Introduction to Abfractions

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Definition of abfraction.

Due to the stresses resulting from biomechanical loading forces exerted on the teeth (static, as in swallowing and clenching or cyclic, as in chewing), both enamel and dentin can chip or break away. This loss of tooth substance, which shall be termed Abfraction, is dependent on the magnitude, duration, direction, frequency, and location of the forces. These abfractive lesions are caused by flexure and ultimate material fatigue of susceptible teeth at locations away from the point of loading.

Both tooth and nail will break down from forces over time.

Enamel rods breaking away.

In time, nail will break after being bent back and forth.
Forces that can be working on teeth at any time.

- **Green arrow** - only non-destructive force.
- **Blue arrow** - lateral force from tongue.
Lines of stress directed down to apical area.

Lines of stress concentrating in area of cervical region.

Tooth bends or flexes around pivot area.
Teeth are designed to absorb heavy forces in the direction of the **long axis** of the tooth.

Most teeth are not designed to absorb damaging **lateral** forces.
EA case
1993
A8
Occlusal wear facet.

Identifying dimple.

Exposure in middle of abfraction.

Buccal view.
3 view of the same tooth.
Abfraction (green arrow) caused from traumatic lateral forces of a ‘tight bite’ malocclusion (red arrow) and a tongue-thrust (blue arrow).
Note same notch - Proof it is the same tooth.

Half of the notch is below the gum level.

It would be impossible for tooth-brushing to cause this abfraction.
Borders of lesion on bite wing x-ray.

Border of abscess visible.
Tooth abscessed.

Abfraction
Tooth compared to only tooth at Smithsonian with abfraction.

Flat surface due to traumatic occlusion.

Tooth compared to only tooth at Smithsonian with abfraction.
Do you think **tooth-brushing** caused these abfractions? Note various slants and angulations of these abfractions.
One tooth with abfraction actually fractured in half.
The powerful traumatic lateral force from this tongue-thrust caused these abfractions. (1998)
Grand Canyon. A natural wearing away due to forces.
Arm broken off my chair because too much stress was placed on it!
One screw broken off and one screw bent because too much stress was placed on them!

Everything will break down to some extent if too much pressure is put on it - be it a thing or a person!
Early history of abfractions.
‘Wasting and/or erosion’ were probably the original terms for what is now known as “abfractions”. First articles describing “Wasting” were in Miller’s article(s) published in the 1907 Jan, Feb and March issues of Dental Cosmos: *Experiments and Observations on the Wasting of Tooth Tissue Variously Designated as Erosion, Abrasion, Chemical Abrasion, Denudation, etc.*

*The Dental Cosmos*
Vol. XLIX, Jan 1907, No.1.
Vol. XLIX, Feb 1907, No. 2.
Vol. XLIX, March 1907, No.3.
1) “In the year 1884, I (Dr. WD Miller) examined all of the skulls in the Berlin anatomical museum, and did not succeed in finding a single case of undisputable wasting.”

2) “The late Zahnarzt Stieren of Wiesbaden examined twenty skulls with negative results. More recently Mr. SP Mummery of London has gone through some of the collections there, and confirms the above results.”

3) Dr. Grevers of Amsterdam stated: “During his studies, which have extended over many years, he has examined no less than 6000 old skulls, and he informs me that he did not find a single case of wasting among the entire number.”

Above statements are significant in that “abfractions”, as illustrated in this presentation, can be seen on several patients on a daily basis in every dental office in the USA. What will anthropologists in the future think were the causes of today’s abfractions???
Aubry study:

“Purpose of study was to compare the prevalence of noncarious tooth lesions (NCTL) in 3 archaeological samples from the Copper Age and Middle Ages and in subjects examined in 3 dental practices in southern France.”

“Noncarious tooth lesions (NCTL) are frequent findings in contemporary dental practices….In the archaeological sample group, no NCTL were detected in 3,927 teeth from 259 individuals. In the dental-practice group, premolars were the most affected tooth type.”

“Occurrence of NCTL has long been attributed to toothbrushing and to erosion by intrinsic and extrinsic acids. More recently, occlusal stress associated with tooth flexure has been implicated…The most likely explanations involve difference in lifestyle, diet, and dental condition.”

“It would be interesting to study present-day populations switching from a traditional to Westernized lifestyle..to better understand..the development of NCTL”

My Hypothesis

Based on the research of others in the previous 2 slides, and my research at the Smithsonian, I hypothesize that abfractions as seen in this presentation are extremely rare in prehistoric skull samples.

