

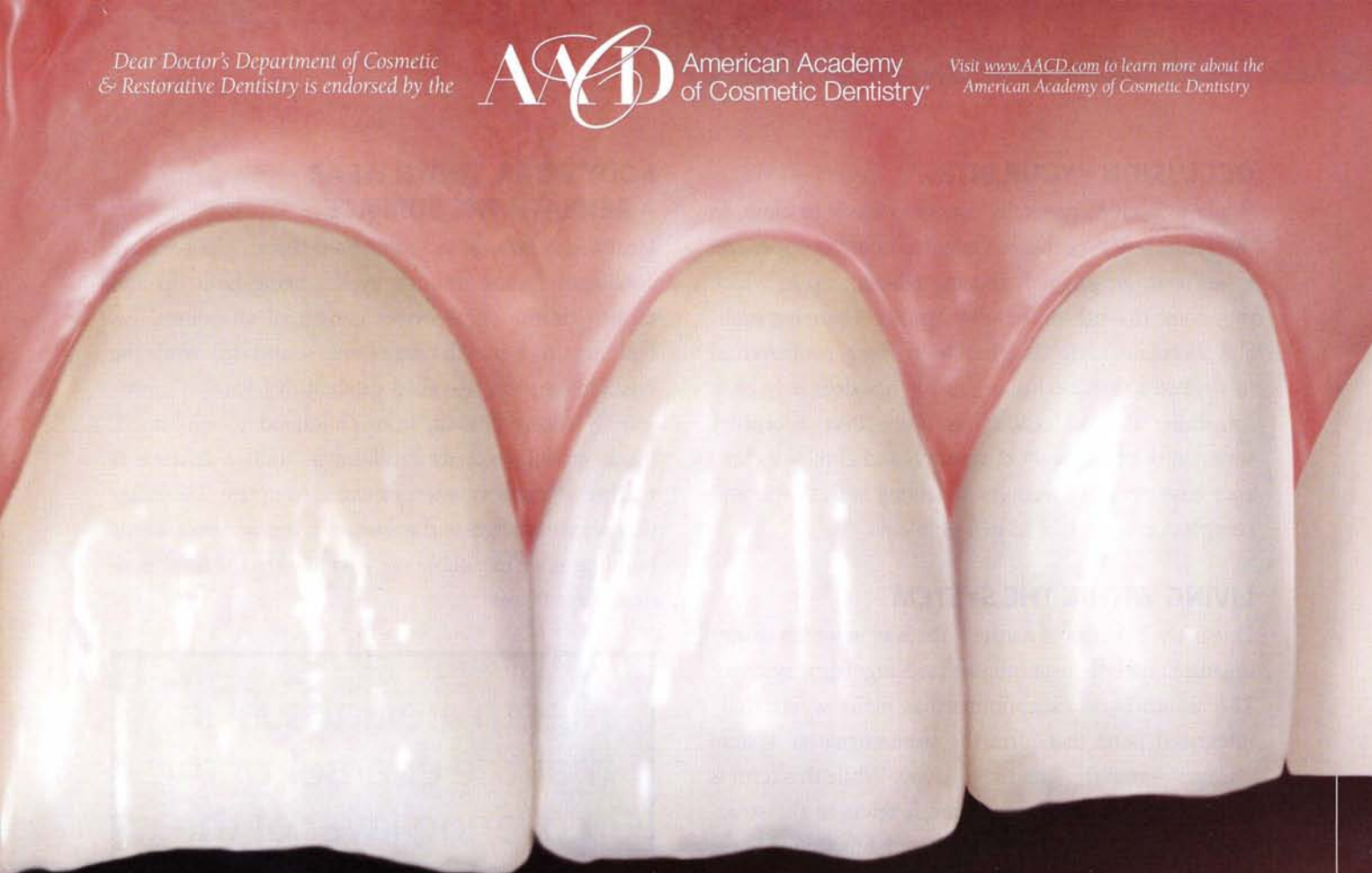


How And Why Teeth Wear

Understanding The Basics Of How Your Bite Works

by Michael R. Sesemann, DDS, FAACD

Are teeth supposed to last for a lifetime? And are humans designed to live for up to a hundred years? While these questions are debatable, our early human ancestors had a lifespan of no more than 30 or 40 years with that being largely dependent upon having teeth. Think about it — the diet of these primitive ancestors was much courser and abrasive than our modern human diet. Once their teeth were worn out, eating and sustenance was no longer possible and thus death quickly followed. Luckily for us, times have changed.



Public health measures are credited with much of the recent increase in life expectancy. During the 20th century alone, the average lifespan in the United States increased by more than 30 years, 25 of which can be attributed to these advances. The Center for Disease Control (CDC) now estimates the average life expectancy in the US at 77.7 years.

