A195 Biomechanical Study of Identifying and Matching the Chop Angles and Knives on Bone Tissue

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After attending this presentation, attendees will gain the knowledge of the patterns of chop marks including the type of knife, angle of blade, and the correlation between angle of blade and impulsive force by using digital microscope method developed in this study.

This presentation will impact the forensic science community by refocusing on the retention of knife marks on the hard tissue which can play a crucial role to profile the characteristics of knives during the medico-legal investigation procedure.

According to Edmund Locard's Principe (1910), the tool marks can play a crucial role to profile the shape, nature and characteristics of the weapon. The imprint of the sharp-force instruments in the hard tissue may implicate a prominent role in the forensic sciences, although little research has been directed specifically quantitative analyses of cut marks on the bone. Knife tool marks on the hard tissue retain their characteristics including knife shape, knife striate and engraved patterns that are useful to outline the type of knife including the shape and angle of the blade. The purpose of this study is to characterize the retained tool marks after knives chopping the bone tissue. A 2.5 meters chopped stage with a fixed handle of knife in a gravitational bar and a simultaneously gravitational accelerator with adjustable heights of fall were set up to mimic the human chopping action. In addition, a polyester resin fixed- bone platform that fulfilled with a compact plain bearing and a bearing shaft rolled on balanced rolling gears are also used to make sure that pork skulls were perfectly fixed and horizontal to ground. A digital microscope (HIROX KH-7700, Japan), which is able to take images from different focal planes and digitally merge them into a single 3D picture, is applied to measure the angle of blade (θ) and the angle of chopping mark in pork skull (ψ). The certificated block gages (thickness of 1.0 mm and 1.5 mm) was used to calibrate the method that measured by digital micro scope in this study. The measured values of block gages are 1.50 ± 0.00 mm (mean ± SD) and 1.00 ± 0.00 mm. The results show the reproducibility and precision of optical measurement method are well acceptable. Establish the k value (elastic coefficient; θ/ψ) after comparing the angle of knife (θ) accompanied with height (19.6 ~ 122.5 cm), velocity, impulsive force of knife and retained angle (ψ) in the chopped bone tissue were performed. At constant knife weight (gravitational acceleration) engaged at the impulsive force between 9.8 to 24.5 (kg-m/s) reveals an angle (ψ) and elastic coefficient (k) of bone tissue between 31.28 to 10.16 degree and 1.125 to 2.179, respectively. The experimental results show a positive, linear correlation between angle of blade and impulsive force. These data are eligible for us to profile the pattern of knife including the weight and type of knife, angle of blade as well as the impulsive force. In addition to the striate of the bone, the retain knife marks on the hard tissue can play a crucial role to profile the characteristics of knife during the medico-legal investigation. **Biomechanical Study, Tool Mark, Chop Marks**

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