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Biting the Bullet? Analyzing the Authenticity of "Bitten" Civil War Bullets

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Abstract: *The public's attention was recently focused on Civil War history, which has manifested in various ways. One is the market for Civil War artifacts, particularly bullets presumably bitten by soldiers who underwent amputations as a result of warfare. This paper will address a study that analyzed a local museum's "bitten bullets" to determine the authenticity of the claim that the marks were human induced, as well as cover previous studies that focused on this same subject matter. The results of this and previous studies demonstrate that bitten bullets are largely the result of animal chewing and that there remains little to no evidence of humans biting bullets during amputation surgeries.*

Key words: *Archaeology*, *Civil War*, *History*, *Medicine*

Introduction

In the past few years the American public's attention turned to our recent past, specifically on the Civil War conflict that occurred just over 150 years ago. There were expressed concerns about how the Civil War was being remembered and portrayed within modern contexts, leading to heated debates about the presence of Civil War monuments in public spaces and the portrayal of the conflict in primary and secondary school curricula. While there are various ways to access, connect with, and understand the past, these debates established a need to reexamine some of the interpretations to the Civil War in order to ensure that the information provided was both accurate and appropriate.

While the public monuments and school curricula debates have or are continuing to be settled in various public and private arenas little attention has been spent on some of the smaller scale connections and interpretations of the Civil War past. This is evident in the growing antiquities market for Civil War artifacts and the stories associated with them. One of the more popular items up for sale are "bitten bullets", which are described as having been used by Civil War surgeons who performed amputations without the aid of anesthesia. According to the lore bullets were provided to patients to bite down on during these surgical procedures as a means of providing relief and/or distraction from the pain. This story has gained validation through several seemingly academic sources, including online reference materials (e.g. the American Heritage Dictionary of Idioms; the Brewer's Dictionary of Phrase and Fable), dentistry websites (Levine, 2012), and privately run historical societies, thereby resulting in a cultural and social lore about Civil War medicine that has spread.

Unfortunately, this topic of "bitten bullets" and surgical interventions of the Civil War has not been at the forefront of study, thereby requiring additional attention to determine if this assertion is indeed supportable. This paper will address these claims through a reporting of an analysis completed on a pair of "bitten bullets" on display at the Cole County Historical Society. These bullets were analyzed to determine their authenticity and to test the hypothesis that they were bitten by human teeth. This paper will cover the historical evidence regarding "bitten bullets" during military conquests, the analysis undertaken within the study, and explore the historical evidence of such practices in Civil War medicine.

Background

There is a large body of literature on the topic of historic period bullets demonstrating bite marks and the motivations for their use during war time excursions. These bullets originate from various American conflicts and make up a variety of makes and calibers as a result. The two most common types of bullets cited in the literature include musket balls and minié

balls. Musket balls are dense, molded lead balls that are fired from a smoothbore weapon, and they were popularly used throughout several conflicts, including the American Revolution and Civil Wars (Sivilich, 2016). Minié balls are conical bullets, which sometimes but not always demonstrate grooving patterns at their base so as to increase range and accuracy upon firing. Minié balls and their associated muzzle loading firearms were popularly used throughout the American Civil War (Sivilich, 2016).

The earliest evidence of "bitten bullets" are musket balls that date back to the American Revolutionary War (Calver & Bolton, 1950; DeRegnaucourt, 1995; Hanson & Hsu, 1975; Sivilich, 1996 and 2016; Sivilich & Wheeler Stone, 2004). According to historic accounts (Simms, 1882; Thacher, 1823) military personnel participated in "biting bullets" as part of punishments, of which the specifics were not noted. This led to the assumption in early research that marks on many of the musket balls were induced by human teeth, but the matter was not further investigated (Calver & Bolton, 1950; Hanson & Hsu, 1975). Additional studies have identified musket balls with human bite marks, which are identified as infrequent and shallow marks present on the bullets. These marks are believed to have been the result of chewing to reduce pain, alleviate boredom, or to promote salivation to mitigate dehydration (DeRegnaucourt, 1995; Sivilich, 1996; Stark & Stark, 1860). Studies by Miller (2016), Sivilich (2016), and Sivilich and Wheeler Stone (2004) have produced evidence to support these assertions. According to Bell (2012) musket balls may have also been chewed on for the purposes of modifying their lethality upon hitting their human target. Unfortunately, there is no evidence to support this claim as any such musket balls would have been radically altered upon meeting their target (Sivilich, 2016).

