NATA
RESEARCH & EDUCATION FOUNDATION

Grant Information Summary:

Helmet Movement and Hand Placement Patterns Associated with Various Face Mask Removal Tools

Practical Significance:

Multiple tools are available for the removal of the face mask from a helmeted athlete with a potential spine injury. In general, the Face Mask Extractor allowed subjects to remove the face mask efficiently.

Background

It is believed that the improper management of a suspected cervical spine injury (CSI) may result in secondary injury. The removal of football helmets during a suspected CSI has been shown to take the cervical spine out of neutral alignment. Because it may be necessary to obtain access to an airway for the athlete, it has become the practice of sports medicine professionals to retract or remove the face mask from the helmet. Removal of the face mask can be achieved through the use of a tool such as a screwdriver, anvil pruner, or devices specifically designed for the task such as the Trainer's Angel and the FM Extractor.

Objective

The purpose of this study was to analyze the amount of movement the helmet undergoes during face mask removal. Time, hand placement patterns, ratings of satisfaction, and overall efficiency were also analyzed.

Design

Each subject performed one trial with each of the following four tools: anvil pruner (AP), FM Extractor (FME), PVC pipe cutter (PVC), and Trainer's Angel (TA). The study was completed at the University of New Hampshire.

Subjects

Twenty-nine certified athletic trainers (age = 29.1 ±5.98 yrs. ATC experience = 15.89 ± 4.75yrs) served as subjects.

Measurements

Each subject cut through four loop-straps and removed the face mask. Total range of motion (ROM) and total movement of the helmet were assessed. A model was in a supine position on the floor in a designated area. Three markers were placed on the helmet. Surrounding the model were six cameras from the 3-D video capture system. The model was oriented on the floor in such a way as to be aligned with the laboratory coordinate system. Thus, the axes for the movements of flexion/extension, rotation, and lateral flexion of the helmet were consistent with the X, Y and Z-axes of the lab. Time to complete the trial was recorded using a stopwatch. Hand placement patterns of subjects were analyzed following data collection. Each subject completed tool satisfaction ratings.

Results

Data were analyzed using a repeated measure ANOVA followed by paired t-tests. Efficiency scores were calculated using time and ROM data, lower scores indicating higher efficiency.

When using the FME, subjects were significantly faster than with all other tools. Significant differences were noted for tool satisfaction for all comparisons except TA vs. AP. When subjects used the FME, they demonstrated significantly less instances of using two hands on the tool (2H pattern) compared to all other tools, and significantly less than the AP and PV for placing the tool down before task completion (TD pattern). Efficiency scores were; 7.5, 9.5, 9.7, and 14.3, for FME, AP, TA and PVC, respectively.

Conclusions

In general, the FME performed better in all variables except the movement variable, where no significant differences were noted. Future research should assess the removal task using specific protocols in order to truly determine whether tools differ in movement created.

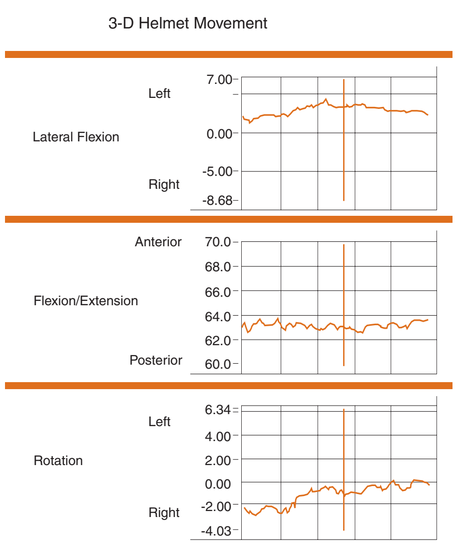
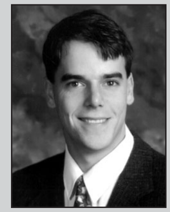


Figure 1:
Orthotrak Graph representing movement in three planes at the helmet

Primary Investigator:



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