Objective Assessment of Surgical Skills using a Cadaveric Model for Ankle Fracture Fixation

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INTRODUCTION:

Objective assessment of surgical skills is of utmost importance in surgical training programs. In orthopaedic surgery training, this assessment is even more critical, due to the limitation in resident working hours in recent years and the large increase in the number and complexity of surgical procedures. We hypothesized that a standardized cadaver model of a bimalleolar ankle fracture could be used to objectively identify the level of orthopaedic trauma surgical skills. Many innovative methodologies have been created to objectively assess a resident's technical ability in the operating room, however, there exists a lack of external validity and reproducibility. The purpose of this cadaveric study was to examine the feasibility of a clinically applicable method for assessment of surgical skills of orthopaedic surgeons in training.

METHODS:

A Weber B bimalleolar ankle fracture was created in 12 cadaveric ankles. Open reduction and internal fixation was performed by three groups of surgeons: Group I (n=4) – residents with 5-8 years of training (including medical school; PGY1-4); Group 2 (n=4) – fellows with 10 years of training (PGY6); Group 3 (n=4) – attending surgeons with 13-19 years of experience. All surgeries were videotaped. The time spent performing critical steps in the procedure was measured by non-surgeons. A global assessment of surgical skill was performed by two orthopaedic trauma surgeons using the videos and fluoroscopic images. Only descriptive statistics were used for analysis due to the low number of participants in each group.

RESULTS:

All 12 participants performed an open reduction and internal fixation procedure on the fracture. Steps that were measured in time included: lateral/medial approach, lateral/medial reduction, lateral/medical fixation, and closure. The average time spent performing each step by the attending level physicians was less than the average time spent performing each step by those of lesser experience. Attending level physicians also demonstrated a greater completion of OSATs tasks and performed better on the global assessments of skill. The study is underpowered to demonstrate clinical significance.

DISCUSSION AND CONCLUSION:

The results of this study demonstrate that there is a decrease in average time spent performing the specific tasks with an increase in surgical experience. This suggests that there is skill gained with surgical experience. The results also demonstrate that certain steps such as 'lateral approach' and 'lateral fixation' show a decrease in time spent performing these steps as surgical experience increased. The same stepwise decrease in time was not observed in any of the other steps. Global OSATS assessment showed that all surgeries resulted in an acceptable fixation construct. The OSATS showed a similar pattern with an increase in percentage of performed steps with increased surgical experience. There was a significant difference in OSATs percentage of steps performed based on who was performing the checklist review with junior residents (group 1) tending to have a greater percentage of steps finished compared to the attending physicians (group 3). Timing of critical steps in the surgical procedure may allow objective assessment of surgical skills of surgical trainees and can possibly be done by non-surgeons. We recommend validating this tool by applying these measurement techniques in the clinical setting.

Surgical Step	Early-Resident	Late-Resident	Fellow	Attending	P-Value
Lateral Approach	544±285s	448±76s	262±127s	160±104s	.1279
Lateral Reduction	1201±660s	659±135s	888±559s	351±261s	.2605
Lateral Fixation	1111±322s	890±189s	852±273s	691±239s	.3161
Medial Approach	266±122s	169±101s	524±89s	243±85s	0.013
Medial Reduction	647±533s	521±95s	1052±669s	671±689s	.7583
Medial Fixation	436±133s	217±112s	522±231s	360±163s	.3151
OSATS Checklist	52.25±11%	59.39±18%	64.93±14%	73.52±8%	.2003