

Why Do Teeth Break?

by Jay Harris Levy, DDS

About once a week one of my patients will tell me a story about having a tooth unexpectedly break while eating. For some patients this is a shocking event, but for others it is a chapter in a depressing saga that has been retold annually for years. Usually, a cusp has broken off the inner surface of a lower molar or the outer surface of an upper molar. I have heard similar stories in conversations with other dentists, in the scientific literature and recently while participating in a conference dedicated to understanding why teeth break.

The simplest explanation as to why teeth break is that excessive biting forces are used during chewing, swallowing or clenching the jaws. They may already be weakened from tooth decay. However, there is, nothing at all simple about why a person uses excessive biting forces. Teeth are much more complex than the hard, rock-like structures that fill our smiles (and bellies)! They are literally “plugged in” to the central nervous system and may be considered to be “Tactile Sensory Organs”.

Teeth possess brilliant adaptations that enable them to endure the rigors of chewing. Each tooth contains thousands of tiny nerve endings encased in dentin and enamel: the two hardest substances in the body. Research that I have performed at OHSU revealed that teeth are quite good at sensing vibrations. They use vibration sense to explore the texture and consistency of a meal thereby providing the brain with essential information about its physical properties.

While eating the brain almost instantly compares a meal's texture and hardness with foods that teeth have encountered in the past and determines the best chewing strategy. Optimal chewing forces and rhythms are chosen based on this tactile sensory feedback. Sometimes tactile feedback informs the brain that the best strategy is to immediately stop chewing (e.g. and spit out that rock that made it into your lentil soup). Safe chewing requires this kind of fast acting reflex behavior. Throughout the entire human body the speed of the reflexes that protect the teeth is second only to those reflexes that protect the eyes.

In the span of a lifetime we pulverize vast quantities of food with our teeth. The goal of chewing is to fracture food into small easily digest-able bits. If we are to live long productive lives our teeth must accomplish this goal without fracturing themselves. Protective tooth reflexes work toward enabling this goal. Tooth reflexes enable the teeth to endure many years of hard chewing without breakage when jaw structure and tooth alignment are optimal.

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Unfortunately, the structure and alignment of the teeth and jaws in modern human beings is rarely optimal. Malocclusion (i.e. mal-alignment of the jaws and teeth) is widespread in western society due to a number of factors. Nasal congestion is high on the list of factors that cause children to develop malocclusion. Nasal congestion often originates from respiratory illnesses, food allergies as well as allergies to airborne pollutants and other allergens. Chronic nasal congestion forces the growing child into a long-term pattern of mouth breathing.

Mouth breathing uses jaw and facial muscles differently than normal nasal breathing does. In the growing child facial bones are literally sculpted by the contractions of the muscles of the face and jaws during breathing and swallowing. During nasal breathing the tongue rests against the inside surfaces of upper teeth and the cheeks rest against their outer surfaces. As a child grows and develops tongue and cheek muscles form a balanced slot into which the teeth grow. In the mouth-breathing child the cheek muscles are not in balance with tongue muscles. This imbalance causes the faces and jaws of mouth-breathing children to grow to be abnormally narrow and the teeth poorly aligned (i.e. mal-occluded).

The problems that are associated with malocclusion run much deeper than having crooked teeth and unsightly smiles. Patients with malocclusions can have a difficult time biting evenly which concentrates biting forces on a few teeth. Patients with malocclusions often have to slide their jaws into uncomfortable positions to be able to swallow or chew, which may fatigue or cause pain in the jaw muscles. Each time we swallow our teeth press firmly together for two to three seconds. We swallow about 2,000 times per day 365 days a year. Simply swallowing places a lot of force repetitively on the teeth. In patients with malocclusion forces from swallowing are concentrated on a few teeth. Add these forces to chewing forces and a scenario is created where cracks develop, enlarge and teeth eventually fracture in areas of force concentration.

Tooth breakage from malocclusion usually occurs rather slowly because sensory feedback from the teeth is able to restrain biting forces from breaking the teeth immediately. Unfortunately, in some mal-occlusions sensory feedback patterns from the teeth may cause clenching or bruxing behaviors. Clenching and bruxing are destructive habits that are not associated with chewing or swallowing but place very high forces on the teeth. The high forces generated by patients afflicted with clenching and bruxing habits causes their teeth to fracture and wear down prematurely. Clenching and bruxing may even be apparent in children. To illustrate how sensory

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feedback and malocclusion interact, imagine moving your jaw to the right side to chew a piece of lettuce but you sense that a tooth on the left side is in the way. Your brain must move the jaw around interfering teeth to accomplish the task of chewing. Interfering teeth set up patterns of excessive movement and avoidance behaviors that lead to stronger than normal biting forces and ultimately broken teeth.

If this is unclear, think about trying to write your name with a very sharp pencil while your 2-year old child is trying to get your attention by bumping your elbow. You would probably grasp the pencil more firmly and use stronger hand strokes in an attempt to regain control of your writing. It is also quite likely that you would break the point of your pencil! Sensory feedback from interfering teeth causes the brain to process several streams of sensory information simultaneously; just like the child competing for your attention does. The end result is higher biting forces, chewing errors, broken teeth and shorter pencils!

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