Given all the improvements in health, both general and oral, people are not only living longer, but they are also keeping their teeth for longer. This article will provide an overview of the vast topic of the “oral system” and one of its more common and important consequences, tooth wear. However, before discussing how and why teeth wear, it is necessary to understand both the system and the environment within which teeth function.

The effects of wear in particular are most noticeable in body structures that do not replace themselves, and this is especially evident in the enamel of the teeth.

THE IMPACT OF ORAL DISEASE

Two of the most common diseases known to man are dental caries (**tooth decay**) and periodontal (**gum**) disease, which together are responsible for the demise of most teeth. Today, these diseases are not only treatable, but they are also largely preventable, nevertheless teeth may still wear just as the body will inevitably age. The effects of wear in particular are most noticeable in body structures that do not replace themselves, and this is especially evident in the enamel of the teeth.

OCCLUSION - YOUR BITE

While to occlude generally means to block or close, in the dental sense “occlusion” refers to how the upper and lower teeth are aligned, and the relationship in which they come to close, or occlude together. There has probably been no topic that has been more controversial in dentistry than occlusion, and it has definitely been something the profession has spent over a century ruminating upon. Years of research and clinical experience have provided answers to solving both simple and complex occlusal, bite related problems.

LIVING WITHIN THE SYSTEM

One of the beauties of nature is the way in which tissues organize into self-sustaining and self-regulating systems. The mouth is no exception; it has many wonderfully integrated parts that form the stomatognathic system (“stoma” – mouth; “gnathic” – jaws). While this term is rather a mouthful, simply stated it refers to the structures involved in many inter-related functions. These myriad functions include breathing, the production of speech, mastication (chewing), tasting, swallowing, and beginning of digestion, in addition to the important social functions afforded by facial expression – to name but a few.

Nothing happens independently in a system so that when one element changes, everything changes. Biting, chewing, clenching, and grinding all take place through the teeth coming together. The forces generated during these activities are carefully controlled and monitored through the neuro-muscular skeletal system (“neuro” – nerves; “muscular” – contractile tissues; “skeletal” – bony framework). Essentially the nerves provide electrical impulses to activate the muscles that move the jawbones, to which the teeth are attached. The nerves also provide feedback to the muscles to control force.

When teeth begin to wear, the wear can affect many aspects of the system. It can either compensate for the wear, cause breakdown or failure, or manifest in symptoms, disorders, and disease.

BODY WEAR, TOOTH WEAR – BENEATH THE SURFACE

Most bodily tissues, including hard tissues like bone are continually going through cycles, being built up and broken down. These cycles consist of anabolism – a building up or growth phase (“ana” – upward), while the breakdown phase is called catabolism (“kata” – downward). During growth, from childhood to adulthood, tissue growth exceeds breakdown, until a balance is reached at maturity when growth is complete. Thereafter the balance changes and as one ages, breakdown exceeds building as we inevitably age. All too often the manifestation of age is wear.

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Teeth are unusual in that the enamel, the covering layer of the crowns of the teeth, is non-living. The cells that initially give rise to the enamel in early life subsequently perform other functions. Interestingly, enamel is the hardest substance produced in the animal world; it is highly mineralized and crystalline in structure composed mainly of calcium and phosphate, and it is relatively resistant to chemical attack and to wear. The dentin underlying the enamel has a more bone-like quality; it is living, and nourished by the tissues of the pulp that is housed in the central chamber of the tooth (the root canal). As teeth age, more dentin is created from within the tooth. This is one of the reasons why teeth change color with age; they become less white, and less sensitive to temperature.

WHAT IS “NORMAL” WEAR?

Wear of the teeth that is most visible is occlusal wear that affects the biting (enamel) surfaces. It occurs when enamel surfaces interact between the upper and lower teeth. More specifically, wear results in the removal of material from the enamel surfaces. Contact due to motion is an important distinction between mechanical wear and other processes that can have similar results, as we will cover later. And it is not only the teeth that can suffer, but other structures can also bear the brunt of excessive force within the oral system.

Because there are no clear guidelines for what constitutes “normal” wear, it is generally and broadly defined: normal wear should be equal in rate or speed with aging. It is common for the teeth to show some wear with age, but the system will naturally compensate for it. As teeth wear they will move minutely, by erupting slightly, moving to maintain proper biting relations. They will also move or drift toward the front of the mouth and tend to crowd more with age. The process is not exactly glacial, but it does take a very long time. It is when wear becomes excessive, beyond what the body can compensate for through the natural eruption of teeth, that problems arise leading to changes in bite relationships and loss of facial height.

Contact due to motion is an important distinction between mechanical wear and other processes that can have similar results.



Mild Wear

Early or mild wear is characterized by thinning and loss of the enamel surfaces usually resulting in chipping and fracturing of the incisal (cutting) edges, shown here affecting the upper front teeth.



