A CONSIDERATION OF THE NATURE OF AURAE *

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Descriptive and statistical studies of aurae are to be found in textbooks of nervous and mental disease, treatises on epilepsy and migraine and special articles; but these sources of information are searched almost in vain for an exposition of the particular conditions of the nervous system or of the mind that favor the occurrence of aurae. Such references as one finds generally are bare statements unsupported by argument and obviously taken without question from the conclusions of some distinguished investigator. That these references are scarce and unconvincing is not surprising in view of the difficulty of investigating aurae, as well as other phenomena connected with epilepsy and migraine, first hand in the person afflicted.

The subject would seem to be worthy of consideration, however, because without a proper understanding of the underlying conditions it is hardly possible either to form a satisfactory opinion of the relation of aurae to the convulsions in epilepsy, or to the headaches in migraine; or to make an accurate statistical or analytic study of aurae themselves. In this article, therefore, an attempt is made first, to bring forward objections to what seems to be the prevailing view; second, to point out anew the relation of aurae to a certain mental state, and finally, to suggest some factors that may influence the form the aurae may take.

AURAE OF EPILEPSY

Objections to Prevailing View on Aurae.—The notion of aurae that is most popular with the authors of textbooks probably originated with Hughlings Jackson,¹ but is given very clearly and concisely in these words of Gowers:²

"This immediate warning is of the greatest importance . . . The sensation is the effect on consciousness of the commencing process of discharge, which begins in structures by which these are influenced

* Contribution in a series offered to Prof. E. E. Southard in honor of the decennium of the Bullard Professorship of Neuropathology, Harvard Medical School.

1. Jackson, H.: Brain **11**:179, 1888.

2. Gowers: See Albutt-Rolleston: A System of Medicine, Ed. 2, New York, Macmillan Co. **8**:494.

that are highest in function and related closely to consciousness. The warning is thus an indication of the part of the brain in which discharge begins, because the place where it first attains such an intensity as to cause a sensation, must be the place at which it starts. . . . Their interest is great, but their practical value is almost limited to the detection of attacks which might otherwise be unperceived, by the evidence their character affords, and by their frequent indication that the instability is the result of a local lesion of the brain." There is in this conception of the nature of *aurae* an application to the sensory component of the epileptic attack of one theory of the origin of convulsions, namely, that which assumes them to be the result of a "discharge" of nervous energy in the motor cells of the precentral area.

Even though this conception of the origin of the convulsive movements of epilepsy be accepted as satisfactory, its application in the explanation of *aurae* may be objected to. The convulsive movements are of sudden onset and display little evidence of a coordination of nervous processes. On the other hand, the aura may be relatively slow in evolution and if complex in nature, indicates a delicate coordination of nervous impulses that is inconsistent with the notion of a "discharge." Further, the conception is incomplete in that it does not indicate the relation of the *aurae* which occur in the presence of an organic lesion to those which occur in brains apparently normal in structure. It is begging the question to get over this difficulty by assuming all cases of epilepsy to be the result of an organic brain disease. Structural changes that probably are not secondary are not found in a large proportion of the brains of a certain type of epileptics. In a still larger proportion the aura is not associated with changes in special sense centers that correspond to the special sense in which the aura occurs. It cannot reasonably be stated, then, that the aura of a special sense indicates or may indicate structural or even functional changes of a pathologic nature in the centers of that sense. A theory of *aurae* should make clear in how far a particular aura may be determined by structural changes and where these changes should be looked for.

In view of the relative futility of efforts to investigate *aurae* first hand in afflicted persons, it is well to attempt to employ another method, i. e., try to get some light from a study of similar and perhaps less inaccessible phenomena, if such can be found, and to apply the information thus obtained by analogy. There is a mental phenomenon, or rather a series of allied phenomena, of common occurrence in man, namely, hallucinations, to which it would seem *aurae* could be safely

compared. Parish,³ McDougal⁴ and others have noted the similarity of these manifestations of mental activity. Although some conspicuous differences may immediately stand forth, it is apparent that they are not essentially dissimilar. The subject matter of the one can generally be essentially duplicated in the other. The senses of sight and hearing, moreover, are represented in both in a similar proportion—as 71 to 29 in some statistics of the occurrence of *aurae* collected from several sources, and as 70 to 30 in the statistics of the occurrence of hallucinations, collected by Parish.⁵ The half-recalled memories or “*deja vu*” phenomena of certain incomplete attacks have many parallels, occurring in connection with sleep and certain waking mental states. No insuperable objection to this comparison is evident, at first sight at least.