Another study performed by Richard R. Polhemus (1977) reported the presence of musket balls demonstrating bite marks. These musket balls were recovered from the Tellico Blockhouse site, a military outpost occupied for a short time between the late 1700s and early 1800s. Polhemus attempted to identify the bite marks but was unable to do so given the numerous marks present on them, which he claimed made identification impossible.

"Bitten bullets" were not just isolated to the American Revolutionary or Civil Wars. At least one study of a large caliber musket ball used during the Mexican-American War suggests human bite marks were present. No additional information pertaining to the specific analyses is identified by the author to verify that the marks were indeed created through mastication or by humans (Haecker, 1994). This source does identify surgery as a potential cause of the human bite marks present on the musket ball.

There is a large collection of "bitten bullets" associated with the Civil War. Several studies report the presence of "bitten bullets", specifically minié balls, at Civil War sites (Anderson, Day, & Kirkwood, 2000; Bondurant, 2007; Braley & Wood, 1987; Garrow, Holland, & Thomas, 2000; Hockensmith, Fiegel, & Freels, 2000; McBride & Stottman, 2000). Several studies noted specific analyses done on the bullets in order to determine if and to what extent the marks were created through biting (Bondurant, 2007; Garrow, Holland, & Thomas, 2000; Hockensmith, Fiegel, & Freels, 2000; McBride & Stottman, 2000). All of them associated the bite marks with those of various types of animals, including but not limited to squirrels or hogs.

Methods

Although there appears to be historical evidence to suggest that biting bullets did happen on occasion during military conflicts, the question remains as to whether or not it was a commonplace event, particularly related to surgical procedures that occurred during the Civil War. A study to explore this question was conducted between 2017 and 2018 on materials housed at the Cole County Historical Society, which is located in Jefferson City, Missouri. In their collection are two bullets, a minié ball and a musket ball, that were donated to the Society's collection by Board Member, Roger Baker, who collected them through metal detecting surveys. The two bullets on public display were labeled as having human bite marks as related to Civil War surgery, but there had been no previous analyses of the marks to support that assertion. Permission was granted to allow study of the bullets for the purpose of determining if the marks on the bullets were created through biting, and if so, what the source may be.

Morphological characteristics of the two bullets were recorded (Figure 1). The minié ball was the larger of the two, measuring 3 cm in length, while the musket ball measured approximately 1.5 cm in length. Both were discolored white due to patina, a result of being buried underground for an extended period of time. This patina was not removed due to concerns for damaging the bullets. The patina, however, did not affect the overall composition of the bullets or markings and was not an inhibiting factor in analysis. The minié ball exhibited several deep grooves and linear scratches throughout its entirety, including marks that seemed to resemble a deep molar impression, and the base was largely flattened. Only one side of the tip of the minié ball was unaltered, while the remainder of it demonstrated substantial alterations on all sides. The musketball had several very deep perforations that extended almost to the center of the ball on one side, but the

Figure 1. Superior and Inferior Views of Cole County Historical Society Minié and Musket Balls

other side had shallower but still substantial grooves present. The marks on the musket ball covered the whole of the ball, leaving no part unaltered.

The study underwent two phases: the first was a direct application of a series of cast and real skulls (with teeth) gently onto the bullets to determine if biting was possible, as well as a comparison of bite marks produced by both human and animal teeth as derived from cast and real skulls. The comparison of the bite marks was conducted by making dental impressions into playdough and comparing the fresh (wet) and dried marks on the playdough to those on bullet. This aspect of this study follows protocols previously conducted by Miller (2016), who examined 35 "bitten bullets" from Monmouth Battlefield State Park Site in New Jersey in this way.

The animal teeth impressions were taken from faunal skeletal collections housed through the Department of Agriculture and Environmental Science at Lincoln University, which houses herbivore, carnivore, and omnivore fauna local to Missouri. A variety of animals, including rodents, deer, cougars, canines (dogs, coyotes, and wolves), foxes, cows, and wild pigs, were included in the analysis to determine specifically what species may have been responsible for creating the marks on the bullets. The human teeth impressions were collected, being derived from cast materials available through the Department of Science, Technology, and Mathematics at Lincoln University, as well as from two living individuals (myself and a male volunteer). Both individuals were used due to incomplete dentitions due to dental modifications. The playdough was a simple mixture of flour, salt, and water created in order to reduce damage to the osteological materials used in this study.

