Abfraction Lesions: Analyzing the Cause by Identifying Biological and Lifestyle Similarities

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INTRODUCTION

Abfraction lesions are non-carious (not caused by decay), wedge-shaped indentations near the gumline that expose the sensitive dentin under the protective enamel (Sarode and Sarode, 2013). A clear understanding of the contributors to abfraction formation would have a major impact on clinical dentistry, potentially informing interventions to prevent these lesions. Knowing the causes of abfractions would also benefit forensic anthropology and bioarchaeology, since dental structures are widely used to determine aspects of a deceased individual's identity, including their age, sex, population affinity, habits, and general lifestyle. However, there little consensus on the etiology of abfractions among the various disciplines affected (Jakupovic et al., 2014; Nascimento et al., 2016).

AIM

To identify biological and lifestyle similarities among individuals with abfractions and deduce probable cause(s), this study considered:

1. **Social race:** In the U.S., people of color often experience racism. Does living with this chronic stress contribute to abfractions?
2. **Sex:** Do the differences among human females and males in tooth size and hormones influence abfraction risk?
3. **Age:** When teeth become compromised with age, does this contribute to abfraction risk?
4. **Substance usage:** Do drugs, alcohol, tobacco, and other substances play a role?
5. **Tooth loss:** Socioeconomic factors like a lack of access to dental care and healthy food options can lead to poor periodontal health. Does this increase abfraction risk?

MATERIALS AND METHODS

This study utilized the New Mexico Decedent Image Database (NMDID; https://nmdid.unm.edu; Edgar et al., 2020), an online repository of computed tomography (CT) scans of forensic cases (Fig. 1). With family member consent, the NMDID provides demographic data for each anonymized decedent.

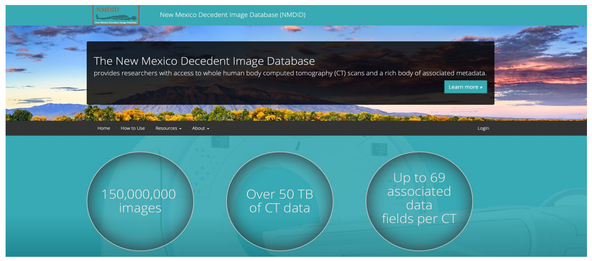

Figure 1. Homepage for the NMDID medicolegal CT database.

CT scans from 370 NMDID decedents were scrutinized for the presence of abfractions (Table 1). Abfractions were scored as present or absent; abfraction severity was scored as 1, 2, or 3, from least to most severe (Fig. 2). Wilcoxon rank-sum tests conducted in *R* tested differences among the groups (α=0.05).

RESULTS

Abfraction Presence:

1. **Social race:** No statistically significant differences among sex-specific or pooled-sex comparisons of races.
2. **Sex:** Males exhibited significantly more abfractions than females (34% vs. 23%; p<0.05).
3. **Age:** Females and males 40+ exhibited significantly more abfractions than <40 (♀ 33% vs. 12%; ♂ 46% vs. 21%; p<0.001).
4. **Substance usage:** No significant differences between substance users and non-users in younger or older females or older males; significant differences between younger male users (31%) and and non-users (10%; p<0.05).
5. **Tooth loss:** No significant differences in degree of tooth loss between groups with and without abfractions—except for younger male non-substance users, for whom tooth loss was more extreme in those with abfractions (p<0.05; may not be valid due to sample size discrepancy, n=45 vs. 5).

Abfraction Severity:

1. **Social race:** No statistically significant differences among sex-specific or pooled-sex comparisons of races.
2. **Sex:** No statistically significant differences in female versus male abfraction severity.
3. **Age:** Pooled-sex adults 40+ exhibited significantly more severe abfractions than <40 (average severity of 1.43 vs. 1.16; p<0.05).
4. **Substance usage:** No significant differences in abfraction severity for <40 versus 40+ substance users and non-substance users.
5. **Tooth loss:** Tooth loss correlated with abfraction severity in 40+ adults (p<0.001; rho=0.439), but not in adults <40.

