Sharp Force Traumatic Injury Patterns

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INTRODUCTION & SIGNIFICANCE

Key information about an individual's cause and manner of death can be discovered through the examination of injuries to bone. To improve the ability of forensic anthropologists to distinguish between a variety of different implements, it is important to study each distinct classif cation of injury produced by sharp force, as it is highly associated with forensically relevant cases. This study focused on conducting a comparison of the four classes of sharp force trauma. This was done using four household items (a chef's knife, a Phillips head screwdriver, a hatchet, and a hand powered saw) on cow and pig bones, then comparing them to the pre-existing literature. Our results exhibited the documented characteristics associated with the acts of incising, puncturing, chopping, and sawing. Overall, the descriptions of the individual characteristics of each of the four classes represented in existing sharp force traumatic research were consistent with our f ndings. This demonstrates the signif cance of sharp force traumatic injury patterns in assisting forensic anthropologists in identifying and individualizing causative implements in cases of forensic signif cance.

MATERIALS & METHODS

Our specimens were a domestic cow femur (*Bos taurus*) and a rack of back ribs from a domestic pig (*Sus scrofa domesticus*). Our weapons of choice were a large kitchen knife, a philips head screwdriver, a hatchet, and a large pull-saw. All trauma was inflicted by Hannah, using her dominant hand, in an effort to limit variables. The femur was used for the chopping (hatchet) trauma and the sawing trauma because of its robusticity. The ribs were used for the puncture (screwdriver) and incision (knife) trauma. Ribs were selected for this because of how often sharp force trauma is found in the human thorax in the forensic context. The specimens were then boiled in individual pots in water to remove the soft tissue. Once they were defleshed, each bone was analyzed to document macroscopically visible instances of trauma. Photographs were taken of the bones at this stage. The wounds were numbered on the bone and two types of datasheets were completed for each of the four wound classes, looking at 8 characteristics helpful in identifying causative instruments.

RESULTS

The four implements used yielded four very different injury patterns. The puncture wounds on specimen 1A (screwdriver) were identif able by their bevelled, circular, cone-shaped indents. There was no visible fracturing, wastage, or striations. The incisions on specimen 1B (knife) were characteristically long, thin, linear marks in the bone. Several of the incisions exhibited small hinge fractures. The chopping trauma on specimen 2A (hatchet) left 8 large clefts in the bone, as well as a complete oblique fracture through the femur. This was in addition to hinge fracturing and radiating fracture lines present. There was very signif cant wastage with this injury pattern. Specimen 2B was the sawing trauma on the opposite surface of the femur from the hatchet trauma. There were 3 original false-starts in the bone, each with a rectangular kerf-f oor. The third was sawed completely through late in the project to make visible the signif cant striations. The wounds were much wider than the saw used, and are the result of signif cant wastage in the form of bone dust from the sawing process.

INFLICTION

The specimens, safety equipment, and implements used.

Inf icting the hatchet trauma.

TRAUMA

Incisions on ribs numbered, post-analysis and documentation.

Distal end of the femur, showing the original pattern of incomplete saw trauma.

TRAUMA

Femur showing clefts, oblique fracture, and saw bisection

Distal end of femur showing saw trauma, including false-starts and f nal break-away spur.

DATASHEETS

Specimen: 1 / 2 (A / B)	Wound Number: 8-13
Specimen Genus, species: pig	Bone:rib
Tool: screwdriver	Class: puncture
Entry Site Recognition: high recognition	Entry Site Appearance: 9,12, 13 - ovoid indent, cone shaped kerf 8,10,11- abrasions that are larger at point of initiation and taper as the weapon glanced the bone
Striations: 8,9,10,12 - not visible with naked eye 11, 13- some visible striations	Fracturing: none to the naked eye
Shape: 9,12,13- cone shaped 8,10,11- linear abrasions	Depth: immeasurably minute.
Width: immeasurable with available tools	Length: 8- 3.12 mm 9- 2.98 mm 10-3.10 mm 11-2.74 mm 12-3.84 mm 13-4.12mm

Notes:

- Bone is a lighter colour at the entry site (implies post mortem trauma)
- wound 10 : the instrument chattered, leaving an initial circular puncture wound and then a long abrasion directly beside it.
- Measurements taken using a vernier caliper.