To test the assertion made by the Cole County Historical Society that the marks on the bullets were produced by human teeth biting down on them during medical intervention, specifically amputation surgeries, it was expected that matching molar impressions on opposite sides of the bullets would be present. This would replicate the bite patterns noted in sources claiming bullets were used as an instrument during surgery. Bullets were most likely put in the back of the mouth (where the molars are located) as these were teeth used for chewing and were morphological wider and better able to hold a bullet, whereas the front teeth (incisors and canines) are used for tearing and are thinner, making it more difficult to hold down an object for an extended period of time. Additionally, a bullet placed at the front of the mouth may have been an impediment in breathing.

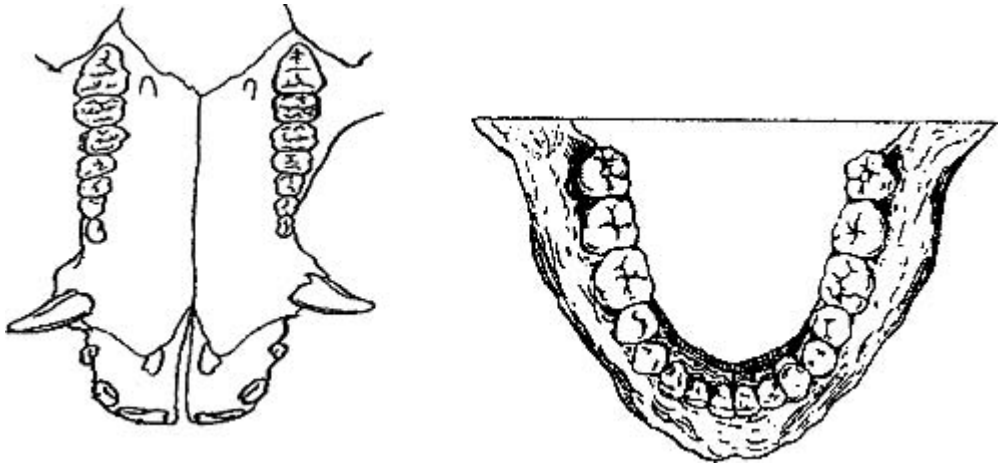
Results

Ultimately, the first part of the analysis-the direct application of the teeth onto the bullets-did not yield much in the way of substantive evidence to help determine if the marks were bite marks or what the source(s) may have been. This was due to the abundance of markings on the bullets and the obfuscation of the marks by the teeth and skulls. Even in cases where the teeth were available and free of their mandibular or maxillary crypts it was still difficult to discern if the teeth and "bite" marks matched.

The analyses comparing the playdough impressions were more productive. When comparing the marks on the bullets to those on the playdough it was determined that these marks bore a very strong resemblance to bite marks and were most likely created by an omnivore. This conclusion was reached based on the specific markings created by omnivores' teeth, which were similarly matched in size and shape when comparing dental impressions in the playdough and those left on the bullets.

As humans and several of the surveyed animal species (e.g. dogs, pigs, and rodents) are omnivores it was initially difficult to determine which specific omnivore was responsible for creating these "bite" marks, particularly as there was distortion of the marks as a result of the numerous "bite" marks

Figure 2. Illustration of Pig (Left) and Human Dentition (Right) (taken from the North American Pet Pig Association and Márton Krisztina)



on the bullets. An accidental discovery of several chewed plastic dog toys, however, provided some insights into the responsible party. These toys have chew patterns resulting from repeated and prolonged chewing, which manifest as overlaying and frequent grooves, indentations, punctures, and dental impressions in the plastic. These bite marks are consistent in the patterning of the "bite" marks left on the two Civil War era bullets, strongly suggesting repetitive chewing. This evidence rejects the assertion that the marks on the bullets were caused by a single bite incident, but instead the marks were the result of multiple chewing episodes.

