

Samurai sword cut marks on bone: do we know enough?

Abstract

A samurai sword is made to cut, slice and stab, has been used to decapitate, used in war since the rise of the samurai in the twelfth century, during WWII and now used in modern day crime. It is not intended to be used to hack or chop an opponent, though may be used as such by inexperienced perpetrators. The use of different weapons in war crimes, genocide and contemporary crime has led to the imperative need of positive identification of cut marks on bone made by specific weapons and to develop standard investigation processes that may assist in the identification of a specific weapon used in such crimes, especially in the absence of eyewitness accounts. The limited numbers of studies to date have not investigated the affects of different perpetrators' experience in wielding a samurai sword, the various sharpening methods and their manifestation in the cut mark itself and the effects of weapons becoming blunt through use. Additionally, assumptions have been made that some bone types will not exhibit specific weapon traits. This paper provides a summary of research undertaken to identify cut marks on bone made by samurai swords confirming the need for further research.

Keywords: forensic anthropology, samurai sword, cut marks, bone, crime, war crimes

Volume 2 Issue 3 - 2016

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Received: March 23, 2016 | **Published:** April 20, 2016

Discussion

Forensic anthropologists identify possible weapons responsible for blunt and sharp force trauma and gunshot wounds. However, tool marks identification on bone is under researched with the majority of sharp blade trauma focused on knife¹⁻⁴ and saw tool marks.⁵⁻⁶ The four studies on Samurai sword trauma derived from archaeological specimens⁷⁻¹⁰ and only one study from a forensic context.¹¹ The use of different weapons in war crimes, genocide and contemporary crime has led to the need to identify specific tool marks on bone to identify the weapon(s) used, especially in the absence of eye witness accounts. Atrocities such as the Nanjing Massacre during WWII,¹² and many more, have been brought before International Criminal and war tribunals and evidence given has been eye witness accounts.¹³⁻¹⁴ In the future, mass graves and further evidence of samurai sword use may become evident and it may be necessary to rely on physical evidence. Sharp force hacking trauma is essentially a blunt force trauma inflicted by a sharp object, and therefore the analysis of the complete bone is necessary. Additionally, a samurai sword used by an experienced trained sword user will use it as it is intended, in a slicing motion, rather than a hacking action that may or may not exhibit in blunt force trauma.

Clearly, the analysis of both types of users and the manifestation of that experience, or lack of experience, is essential. Based entirely on archaeological specimens, a general description of three types of samurai sword cut marks has been defined⁷⁻¹⁰ as;

- i. Gashes: long deep cuts (>40mm in length) and penetrate the skull;
- ii. Incisions: short, superficial crescent shaped. <30mm in length, only the external laminae of the skull penetrated, found in groups of parallel cuts that are 1-2mm intervals and always found in association with scratches; and
- iii. Scratches: groups of very short, shallow cuts, most were parallel but some cross each other.

- iv. These traits were determined to be caused by samurai swords based on the age of the remains being dated to the 14th Century when samurai swords were being used.

Using domestic cattle hind limbs (tibia) Lewis¹¹ examined criteria for distinguishing between cut marks made by different classes of bladed weapons on bone and used six different bladed including a Japanese katana, an Arabian styled scimitar, a kris-blade (wavy blade) broadsword, a Samburu s'hort sword, a machete and a hunting knife. Weapon parameters including blade length, blade height, blade weight, curvature index and sharpness index were recorded for each weapon. Both metric and non-metric observations were made on all cut marks resulting in eight traits used to distinguish between the weapons. These included cut mark length, cut mark shape, presence of bone feathering, presence of bone flaking, damage to the sides of the cut mark, cracking of the bone through the cut mark, breakage of the bone itself, the presence of bone shards in the cut mark and the aspect or angle of entry of the weapon into the bone surface.¹¹ Using a combination of cut mark morphology and the recording of specific states for each trait for individual cut marks, a detailed key was developed that described the traits, possible states and instructions for scoring. Making a qualitative comparison of the 68 sword marks and 24 knife marks, Lewis' results identified a number of criteria that clearly distinguish samurai sword marks.¹¹ Samurai swords leave long and narrow cut marks that are ellipsoid in shape, smooth kerf walls with one being more curved in profile than the other and unilateral feathering and flaking. The feathering is large and 'flake like' and the flaking is present along the majority of the wall. Cracking radiating from the sides of the kerf may be present.