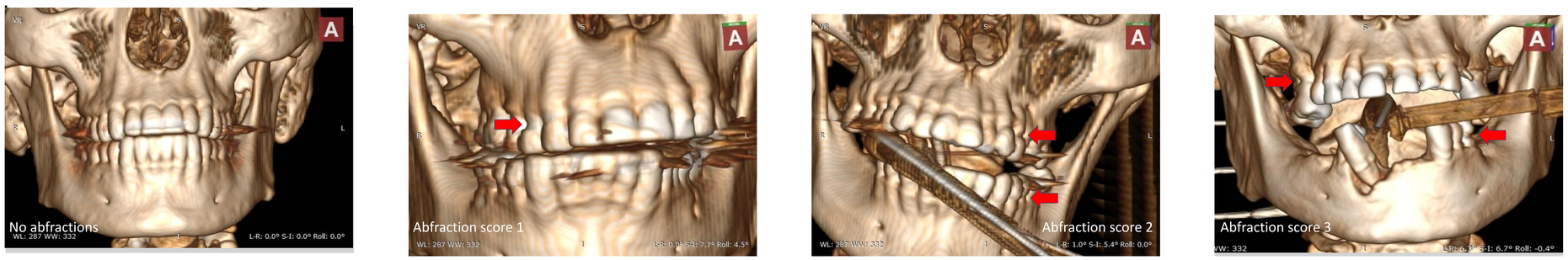

Figure 2. Examples of CT imagery from the NMDID showing decedents with no abfractions and three different severities of abfractions (left to right). Representative abfractions are indicated by arrows.

Table 1. Sample demographics (N=370). Note that "SA" is used as an abbreviation for "substance abuse."

Black ♀ n=9	Black ♂ n=32	Hispanic ♀ n=33	Hispanic ♂ n=38	Indigenous ♀ n=53	Indigenous ♂ n=63	White ♀ n=71	White ♂ n=71
<40 SA* n=2	<40 SA* n=6	<40 SA* n=10	<40 SA* n=8	<40 SA* n=10	<40 SA* n=15	<40 SA* n=15	<40 SA* n=19
<40 no SA n=1	<40 no SA n=4	<40 no SA n=9	<40 no SA n=9	<40 no SA n=18	<40 no SA n=15	<40 no SA n=19	<40 no SA n=22
40+ SA n=5	40+ SAn=11	40+ SA n=5	40+ SA n=14	40+ SA n=11	40+ SA n=14	40+ SA n=19	40+ SA n=14
40+ no SA n=1	40+ no SA n=11	40+ no SA n=9	40+ no SA n=7	40+ no SA n=14	40+ no SA n=19	40+ no SA n=18	40+ no SA n=16

CONCLUSIONS

In this modern U.S. sample, male sex and older age emerged as likely risk factors for abfractions. Substance usage was only a statistically significant factor in younger males, suggesting that the types of substances used by younger males may differ from those used by other groups, potentially with lesion-causing effects. Older age was also associated with more severe abfractions, and in older adults, tooth loss also correlated with abfraction severity. The better understanding of abfraction etiology provided by this research will inform clinical dentistry, bioarchaeology, and forensic anthropology.

WORKS CITED

Edgar, HJH; Daneshvari Berry, S; Moes, E; Adolphi, NL; Bridges, P; Nolte, KB (2020). New Mexico Decedent Image Database. Office of the Medical Investigator, University of New Mexico.

Jakupovic S, Cerjakovic E, Topcic A, Ajanovic M, Prcic AK, Vukovic A. (2014) Analysis of the abfraction lesions formation mechanism by the finite element method. Acta Inform Med. Aug;22(4):241-5. doi: 10.5455/aim.2014.22.241-245.

Nascimento, M. M., Dilbone, D. A., Pereira, P. N., Duarte, W. R., Geraldeli, S., & Delgado, A. J. (2016). Abfraction lesions: etiology, diagnosis, and treatment options. *Clinical, cosmetic and investigational dentistry*, *8*, 79–87. https://doi.org/10.2147/CCIDE.S63465

Sarode, G. S., & Sarode, S. C. (2013). Abfraction: A review. *Journal of oral and maxillofacial pathology : JOMFP*, *17*(2), 222–227. https://doi.org/10.4103/0973-029X.119788