Relation of Auræ to Other Hallucinations.—Hallucinations are common in both abnormal and physiologic mental states. Their occurrence in the insane and in those addicted to the use of drugs and alcohol is well known. The most common manifestation in physiologic states occurs in connection with sleep, in the form of dreams. There are also the hallucinations of hypnosis, of crystal gazing and of the psychic medium. Finally, there is the spontaneously occurring variety so much studied by spiritualists, and commonly known as visions.

According to Parish,⁶ there is a common mental state underlying all hallucinations, which he designates “dissociation of consciousness.” By this term he refers to a state of consciousness that differs from the waking state, in that normal association of ideas does not occur, or in which, as James expresses it, ideas are “deprived of their reductives.” Leaving aside as too complicated for consideration the pathologic states in which hallucinations are found, there is the loss of consciousness to a greater or less degree in sleep and a similar, but less profound, loss in hypnosis and crystal gazing, which favors the production of hallucinations. That the psychic medium usually gives her information with eyes closed, would indicate that she may be at such times in a state of autohypnosis. In the case reported by Prince,⁷ visions appeared in a prospective medium only after she had gone through a preliminary course of training, which consisted in gazing intently at a small point on a table for a long time. She doubtless was thus acquiring the power of autohypnosis. In the case of the visions reported by various societies for psychical research, Parish was able to demonstrate that in a large

3. Parish: *Hallucinations and Illusions*, New York, 1909.

4. McDougal: *Hallucinations*, *Encyclopedia Britannica*.

5. Parish: *Hallucinations and Illusions*, New York, 1909, p. 107.

6. Parish: *Hallucinations and Illusions*, New York, p. 71.

7. Prince: *Brain* 21:528, 1898.

proportion they occurred under conditions that favor sleep, or during emotions such as grief, fear or excitement that may produce a somewhat similar dissociation of consciousness. Before reading the conclusions of Parish, I had been impressed with this association merely in going over accounts of visions by various authors.

There is in epilepsy a disturbance of consciousness in the form of a loss. The depth of the unconscious state precludes the recollection of any visions occurring at this time; but there is a brief interval before consciousness is entirely lost that is probably not unlike the normal drowsy state and during which there are probably the conditions which have been shown to be suitable for the development of hallucinations. That hallucinations or aurae do occur at this time is, therefore, not surprising. Hence one should consider aurae as having an origin somewhat similar to that of hallucinations in normal persons, and should not assume, as Gowers and others have assumed, that they result from a "discharge" of an epileptic nature, due perhaps to a local lesion.

Factors Influencing the Form of Aurae.—If this assumption be true, the content of aurae should in general be derived as are dreams and visions. They may represent a fragment of memory, as was the case with one patient of mine whose aura consisted of a familiar face—not always the same face, however—and with another, whose aura was the vision of a disagreeable old woman he had known in childhood. In this connection it is interesting to recall the suggestion of Schwab⁸ that aurae may represent memory pictures of events attending the first fit, which have been "fixed," so to speak, by the strong attending emotional reaction. Further, the aura may consist of diminution or distortion of normal perceptions—micropsia, macropsia, etc.—which occurs also in connection with sleep. Finally, the underlying factor may be structural change. Since disease of the organs of special sense or of their pathways leading to the brain may lead to the formation of hallucinations in the corresponding sensory spheres in either the sane or the insane,⁹ similar changes may influence aurae. Turner¹⁰ considered these factors, in the case of auditory aurae, without much success; but the subject is worthy of further study.

