

Brain Mechanisms in Blepharospasm

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There have been several important advances in understanding the brain mechanisms associated with blepharospasm. Clues to these mechanisms come from several sources. First, there are brain imaging studies to try to identify the parts of the brain that are important for the development of blepharospasm. Some of these studies use standard imaging tools like computed tomography (CT) or MR (magnetic resonance) to visualize brain abnormalities like stroke. Other investigations use more complex equipment like positron emission tomography (PET) to identify changes in brain function. This review will concentrate on brain mechanism found using PET and relate that to other relevant research.

PET has been used to identify the site of abnormal function in several different groups of people with dystonia, including blepharospasm. First, it was found that a change in function in an area deep in the brain called the putamen can be associated with dystonia. However, most people with primary dystonia like blepharospasm do not have such an obvious change in this part of the brain. Other, more sensitive methods to analyze these PET findings can identify subtle changes in the relationship of activity of different parts of the brain and how they might work together. Other PET studies use measurements of brain blood flow to investigate how the brain responds to various stimuli. This may be important as there are clinical clues that suggest an abnormality in processing sensory information. One of the early PET studies to investigate sensory motor processing found a specific change in how the brain responds to a vibration stimulus on the hand. There was a reduction in the brain's response to this stimulus in the sensory motor cortex and an area called the supplementary motor area -- both these areas of the surface of the brain are important for movement and sensation. The same abnormal processing also was found in a group of people with blepharospasm, providing further evidence for the similarity of brain mechanisms in different types of dystonia, whether affecting the hand or the face. Preliminary evidence also suggests that this brain response may recover with administration of a drug called levodopa, that most likely has its site of action deep in the brain in the basal ganglia.

The suggestion that the basal ganglia are involved in dystonia in general and blepharospasm in particular is supported by several other lines of evidence. First, there is a reduction in dopamine receptor function in this area in people with blepharospasm. Dopamine is a chemical messenger that transmits signals between nerve cells. The specific spot that dopamine attaches to on the receiving nerve cell is called a receptor. PET studies measuring these receptors in the basal ganglia demonstrate that there is a 25-30% reduction in blepharospasm and a similar reduction in people with dystonia that affects only the hand.

Measurements of dopamine receptors are also reduced to this same degree in an animal model of dystonia. This animal model provides a number of opportunities for further investigation of the mechanisms underlying blepharospasm. Interestingly, another completely different animal model of eyelid squeezing has been developed by Craig Evinger in New York. He demonstrated that a deficiency of dopamine in the striatum is an important factor in the development of blepharospasm-like movements. This dopamine deficiency coupled with an irritation of the one of the nerves important for sensation around the eye led to these movements. These findings may help to explain some of the symptoms that affect people with blepharospasm.

Overall, these studies suggest that there is a specific change in the function of part of the basal ganglia leading to dystonia including blepharospasm. Other clinical observations support this notion as do some recent advances in the genetics of dystonia. Hopefully, these advances will lead to new, more effective, treatments of blepharospasm.

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