Reason for lack of abfractions is that prehistoric people had no choice except to breastfeed their young. As explained in some of my articles and presentations on this website, breastfeeding reduces the risk of malocclusions and tongue thrusts which I believe are the main contributing cause of abfractions.

Malocclusions and tongue thrusting are also caused by ankyloglossia, but if an infant was born in prehistoric times with ankyloglossia, he probably died because he was unable to breastfeed.
Hypothesis continued

I even narrow my hypothesis as to when abfractions first started to appear in significance numbers down to the last 200 years. It was approximately 200 years ago that the precursor to the modern baby bottle was first invented.

* “Newly invented glass feeding bottle with spherical base and extended neck; screw top with sponge for sucking (*Italy*)” was first discussed in the medical literature circa 1770-1800AD. (Fildes, page 326)

* “Rubber teats did not come into general use until the mid-nineteenth century.” (Fildes, page 344)

Dr. WD Miller (Germany) practiced in the same era (early 1900s) as GV Black (USA), the ‘father of modern dentistry’.
‘Father of modern dentistry.’

GV Black

Greene Vardiman Black, MD, DDS, ScD, LLD.

Dean and Professor of Operative Dentistry, Dental Pathology and Bacteriology at Northwestern University Dental School.

*A Work on Operative Dentistry*, 1914
In his book, GV Black stated:

“Dr. W.D. Miller, of Berlin, Germany, recently published (Dental Cosmos of Jan and Feb, 1907) the results of two years’ work on the etiology of erosion. He announced his belief that it is caused by weak acids or gritty toothy powders, or by both, assisted by the tooth brush. He seemed to be convinced that the tooth brush is the main factor, and what we have designated as erosion is nothing more nor less than abrasion brought about by these agencies.”

But after Dr. Black visited Dr. Miller’s laboratory he stated:

“I (Dr. Black) saw none of his artificial production, however, that had the sharp, clean-cut margins so often present in the real thing as it occurs in the mouth.”

GV Black, A Work on Operative Dentistry, 1914, Page 51.
Examples of ‘wasting’ from the early 1900s.
G.V. Black: Fig. 48 - Wasting.
G.V. Black: Anterior wasting.
GV Black: Fig. 51- Wasting. Note: no cuspid.
GV Black: Photomicrograph showing cracks in enamel.
Page 57 - “A sufficient use of clear water and the brush will, I believe, do no harm….I have made considerable effort to reduce the evil results by inserting fillings, but can report but few successes….The erosion will go on beside the fillings and continue spreading, leaving the margins of the fillings standing as they were placed. Most of my efforts have failed to stop the spreading”

Page 157: “We sometimes hear of the brush doing injury to the teeth. It does not seem possible that the brush, used with water only, will do injury to the hard tissues of the teeth.”
Page 57 - “In what I learned of Dr. Miller’s work in the producing of erosion it seemed to me that he was not very successful in producing erosion with the brush and water, even when much brushing was done with the electric motor.”

Page 58 - “The artificial crown is the better treatment.”

Page 58 - “In the great majority of cases, however, it will be better not to make fillings of any kind.”
Samuel Charles Miller, DDS, FACD, FADM (1950)


Page 63 - “Gingival recession is induced on the labial, buccal, and lingual surfaces of teeth by tooth brushing, traumatic occlusion, or by the action of abrasive foods and the tongue, lips, and cheeks during mastication.”

Possibly first article stating that traumatic occlusion and the tongue could be a causative factor for gingival recession.

(Today, some dentists do not even believe that occlusion has anything to do with dentistry.)

Book describes the appearance of teeth after they had been brushed on a ‘tooth brushing machine’ for various lengths of time.
Mannerberg tooth brushing machine
Fig. 48, p72.

Arm of machine with toothbrush on the teeth.

Teeth after being brushed on the machine for 3, 5 and 10 hours.

This is tooth brush abrasion.

This is a typical abfraction.
‘THE TOOTH’

This tooth was extracted in 1993.
Fig. 3 in my article comparing tooth removed in 1993 to the only tooth (at the time of my visit) at the Smithsonian.
Questions to ask yourself.

While looking at each of the lesions in this presentation, ask yourself:
Could a toothbrush cause this lesion?

If you think the lesions could be due to acids or some other solution, why aren’t more of the adjacent teeth affected?
Research and presentation developed by:

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