Further research into this matter provided additional clarification into the specific source species of these marks. Daniel Sivilich (2016) has undertaken some of the most extensive studies on bullet identifications. His work has advanced the study of bullets, particularly in regards to how and what extent a bullet's original form was altered. He has provided historical and modern examples of manipulated bullets, particularly "bitten bullets". Through his experimental and traditional archaeological work, in partnership with zooarchaeologist Henry Miller (2016), it has been determined that the power of human jaws and morphological characteristics of human teeth can only leave shallow indentations on matching sides of lead bullets, but none of these marks definitively leave whole tooth impressions. Deeper impressions, a multitude and variety of marks (e.g. dents, punctures, scrapes, scratches, and whole tooth impressions), and flattening of bullets are all associated with persistent chewing, most often seen among rodents and pigs. Juvenile and adult pigs' teeth are morphologically similar to human teeth, which Sivilich (2016) notes can and do lead to frequent misidentifications of bite marks on bullets. A comparison of the marks on the two bullets studied herein and those previously studied and provided by Sivilich (2016) and Miller (2016) further demonstrate that a pig was most likely responsible for produce the bite marks on the Cole County Historical Society bullets. This conclusion was reached as the minié ball marks provided the clearest markings that appears to have been formed by molar teeth (used for crushing), while the musket ball marks seemed to have been caused by sharp, canine teeth (used for tearing and puncturing). All of these marks are consistent with marks produced by pigs, particularly as their mastication power are the only ones able to leave near perfect molar impressions on lead bullets.

Discussion

This conclusion that the marks on the Cole County Historical Society bullets were not human induced or the result of chewing during medical procedure is consistent with historic records concerning Civil War medicine and amputation surgeries. The field of medicine had advanced greatly in the years leading up to the Civil War, and medical doctors required years of specialized training to earn the title of medical doctor and the ability to practice medicine (Freemon, 1998; Miller, 2015; Reilly, 2016). All enlisted doctors employed during the Civil War were also provided and expected to use a comprehensive medical manual that outlined the best practices for medical attention to be provided to wounded soldiers (Freemon, 1998; Gross, 1861). According to the historic records amputation surgeries were not to be undertaken lightly, in part because of their extreme nature and the fact that they would render the amputee unable to perform many basic (occupational and otherwise) duties, which were often directly linked back to masculinity, economic success, and social

acceptance (Miller, 2015; Ott, 2008; Stauffer, 2006). At this time deformity, even as a result of military service and combat, was not viewed sympathetically (Boggs, 2015; Gannon, 2016; Ott, 2008), and many men reportedly requested to die rather than undergo amputation surgeries, making the procedure one only to be taken as absolutely necessary. This resulted in the requirement that doctors were to consult with at least two other doctors prior to performing the procedure, although it is unclear how often this could and did occur. If and when amputation surgeries were undertaken doctors were advised to use a medical anesthetic, such as chloroform, morphine, or ether (Dammann & Bollet, 2008; Freemon, 1998; Gross, 1861; Miller, 2015; Reilly, 2016), and if these options were unavailable a strong drink (e.g. whiskey or other hard liquor) was provided to the patient. The only mention of patients biting on anything during surgeries was a few excerpts in historical records of a leather strap being used, as well as advisement against using any other objects, such as a piece of wood, as that was deemed unprofessional. From a purely practical standpoint biting down on a bullet during such procedures would lead to greater issues, including but not limited to chipping and/or breaking of teeth and the bullet becoming a choking hazard either while the patient was awake or passed out.

Conclusion

The historical record and quantity of previous studies demonstrate that bitten bullets do exist. Historical accounts (Bell, 2012; Simms, 1882; Stark & Stark, 1860; Thacher, 1823) and archaeological studies (Anderson, Day, & Kirkwood, 2000; Bondurant, 2007; Braley & Wood, 1987; Calver & Bolton, 1950; DeRegnaucourt, 1995; Garrow, Holland, & Thomas, 2000; Haecker, 1994; Hanson & Hsu, 1975; Hockensmith, Fiegel, & Freels, 2000; McBride & Stottman, 2000; Polhemus, 1977; Sivilich, 1996 and 2016; Sivilich & Wheeler Stone, 2004) provide evidence that bullets were most often bitten or chewed on to mitigate dehydration, alleviate boredom, potentially increase the lethality of bullets used during combat, or used in the commission of corporal punishment. While these bullets do exist they are rare and infrequently present in archaeological samples. What is far more commonplace are "bitten bullets" that were the result of animal chewing, principally produced by domesticated or wild pigs grazing or rodents filing their teeth (Miller, 2016; Sivilich, 2016). To date no studies have provided evidence to support the notion that bullets were bitten during medical procedures. The notion that biting the bullet has human origins appears to be based on a morphing of historical events and myths into something more literal than actually occurred. The historical and archaeological evidence, paired with the results of this study, do not support the idea that "biting the bullet" was a common medical practice in Civil War medicine or during any other military excursion.

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