

# Combat and Warfare In the Early Paleolithic and Medically Unexplained Musculo-Facial Pain In 21st Century War Veterans and Active-Duty Military Personnel

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**Acknowledgements:** This material is based upon work supported in part by the Office of Research and Development, Medical Research Service, Department of Veterans Affairs, VA Pacific Islands Health Care System, Spark M. Matsunaga Medical Center. Support was also provided by a National Alliance for Research on Schizophrenia and Depression (NARSAD) Independent Investigator Award, and the VA National Center for PTSD.

## **Abstract**

In a series of recent articles, we suggest that family dentists, military dentists and psychiatrists with expertise in posttraumatic stress disorder (especially in the Veterans Health Administration) are likely to see an increased number of patients with symptomatic jaw-clenching and early stages of tooth-grinding (Bracha et al., 2005). Returning warfighters and other returnees from military deployment may be especially at risk for high rates of clenching-induced masticatory muscle disorders at early stages of incisor grinding. The literature we have recently reviewed strongly supports the conclusion that

clenching and grinding may primarily be a manifestation of experiencing extreme fear or severe chronic distress (respectively). We have recently reviewed the clinical and paleoanthropological literature and have noted that ancestral warfare and ancestral combat, in the early Paleolithic Environment of Evolutionary Adaptedness (EEA) may be a neglected factor explaining the conservation of the archaic trait of bite-muscle strengthening. We have hypothesized that among ancestral warriors, jaw clenching may have rapidly strengthened the two primary muscles involved in biting, the masseter muscles and the much larger temporalis muscles. The strengthening of these muscles may have served the purpose of enabling a stronger, deeper, and therefore more lethal, defensive bite for early Paleolithic humans. The neuroevolutionary perspective presented here may be novel to many dentists. However, it may be useful in patient education and in preventing progression from jaw-clenching to chronic facial pain.

## **Introduction**

Recently there has been a rapidly increasing acceptance of evolutionary perspectives in medicine (12, 16-18, 20, 27). There is also a slowly increasing acceptance of neuroevolutionary perspectives in psychiatry (13-15, 21, 26, 29-34, 36-39). More specifically with regards to neuroevolutionary perspectives of stress-induced and fear-circuitry disorders (see several recent reviews by Bracha and colleagues (2, 3, 10; 5-7). Although psychological stress has long been acknowledged to be a key factor in the pathophysiology of jaw-clenching, almost nothing has been written about clenching behaviors from a neuroevolutionary perspective. In a recent comprehensive review, we have summarized the interdisciplinary research literature in this area and presented a brain evolution based hypothesis of the distal etiology of this very common presenting symptom which very often precedes medically unexplained chronic facial or jaw pain (7).

We have recently proposed (7) that the strengthening of the masticatory muscles was a useful human trait as recently as the Paleolithic, i.e. a behavioral trait that enhanced the survival

odds of early humans. Clenching-grinding behaviors may thus be viewed as a conserved archaic response to periods of extreme chronic or inescapable acute stress that no longer serves a survival purpose for modern humans.

## **Evolutionary Roots of Jaw Clenching and Teeth Grinding**

As we have noted elsewhere, only recently has the attention of researchers shifted away from purely dental factors and toward synergistic neurobiological factors in the etiology of clenching-grinding spectrum disorders and the subsequent masticatory muscle pain (7, 8, 25). Elsewhere we have discussed interfaces between psychiatric research and dental research in areas other than jaw clenching and teeth grinding (1, 4, 9, 40). More recently, we have hypothesized that the evolutionary purpose of jaw clenching may simply be the strengthening of the masticatory muscles, a useful trait during the early paleolithic that enhanced the survival odds of early humans (the current term is hominins) (7). This recently published hypothesis is briefly summarized below.

Strong masticatory muscles are widely understood to have facilitated mastication and thus food consumption and survival of pre-Paleolithic hominins which lacked control of fire. However, as we have argued in a series of recent articles, psychological stress, in the early paleolithic Environment of Evolutionary Adaptedness (EEA) (which began approximately two million years ago and ended 200,000 years ago), may be a neglected factor explaining the conservation of this archaic trait even after humans were able to soften their food by cooking. We have hypothesized that jaw clenching may have rapidly strengthened the two primary muscles involved in biting, the masseter muscles and the much larger temporalis muscles. The strengthening of these muscles may have served the purpose of enabling a stronger, deeper, and therefore more lethal, defensive bite for early Paleolithic humans (*Homo ergaster*, previously known as African *Homo erectus*). This behavioral trait of clenching may have been selected into some human genomes and may be the basis of clinical teeth grinding.

It has traditionally been assumed that the origins of human warfare are recent. However, newer research has documented extensive human warfare in the early paleolithic EEA. Long periods of human evolution were characterized by frequent lethal interpersonal violence, both within and between groups (11, 24). Throughout the EEA and as recently as the Middle Ages, the majority of combat deaths did not occur on the battlefield. Instead, research suggests that combat deaths resulted from infection of infected wounds and the lack of effective treatment (23, 35). It is well documented that human bites are highly lethal due to the particularly virulent nature of the oral flora.

Due to the aforementioned intergroup violence, humans in the early paleolithic EEA were frequently subject to situations involving extreme fear and inescapable stress. In our recent review, we hypothesize that clenching, by exercising the bite muscles, provided an improved defensive bite within days for the paleolithic combatant. This occurred faster than could be achieved by incisor enamel sharpening. Therefore, jaw clenching may have been a survival response that evolved during the EEA during times of exposure to extreme and inescapable stress.

While clenching in other species has been little studied, incisor grinding has been documented in baboons and in several other species. A hypothesis related to our clenching hypothesis has been proposed for incisor grinding by Every (19) and recently expanded upon by Kleinberg (22) and by Murray and Sanson (28). These research dentists have argued that constantly sharpened incisors may have been a useful survival trait for the paleolithic combatant (22).

### Clinical Implications

Academic tertiary care dental centers typically see the tooth flattening (shortening) associated with late-stage advanced bruxism. However, we have previously proposed that the sharpening function of grinding is much clearer at earlier stages prior to the enamel chipping and dentin loss that eventually shortens and flattens the incisors. We posit that general dentists, military dentists, and clinicians in PTSD clinics (especially in the Veterans Health Administration) are much more likely to see patients at the earlier "sharp incisors stage." We predicted that new returnees from current military deployment may demon-

strate a high rate of clenching induced masticatory muscle disorders at early stages of incisor grinding.

In summary, we suggest that the alleles which wire the fear circuits to the brainstem nuclei activating the clenching-grinding behaviors were highly conserved in the human clade (lineage), since they enhanced the survival of anatomically and mitochondrially modern humans throughout the early Paleolithic. Although such evolved behaviors were useful survival traits for early humans, strengthening of masseter and temporalis muscles and tooth-sharpening has outlived its usefulness. The neuroevolutionary perspective presented here may be new to most dentists (and to many psychiatrists). However, in the VA system, we often observe what we believe to be progression from stress-induced involuntary jaw-clenching to chronic musculo-facial pain. Although more research is needed, we believe that explaining to the patient the archaic origins of this behavior may be helpful in educating patients and hopefully prevent chronic musculo-facial pain among civilians, VA patients, recent returnees from Operation Iraqi Freedom and Operation Enduring Freedom, and other active-duty military personnel. ■

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