Moderate Wear

Moderate wear showing significant shortening of the upper front teeth, resulting in loss of facial height with a consequent characteristic appearance of aging.



Excessive Wear

Excessive tooth wear resulting in advanced loss of tooth structure, which further accentuates loss of facial height and aging. Large areas of softer dentin are also exposed, increasing the potential for accelerated tooth wear. Note that wear also affects the back teeth — decreasing facial height, and accentuating the aging process.

MAY THE FORCE BE WITH YOU

Normal forces are applied to the teeth, during both biting and non-biting contact. Biting and chewing normally generate forces of between 13 – 23 pounds. During non-biting contact the teeth come together fleetingly hundreds, if not thousands of times a day at a force of 0.75 – 7.5 pounds. These brief contacts provide the stimulation that is necessary to maintain normal healthy bone.

Paranormal force or parafunctional forces, by definition are outside the normal range. Now here's where it gets interesting. The average human has the potential to generate a biting force of anywhere between 23 – 230 pounds. It's not just the large forces generated, but their direction, duration and frequency together that are so damaging. Highly destabilizing forces applied both frequently and for long periods can lead to problems, symptoms and breakdown. Parafunctional forces and habits are generated most often through clenching, and/or grinding (also known as bruxism). They can affect one or many elements of the oral system.



They can stress:

- The muscles – causing spasm and pain;
- The jaw joints – causing TMD (**Temporo-Mandibular Disorder**)
- The periodontal ligaments (**attach teeth to bone**) – causing tooth looseness or;
- The teeth – causing excessive wear or even fractures.

Combinations of some or all of these factors can also occur. Excessive wear is also known as retrograde wear – wear that is faster than the normal rate. It cannot be readily maintained by the normal compensation of tooth eruption and the effects can be profound. However, even excessive wear may not cause symptoms. Still other factors can increase wear, like decay that compromises the teeth and filling materials, either too soft which will wear too quickly, or too hard, which will cause undue wear of opposing teeth.

Excessive wear can also lead to “bite collapse,” with associated facial changes that produce sagging cheeks, and creasing of the lips at the corners of the mouth — all manifestations of lessening lower face height which accentuate the aging process.

Oral Habits: Parafunctional forces can also impact the teeth through other interesting habits.

- Tooth-to-tooth habits include clenching and grinding, a common sign of psychological stress that occurs unconsciously, for example, during sleep. Unless they are causing symptoms, many people are often totally unaware they grind their teeth until pointed out by a dental professional.
- Tooth-to-foreign body habits encompass a broad range of objects that individuals habitually hold between their teeth like nails, pencils, bobby pins and more, that can create damage and wear. They can both move teeth and cause abnormal wear patterns.
- Tooth-to-soft tissue habits, such as thumb or finger sucking, are unlikely to cause wear; however, they can cause irregularities in bite and swallowing patterns.

Examples of Tooth Wear and Restorations



An example of mild wear of the edges of the upper front teeth resulting in thinning and chipping of the enamel surfaces.



An example of wear with a moderate loss of tooth length exposing the underlying softer dentin surface of the tooth.



An example of excessive wear, that often results in the loss of facial height and other features of aging.



WHERE DOES WEAR END?

Tooth wear is basically the result of four different and frequently combined processes:

- **Abrasion:** Wear produced by interaction between teeth and other materials
- **Attrition:** Wear through tooth-to-tooth contact
- **Erosion:** Dissolution by acidic substances
- **Abfraction:** Another form of loss of tooth structure that may have a wear component. It is associated with enamel loss at the necks (at the gumline) of the teeth. There are many factors that can contribute to abfraction simultaneously including abrasion and erosion.



An example of possible abfraction where tooth structure is lost at the gum line.

THE FIX – DEPENDANT ON THE CAUSE

As in most areas of medicine, treating a problem means getting to the root of its cause in order for treatment to be effective. With tooth wear it is not only necessary to replace the tooth structure lost through wear, but also to make sure that the corrected bite is properly restored in terms of form, function, normal tooth shapes and aesthetics. Once corrected, a properly aligned and functional bite should continue into the future without further destroying itself. If abnormal tooth wear is evident from para-functional habits (clenching and/or grinding), it is both appropriate and necessary to provide therapy through a variety of techniques to reduce the likelihood of further damage. One preventive and treatment option includes wearing a professionally made mouthguard (occlusal guard) during periods of stress or sleep that is specifically designed to protect the teeth when the damaging activity typically occurs. This simple step can result in improved oral health and social/psychological well-being.

Examples of individuals (on the opposite page) with early, moderate and advanced wear of the upper front teeth show “before” and “after” treatment results. They show how modern dentistry can successfully restore the normal shape, appearance and function of worn teeth.

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