Our results have mainly shown that considerable portions of the corpora striata of dogs may be destroyed by our method without producing marked neurological disturbances. Following considerable destruction of the caudate and lenticular nuclei we have seen animals remain apparently normal for several months. This has occurred even when portions of the nuclei on each side of the head were simultaneously destroyed. However, three to five days following the treatment we have noted in several cases, hypertonicity, tremors, and a certain clumsiness in locomotion. Following these symptoms we have noted prompt compensatory adjustment, so that within a short time the animal is apparently again normal and remains so.

Clinically, the function of the corpus striatum is believed to be the control of automatic associative movements, and we believe that the symptoms we observed in our dogs are manifestations of disturbances in that mechanism.

We believe that our method of destruction due to radium emanation will prove of considerable value to the study of localization of functions in the basal ganglia of the brain.

187 (1934)

An hypothesis of the mechanism by which normal rhythm is restored in atrial fibrillation.

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The abrupt change from atrial fibrillation or flutter to normal sinus rhythm has become rather familiar to us since the use of quinidin. In spite of our greatly improved knowledge of the mechanism of fibrillation and flutter the exact way in which normal rhythm supersedes these arrhythmias is still a matter of speculation. The most prominent explanation, offered by Lewis,[1] has recently been considerably modified[2] and is still rather unsatisfactory because it fails to take into consideration events that may be taking place in the region of the sinu-atrial node.

[1] Lewis, T., *Brit. Med. Jour.*, 1921, 514.

[2] Lewis, T., *Heart*, 192, ix, 55.

It is the opinion of the writer that an adequate and satisfactory explanation of the change to regular rhythm will include a consideration not only of changes in the condition of circus contraction, but also of events in the immediate neighborhood of the normal pacemaker. This becomes more evident when we remember that the change in rhythm takes place quite suddenly at a time when the rate of flutter or fibrillation has been slowed to approximately twice the normal sinus rate.

Furthermore, the experimental evidence that we now have confirms our view, suggested by the experiments of Lillie on conduction and our own records of the effect of quinidin on the human heart, that quinidin not only increases the refractory interval but also slows the conduction rate. In fact the conduction rate seems, at least in some cases,[2] to be much more markedly affected than does the refractory interval. This is quite at variance with previous explanations of the effect of quinidin.

It is more in accord with known facts to believe that quinidin restores normal rhythm in the fibrillating or fluttering atrium, not by prolonging the refractory period to such an extent that circus movement is no longer possible, but by decreasing the conduction rate and so slowing up the circus movement to such an extent that the rhythmic function of the atrial muscle can reassert itself. A review of our knowledge of events prior to the sudden change in mechanism will make this more evident.

There is a fair amount of experimental evidence that in the condition known as atrial fibrillation there is a continuous circuit or circus movement taking place in the atrium at a rate somewhere in the neighborhood of 500 per minute. It is clear that with such a circus movement stimulating the atrium approximately 500 times a minute the sinu-atrial node, with its normal rate of 60–100 per minute, has very little chance of obtaining control and thus the condition of fibrillation is self-perpetuating. If we give quinidin to a patient with atrial fibrillation we know that the rate of this circus movement is slowed very appreciably. It is obvious that if the circus movement could be made slower than the sinus rate the sinus, if normal, would regain control and normal rhythm would be established. A more careful consideration of the problem will reveal that it will not be necessary to slow the rate of the

circus movement below the normal sinus rate in order to obtain proper conditions for the restoration of normal sinus rhythm. Let us take for example a heart in which the normal sinus rate is 100 per minute, and in which the rate of circus movement has been slowed by quinidin to about 190 per minute. Let us follow our circus contraction and observe the events that take place. At first we notice that the circus movement stimulates the atrial muscle in the region of the sinu-atrial node and stimulates the node itself. But the node probably has a much greater nerve supply than the ordinary atrial musculature and therefore can be more sensitive to nervous influence and more subject to changes in the refractory period. As we watch we see that the region of the node, being for an instant slightly more refractory than usual, has failed to respond to one circus stimulus. But the rhythm of the node itself is sufficiently fast so that before the next stimulus arrives the node itself inaugurates a contraction. Whether or not this stimulus inaugurated by the node has time to spread very far before the next circus stimulus arrives depends on the exact time relations of the circus movement and the normal pacemaker, but if the stimulus inaugurated by the pacemaker has progressed as far as the central path of the circus movement it is evident that the circus movement will be blocked and will therefore cease, giving way suddenly to normal sinus rhythm.

In addition to the possibility of interruption of the circus movement by the normal pacemaker we must consider also the possibility of interruption by atrial premature contractions of extranodal origin. Such atrial premature contractions or extrasystoles are frequently encountered in patients with irritable nervous systems, and especially in patients who are being treated with quinidin. The manner in which the circus movement might be interrupted by an extranodal center is similar to that just described. The very frequent occurrence of atrial extrasystoles in patients who respond to quinidin therapy impels us to allot considerable importance to the rôle of such extrasystoles in the restoration of normal rhythm.

To summarize we propose for consideration the view that the way in which quinidin restores normal rhythm in the fibrillating atrium is by slowing up the conduction rate to such an extent

that either the normal pacemaker or some ectopic source is enabled to reassert its rhythmic function and thus interrupt the circus movement.

In conclusion it should be remembered that the hypothesis here given is different from, but not contradictory to the hypothesis of Lewis. Both hypotheses are valid. In fact it is probable that both mechanisms take place and so explain the two different ways in which atrial fibrillation returns to normal rhythm. We refer to the sequence with quinidin—*i.e.*, fibrillation, flutter, normal rhythm, and the sequence under digitalis of flutter, brief fibrillation, and normal rhythm.

188 (1935)

The emetic action of antimony and potassium tartrate (tartar emetic).

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Tartar emetic (antimony and potassium tartrate) induces vomiting reflexly through local irritation after its introduction into the stomach or duodenum. The portion of the duodenum lying immediately below the pylorus is more sensitive than the stomach. Concentrated solutions are more active than dilute solutions in inducing this reflex.

Tartar emetic does not cause emesis in the cat or dog, when it is applied directly to the vomiting center decribed by Thumas, and which lies in the floor of the fourth ventricle.

Intravenous injections of tartar emetic induce vomiting after varying intervals of time, largely dependent on the size of the dose. This emesis is not prevented by the removal of the gastro-intestinal tract, or by the removal of the celiac plexus and simultaneous cutting of the vagi below the diaphragm, but it is profoundly influenced by cutting the vagi in the neck, or paralyzing the vagus endings with atropin; it is apparently abolished by severing all nervous connection between the heart and centers by