Example of one of our trauma analysis datasheets (specimen 1A)

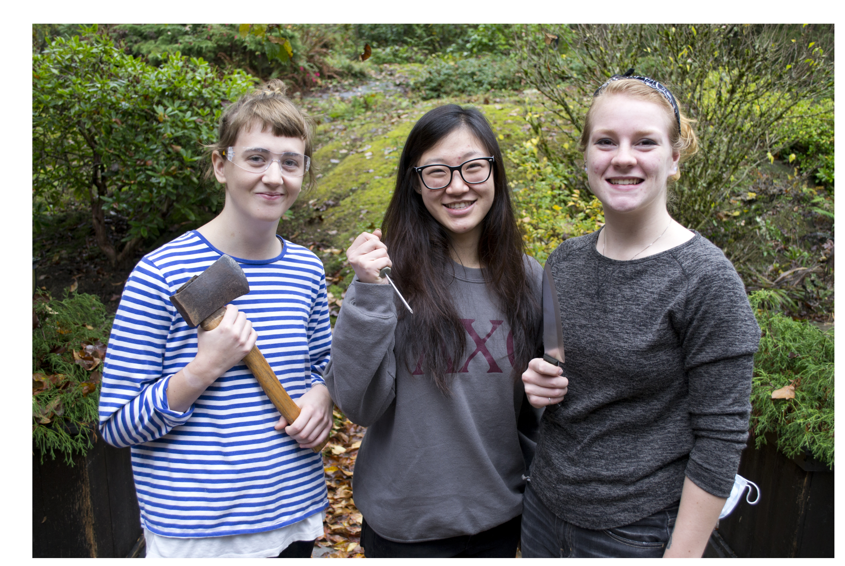
For each specimen, an initial cataloging datasheet and a secondary, more in-depth trauma analysis datasheet were completed. These were designed considering the 8 determining attributes of causative tools, as discussed in Byers (2010).

CONCLUSIONS

We were successful in reproducing the four classes of sharp force traumatic injury patterns, consistent with what we hypothesized at the beginning of our experiment. The puncture wounds were cone-shaped; the incisions were longer than they were wide; the saw produced highly visible striations; and by applying dynamic vertical force with a sharp edge, we produced clefts. We saw evidence of compression and expansion of the bone around points of impact causing some wounds to be smaller than the tools which created them. This was most typical of incisions.The greatest instances of fracturing and wastage were seen with the chopping trauma inf icted with the hatchet.

One incident during the course of our experiment was unexpected: our specimens were stolen. This occurred shortly after the f rst documentary photos were taken of the def eshed specimens. They were found outside after a period of exposure to potential animal scavenging. They were scattered over the ground, and had clearly been interfered with. This made some of our analysis diff cult, as we now had to consider that some trauma was not the direct result of our experiment.This especially proved an obstacle with the puncture specimen. Some types of animal scavenging can exhibit characteristics very similar to that of puncture trauma. As the puncture wounds inf icted by us were not easily discernible in the f rst place, the chance that some wounds were the result of animals led us to be much less conf dent with the numbering of wounds on specimen 1A.

All instances of trauma that we produced were easily distinguish-able from each other and matched their class descriptions very neatly. The implications of this relate to the ability of forensic anthropologists to make identifying judgements about causative weapons in forensically signif cant cases. As our results conf rm our hypothesis about the reproducibility of the four classes of sharp force traumatic injuries, we conclude that kerfs produced on bone by sharp force trauma can provide reliable information to forensic anthropologists regarding manner and cause of death.



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