D10 Power Tool Injury Biomechanics

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After attending this presentation, attendees will gain the ability to recognize and interpret the patterns in injuries involving power tools and how to apply this and other information to reconstruct the injurious event.

This presentation will impact the forensic community and/or humanity by adding to the body of knowledge regarding injury pattern recognition and the integration of applicable information to injurious event reconstruction. By the reconstruction of events, such as power tool injuries, alternatives to safety and guarding can be recognized.

Power tool injuries represent an interesting subset of traumatic injuries that may be difficult to interpret accurately. It is possible, with specific knowledge of the tools involved, the circumstances of the incident and patterns of injury to bone and soft tissues, to reconstruct power tool injuries.

Although tool mark forensics are well known within the forensic community, this work differs dramatically by using the integration in forensics of medical knowledge, kinesiology, anthropometrics, bloodstain pattern analysis, and alternate light sources. This integrative approach is combined with knowledge of power tool operation and uses, available force, and configuration to arrive at a reconstruction.

The injuries are generally divided into soft tissue and boney injury. Soft tissue injuries are then subdivided by traditional types in forensic medicine. Each type of soft tissue injury can then be related to its particular mechanism for causative information.

Boney injuries, when examined, are typically interpreted by fracture type. However, in power tool injuries these can be placed more appropriately along a spectrum of cut versus crushed bone. Research in the response of boney tissues (and soft tissues) to power tool implements has been done over the past 8 years and the results of these studies support the accurate determination of the amount of tool force, the direction of force, the order of the injuries, and the orientation of the tool to the injured part.

Examination of the involved tool and any available work piece or work area can yield pertinent information regarding the injurious interaction. General consideration during the examination should be taken of any damage, tool marks, tool condition and operation, and existing tool configuration. Blood stain and tissue spatter patterns should be sought using visible and alternate light sources. This particular set of collected data must be interpreted with knowledge of power tool interactions with living tissues. Research in this area has been done as well. This information, combined with case studies, has yielded important interpretive clues for power tool injury reconstruction.

Knowledge of how a particular tool is used and misused, the force (power and direction) of the tool operation, available tool configurations, and tool dimensions (including weight) is combined with the above typical forensic analysis to arrive at the final reconstruction. Occasionally, static and\or powered testing of a tool is required to fully understand the operation and forces involved for that particular tool.

Extraneous factors should be included in the analysis. The medical history of the injured individual often produces critical pertinent information, such as seizure disorders, previous injuries, vision or other sensory problems, medications, substance abuse, psychiatric problems, and congenital disorders. The individual's state of health at the moment of the injurious event is often reflected in the medical records. Although these should be previously scanned for injury information, other helpful information, such as toxicology screens, should be sought.

Any reconstruction must entertain alternative scenarios that can be excluded or used to modify the existing hypothesis. The integration of kinesiology and anthropometrics into the reconstruction assists in this end of the analysis. Matching the injured individual to the injurious tool directly or through the use of surrogates and exemplars often clarifies the reconstruction. Even simple testing using easily available surrogate tissues can assist in the reconstruction by examining injury outcomes in the patterns produced by the tool and tissue interactions in varying configurations.

The approach used here is broadly applicable due to its foundation in forensics. The specifics of the analysis are based upon appropriate knowledge and pattern recognition. It is hoped that this work will bolster the sparse information available in the area of power tool injuries.

Power Tool Injury, Injury Pattern, Accident Reconstruction

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