First described by Johann Christian Reil, the insula (Latin for island) became known as the island of Reil.\(^1,2\) Subsequent understanding of the far-reaching varied connections of the insula make the idea that it was ever conceptualized as an island a bit ironic. Beyond issues with the misnomer island, the insula continues to be challenging. The insula has broad reciprocal connections with frontal, temporal, and posterior cortical structures,\(^3\) making it involved in varied and diverse functions. In turn, involvement of the insula in an epileptic seizure can result in a heterogeneous mix of semiologies. Therefore, for some time now, we have been aware of the insula as “the great mimicker.” It is prudent for any physician treating epilepsy to remember the insula as a potential origin of the epileptogenic zone.

**The Fifth Lobe**

The insular lobe is the fifth, often forgotten, lobe of the brain, lying deep within the Sylvian fissure below the frontal, parietal, and temporal operculum. There is a vascular network immediately over the insula.\(^1,3\) The deep location and associated vasculature of the insula have slowed exploration and understanding of the insula compared with other brain lobes.

The insula is composed of an anterior portion and a posterior portion. The anterior portion is further subdivided into the anterior short gyrus, middle short gyrus, and posterior short gyrus. There is an accessory gyrus on the ventral margin of the anterior insula. The posterior portion of the insula is subdivided into the anterior long gyrus of the insula and the posterior long gyrus of the insula.\(^1,3\) Anatomic study in monkeys has demonstrated that the posterior insula has afferents from amygdala, dorsal thalamus, and sensory regions, including auditory and sensory cortices.\(^1\) The afferents to the anterior portions are primarily from limbic cortices.\(^1\)

Regarding function, several electrocortical stimulation studies have been performed and detail a variety of responses to stimulation, including cognition, behavior, and sensory processing.\(^3\) There are 4 qualitatively and spatially distinct areas in the human insular cortex, identified by electrocortical stimulation results, including:

1. general somatosensory
2. thermal and pain perception
3. viscerosensation, and
4. gustation.

Other sensations, however, including vestibular sensations, a feeling of movement, auditory sensations, and speech impairments have also been described.\(^1\)

**Semiology**

Seizures of insular onset can present with varied and diverse clinical characteristics making them easily mistaken for seizures originating from other cortical regions. These features are thought to result from rapid spread from the insula to other interconnected areas. For example, seizures of insular origin have been noted to present with altered awareness and automatisms similar to temporal lobe seizures.\(^3\) Similarly, seizures of insular origin have been noted to have hypermotor or tonic features more commonly thought consistent with frontal lobe epilepsy. There also have been reported epileptic spasms and reflex epilepsy including audiogenic and somatosensory evoked seizures.\(^3\)

There is, however, a clinical semiology that seems to be fairly specific for origin in or rapid involvement of the insular cortex (Box).\(^1,3\) These seizures also tend to feature preserved awareness.\(^1,4\) An aura of a feeling breathless, having painful sensations, or having gustatory auras is also suggestive of insular origin. People having insular seizures may be

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**BOX. Characteristic Pattern of Insular Seizures**

- Pharyngolaryngeal constriction
- Perioral dysesthesia of electricity or warmth
- Lateralized somatosensory sensations
- Dysarthria or dysphonic speech
- Focal somatomotor signs
observed to make an expression of pain and/or clutch at their throat.³

EEG

The EEG of insular epilepsy can be equally challenging. Scalp EEG changes can be variable or misleading.³ Insular spikes simply may not be seen on scalp EEG. If spikes are seen, they may be over frontopolar and frontotemporal regions if the focus is in the anterior insula or over the midtemporal region or central leads with posterior insular foci leading to false localization.³ Ictal patterns seen are generally nonspecific; however, on scalp EEG, long latency from electrical onset and hypermotor manifestations suggests insular onset.³ In general, intracranial EEG may be required to localize insular epilepsy, and stereoEEG is considered a superior technique compared with grid and strips because of the location of the insula.³,⁴

Conclusion

Insular epilepsy can be a great challenge to recognize. Although there is a characteristic semiology involving peri-oral dysesthesia, pharyngolaryngeal constriction, lateralized sensations, abnormal speech, and somatomotor signs with preserved awareness, many other seizure types are possible because of the widespread connections of the insula. To further complicate the diagnosis, scalp EEG is not as useful as we would like it to be. There is a strong possibility of misdiagnosis if the treating physician does not consider the possibility of epilepsy of insular onset. A misdiagnosis of temporal lobe epilepsy or frontal lobe epilepsy is possible. Of even greater concern, a misdiagnosis of paroxysmal nonepileptic spells (PNES) is also a possibility—one that can set the patient down a long and unnecessary course of diagnostic odyssey. A general neurologist caring for persons with epilepsy would be advised to consider the diagnosis of insular epilepsy and refer suspected cases for further testing and evaluation at an epilepsy center.


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