also Moxon's, in which cardiac arrest was observed, is mentioned. Dr. Hughlings-Jackson has observed the same thing in petit mal seizures. Dr. Russell reports one case from his own experience and gives the description of another which was reported to him. He concludes:

Sudden cardiac arrest is one of the few possible causes of anemia of the brain. It has been shown that such cardiac arrest does occur in some cases of epilepsy, and it is suggested that this occurrence may be much more common than is generally assumed, and that the rarity of opportunities for making such observation may explain the fact that it is not more widely recognized.

This article and another² by the same author attracted my attention. The phenomenon observed and held to be the cause of the seizure is so simple and so easily observed that it seemed strange that it had not been noted before. Taking together the heart auræ present in some cases and the favorable action sometimes exhibited by digitalis in epilepsy, it did not seem improbable, especially when one considers the rarity of opportunities for observation, as indicated by Dr. Russell, that cardiac arrest might frequently be present.

THE AUTHOR'S METHOD.

This suggestion, so simple and yet so important if susceptible of confirmation, has led to the present piece of work, which has consisted of obtaining graphic records of the pulse of epileptics previous to the seizure. Some six months has been spent in the work which, requiring the observation of the beginning of the seizures, even where material is exceedingly plentiful, is of the greatest difficulty. The time of the next seizure can not be foretold in any case, even approximately, and in order to obtain records it has been necessary to observe cases continually for hours and days at a time, a process which is tedious and laborious in the extreme. Casting aside digital palpation as a physical impossibility, the author arranged an air transmission apparatus whereby the pulsations in a constricted limb were transmitted to a tambour recording on blackened paper. A Janeway sphygmomanometer cuff was applied to the arm of the patient and inflated to some suitable pressure, recorded by a mercurial thermometer. The pulse waves in the

* From the Laboratory of the Craig Colony for Epileptics.

1. Transactions of the National Association for the Study of Epilepsy, vol. iv.

2. Lancet, July 21, 1906.

arm were transmitted through the cuff and heavy connecting tubing to an expansile pouch of rubber, inclosed tightly in a glass funnel, which is connected with a tambour. The kymograph used takes a blackened record about seven feet in length, so that a whole day's record may be traced on one band.

I regret very much that no time recording device was available for the work. Nevertheless, I am sure after several months' experience with this particular kymograph that its motion is practically regular—sufficiently constant for the work of this paper. The cases observed were taken at random, except that a few were selected because of heart lesions. The patients were observed lying in bed, sometimes bolstered up with pillows in any attitude comfortable for them. In reporting the observations on the cases I will give a short history of each case and then describe the findings.

CASE 1.—*History*.—Male, aged 23. Grandmother a paralytic. Onset of epilepsy at 14 without assigned cause. Physical examination negative. Two tracings were obtained in this case. There was a very slight acceleration preceding the attack. After the seizure the pulse was regular and still slightly accelerated. In the second of these tracings the seizure began some fifteen pulse waves before the first muscular contraction is recorded. In the first the period was some two or three pulse waves shorter.

CASE 2.—*History*.—Male, aged 33, a printer by trade. Had been deaf since eight years of age. Onset of epilepsy at 25. Assigned cause, careless habits of eating and sleeping. Denied the use of alcohol; used tobacco moderately. Palate and chest asymmetrical; heart negative; dermatographia. HCl present

one of a petit mal. In the first there appeared to be acceleration of the pulse rate before the attack, and in the second there was no change.

CASE 5.—No 1580. Male, aged 13. Onset at 14 months. Physical examination negative. In several tracings of petit mal attacks no change of rate preceded the seizure.

CASE 6.—No. 1779. Male, aged 31. Heredity poor. Onset at 19. Mitral regurgitation. Records were taken of four seizures, petit mal or mild grand mal in character. In one, there was no change in rate, but in others there was acceleration just before or just after the onset. The indicated onset preceded the first muscular contraction.

CASE 7.—No. 846. Male, aged 22. Mother suffered from severe headaches. Onset at 10, supposed cause a fall five years previously. In the tracings of two grand mal attacks, the first showed slight acceleration before the convulsion begins, and the second showed no change.

CASE 8.—No. 939. Male, aged 18. Onset at 8 years of age. Heredity poor. Worm fits at 2 years. I have only the record of a petit mal attack. There was only a slight acceleration.

CASE 9.—No 1004. A Jacksonian case, with almost constant clonic movements of the affected side. The tracings showed intervals in the convulsion during which the pulse was regular up to the point where resumption of convulsion hid the pulse wave in the tracing.

CASE 10.—No. 1524. Marked mitral insufficiency. Numerous mild attacks were traced in which the pulse was regular up to the moment of convulsion. Two other tracings showed no change in rate before the convulsion.

These cases, chosen at random or for a short heart lesion, may be considered to represent the average of epileptics. Looking over the results of the work re-

Sphygmographic tracing during seizure, showing no cessation of heart action.

but once out of several examinations. The seizure (grand mal) observed began without a cry; there was a drawing up of the face muscles and the head turned to the right. Knees were slightly flexed. Pupils were dilated at the end of the seizure. In the tracing from this case, an accidental movement interrupted the curve before the attack, but about eight occurred before the beginning of the seizure. After the onset there was apparently a momentary slowing, but this disappeared and the waves were still closer together as they approached the first muscular contraction. The rate after the seizure was about the same as before.

CASE 3.—No. 1871. Male, aged 25. Onset of epilepsy at 9, following scarlet fever and Bright's disease. Heredity negative. Thorax negative; dermatographia present; some asymmetry of facial markings and atrophy about the shoulder girdle, especially in the supraspinatus and infraspinatus muscles. Mental condition fairly good.

The record of a grand mal attack is shown in the accompanying illustration. The tetanic convulsion was of considerable duration, the eyes were turned up and to the right and the pupils were dilated. The clonus was short. The tracing shows slight acceleration after the muscular contraction is recorded, and during and after the convulsion the heart rate is still more increased.

CASE 4.—No. 2107. Male, aged 26. Heredity poor. Pneumonia at 1 year of age. Onset at 1 year. Patient has had muscular rheumatism and has a presystolic murmur. Pulse regular.

Two records were taken—one of a grand mal attack, and

ported it will be seen that the condition common to all but one was an acceleration of the pulse preceding the seizure and lasting through the onset stage to the moment of the first recorded convulsion. This acceleration was never great. The absence of a time marker prevented exact statements, but the increases seemed to be in the several cases, from eight to nine, or from twelve to fifteen or seventeen beats. In all the cases the pulse was entirely regular.

For this group of cases one can conclude definitely:

First—Cardiac arrest does not occur.

Second—Except for slight acceleration, and in one case slight slowing, the heart does not take part in the convulsion.

While I am certain as to the accuracy of the above stated conclusions, the question as to the extent to which they apply to all epilepsies is a different matter. It seems to me, however, that it is doubtful if cardiac arrest will be found in cortical epilepsies uncomplicated by heart lesions.

Handle a Few Tools Well.—Don't try to have too many remedies or combinations of remedies; it is better to have a few tools which one knows how to handle well, than to have a vast number with which one is poorly acquainted.—Dr. L. Duncan Bulkley in *Therapeutic Gazette*.