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Evaluation of 8.0-cm needle at the fourth anterior axillary line for needle chest decompression of tension pneumothorax.

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BACKGROUND: Five-centimeter needles at the second intercostal space midclavicular line (2MCL) have high failure rates for decompression of tension pneumothorax. This study evaluates 8-cm needles directed at the fourth intercostal space anterior axillary line (4AAL).

METHODS: Retrospective radiographic analysis of 100 consecutive trauma patients 18 years or older from January to September 2011. Measurements of chest wall thickness (CWT) and depth to vital structure (DVS) were obtained at 2MCL and 4AAL. 4AAL measurements were taken based on two angles: closest vital structure and perpendicular to the chest wall. Primary outcome measures were radiographic decompression (RD) (defined as CWT < 80 mm) and radiographic noninjury (RNI) (DVS > 80 mm) of 8-cm needles at 4AAL. Secondary outcome measures are effect of angle of entry on RNI at 4AAL, RD and RNI of 8-cm needles at 2MCL, and comparison of 5-cm needles with 8-cm needles at both locations.

RESULTS: Eighty-four percent of the patients were male, with mean Injury Severity Score (ISS) of 17.7 (range, 1.0-66.0) and body mass index of 26.8 (16.5-48.4). Mean CWT at 4AAL ranged from 37.6 mm to 39.9 mm, significantly thinner than mean CWT at 2MCL (43.3-46.7 mm). Eight-centimeter needle RD was more than 96% at both 4AAL and 2MCL. Five-centimeter RD ranged from 66% to 81% at all sites. Mean DVS at 4AAL ranged from 91.8 mm to 128.0 mm. RNI at all sites was more than 91% except at left 4AAL, when taken to the closest vital structure (mean DVS, 91.8 mm), with 68% RNI. Perpendicular entry increased DVS to 109.4 mm and subsequent RNI to 91%. Five-centimeter RNI at all sites was more than 99%.

CONCLUSION: CWT at 4AAL is significantly thinner than 2MCL. Based on radiographic measurements, 8-cm catheters have a higher chance of pleural decompression when compared with 5-cm catheters. Steeper angle of entry at 4AAL improves 8-cm noninjury rates to more than 91%.

LEVEL OF EVIDENCE: Therapeutic/care management study, level IV.