Lewis concluded that it would be difficult to make a sword class prediction based on a single mark due to the variation in marks made by a single class of sword. Lewis also demonstrated that cut mark length is not useful for diagnostic purposes as they varied greatly and was dependant on the size and shape of the bone.¹¹ It must be noted that characteristics such as the width of the entry site and depth

of penetration are dependent on extrinsic factors including, but not limited to, bone elasticity whereby the wound may start to close after the weapon is withdrawn,¹⁵ the sharpness of the weapon and strength of the person inflicting the trauma may alter the depth of penetration. The accurate identification of trauma, including sharp, blunt, thermal or poly (multiple) trauma, is dependent on pattern recognition as well as intrinsic and extrinsic factors that determine the way bone fractures and such characteristics on long and short bones may not be evident in other types of bone (such as flat and irregular bones.). The research is limited and missing significant information, including but not limited to, the examination of the different traits left by an experienced and inexperienced swordsman, the different materials weapons are made from, the effects of different types of sharpening methods, the use of blunt and sharp weapons and the different characteristics they may produce in cut marks.

Conclusion

Class and individual characteristics of tool marks made by weapons used in war crimes, genocide and contemporary crime may play a major role in weapon identification in the future, especially in the absence of eyewitness accounts. Such identification has the potential to add another level of scientific inquiry when examining evidence in a trial. This variety of weapon usage, the experience of perpetrators and how they use specific weapons, necessitates further research to enable the identification of the marks that the each of the weapons leaves on their victims. Further experimentation is currently being undertaken by the author as part of a PhD.

Acknowledgments

I would like to thank Professor Adam McCluskey (School of Environmental and Life Sciences, Faculty of Science and Information Technology, University of Newcastle, NSW), for his support, review and comments. Thank you also to the University of Newcastle, Australia, Research School of Medicine & Public Health, Higher Degrees Funding of my PhD research of which this article derives.

Conflicts of interest

The author declares that there are no conflicts of interest.

References

1. Thompson TJ, Inglis J. Differentiation of serrated and non-serrated blades from stab marks in bone. *Int J Legal Med.* 2009;123(2):129–135.
2. Ormstad K, Karlsson T, Enkler L, et al. Patterns in sharp force fatalities—a comprehensive forensic medical study. *J Forensic Sci.* 1986;31(2):529–542.
3. Knight B. The dynamics of stab wounds. *Forensic Science.* 1975;6(3):249–255.
4. Bartelink EJ, Wiersema JM, Demaree RS. Quantitative analysis of sharp-force trauma: an application of scanning electron microscopy in forensic anthropology. *J Forensic Sci.* 2001;46(6):1288–1293.
5. Symes SA, Smith OC, Berryman HE, et al. *Bones: Bullets, Burns, Bludgeons, Blunders, and Why.* Proceedings of the American Academy of Forensic Sciences. 1996;2:10–11.
6. Symes SA, Hugh EB, Smith OC. *Saw marks in bone: introduction and examination of residual kerf contour.* In: Reichs KJ, editor. *Forensic Osteology II. Advances in the Identification of Human Remains.* Springfield, IL: Charles C Thomas, USA. 1998;333–352 p.
7. Suzuki H, Hayashi H, Tanabe G, et al. *Medieval Japanese skeletons from the burial site at Zaimokuza, Kamakura City.* Tokyo, Japan. Anthropological Society of Nippon, Iwanami Shoten, Japan. 1956.
8. Shackley M. Arms and the Men; 14th Century Japanese Swordsmanship Illustrated by Skeletons from Zaimokuza, Near Kamakura, Japan. *World Archaeology.* 1986;18(2):247–254.
9. Karasulas A. Zaimokuza reconsidered: The forensic evidence, and classical Japanese swordsmanship. *World Archaeology.* 2004;36(4):507–518.
10. Fujita H. Stab marks possibly from a spear (yari) on a skull excavated from the mediaeval Zaimokuza site, Kamakura City. *International Journal of Osteoarchaeology.* 2013;23(1):112–118.
11. Lewis JE. Identifying Sword Marks on Bone: Criteria for Distinguishing Between Cut Marks Made by Various Classes of Bladed Weapons. *Journal of Archaeological Science.* 2008;35(7):2001–2008.
12. Chang I. *The Rape of Nanking: The Forgotten Holocaust of World War II.* Basic Books, New York, USA. 1997.
13. Piccigallo PR. *The Japanese on Trial: Allied War Crimes Operations in the East, 1945–1951.* University of Texas press, USA. 2011.
14. *Basic facts on the Nanking Massacre and the Tokyo War Crimes Trial.* New Jersey Hong Kong Network. 1990;10 p.
15. Maples WE. *Trauma Analysis by the Forensic Anthropologist.* In: Reichs KJ, editor. *Forensic Osteology Advances in the Identification of Human Remains.* Springfield, IL: Charles C Thomas, USA. 1986;218–228 p.