Some points at which aurae and other varieties of hallucinations differ are worthy of consideration. There is, first, variability; aurae being constant in most cases and hallucinations generally fleeting. This difference may be in part explained by one of the characteristics

8. Schwab: Unpublished contribution presented before St. Louis Neurological Society, 1916.

9. Colman: Brit. M. J. 1894, p. 1015.

10. Turner: Epilepsy, Chicago, Chicago Medical Book Co., 1907, p. 81.

of epilepsy, namely, stereotypy. In general, the various reactions in epilepsy tend to be constant: hence, the preconvulsional disturbance of consciousness should be about the same in all attacks. This being true, the aura would be expected to be relatively constant. On the other hand, drowsy states vary within the widest limits and in them, unlike epileptic mental states, consciousness is often very receptive to external stimuli. It is therefore not surprising that the hallucinations should vary. Another point of difference is the absence of hallucinations during and after the convulsion. The depth of unconsciousness and fatigue factors may account for this lack. Some authors have assumed, however, that hallucinations do occur at this time.

AURAE OF MIGRAINE

As regards migraine, the problem is more obscure. Parallels for some of the aurae of migraine, such as the fortification spectrum described by Gowers for instance, are rare; but as aurae of this type seldom appear, few parallels should be expected. In visions and hallucinations bright lights and brilliantly colored objects are not unusual. Not unlike some migrainous aurae, is the vision of the boy, described by Gurney,¹¹ who saw in the dark a distant, tiny, luminous point approaching and increasing in size and becoming a face, and finally a mass of luminous faces unlike anything he had ever seen. A patient of mine had, after retiring and before falling asleep, a vision consisting of a "head of flame." That some disturbance of consciousness occurs with migraine there can be little doubt. Migraine is regarded by many as akin to epilepsy, and various abnormal sleep-states are commonly associated with it. One would think that conditions in migraine are even more favorable for the formation of hallucination than are those in epilepsy, inasmuch as in migraine the march of symptoms is slow and consciousness is not lost.

There remains to be considered the relation of the localized brain lesion to aurae. That there is an association of olfactory aurae with certain local lesions Hughlings Jackson,¹² Gowers¹³ and Southard¹⁴ have conclusively demonstrated. This fact instead of controverting the view that aurae are merely a type of hallucination, is itself made clear by some characteristics of hallucinations. It already has been pointed out that lesions of organs of special sense or of their pathways leading to the brain, may predispose to aura formation. In the case of the brain lesion, then, it may be assumed that the same principle is at work, the only difference being that interruption of peripheral impulses

11. Gurney: *Phantasms of the Living* 1:400, 1886.

12. Jackson: *Brain* 21:580, 1898; Jackson and Stewart: *Ibid.* 22:534, 1899.

13. Gowers: *Brain* 32:303, 1909.

14. Southard: *Am. J. Insan.* 64:607, 1907-1908.

occurs in the brain rather than in the peripheral pathways. Indeed, this principle can be applied in instances where another, let us say, that of direct irritation to the cortical cells, cannot be. In a case with olfactory *aurae* described by Jackson,¹² for instance, the lesion found postmortem was a cyst of softening in the hippocampal gyrus. According to a dictum of Jackson himself, a purely destructive lesion should not be considered as acting as an irritant on surrounding cortical substance. Again, in a case with a similar type of *aura*, quoted by Gowers,¹³ the lesion found at necropsy was a gumma of one olfactory lobe. In neither of these cases, then, can the *aura* have resulted from an irritation of the olfactory cortex; but both are easily explained as the result in the center of a disturbance of incoming nervous impulses.

CONCLUSION

By way of summary, it may be stated that I have attempted to point out anew the analogy between *aurae* and the hallucinations occurring in connection with sleep, hypnosis, crystal gazing, etc. According to this view, *aurae* should be regarded not as the result of "discharges" of an epileptic nature in some part of the cortex, but as deficiency reactions, like dreams, occurring when there is a "disturbance of consciousness" of a certain type. Their relation to the loss or disturbance of consciousness in epilepsy and migraine is assumed to be the same as that of dreams to drowsy or sleep states; and their content should be regarded as being determined by the same factors that determine the content of dreams and similar hallucinations. Their relation to structural changes may be the same as that of those hallucinations which develop in connection with disease of the organs of special sense or of the nerves connecting them with the brain.