

Comparative Study of Four Maxillofacial Trauma Scoring Systems and Expert Score

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Purpose: To select a scoring system suitable for the scoring of maxillofacial trauma by comparing 4 commonly used scoring systems according to expert scoring.

Patients and Methods: Twenty-eight subjects who had experienced maxillofacial trauma constituted the study cohort. Four commonly used systems were selected: New Injury Severity Score (NISS), Facial Injury Severity Scale (FISS), Maxillofacial Injury Severity Score (MFISS), and Maxillofacial Injury Severity Score (MISS). Each patient was graded using these 4 systems. From the experience of our trauma center, an expert scoring table was created. After the purpose and scheme of the study had been explained, 35 experts in maxillofacial surgery were invited to grade the injury of the 28 patients using the expert scoring table according to their clinical experience. The results of the 4 scoring systems and expert score were compared.

Results: The results of the 4 scoring systems and expert score demonstrated a normal distribution. All results demonstrated significant differences ($P < .01$). The Pearson correlation coefficient between the MFISS and expert score was the greatest (0.801). The correlation coefficient between the NISS, FISS, and MISS and the expert score was 0.714, 0.699, and 0.729, respectively. Agreement between the standardized scores and the expert score was evaluated using Bland-Altman plots; the agreement between the standardized MFISS and expert score was the best.

Conclusions: Compared with the other 3 scoring systems, the correlation and agreement between the MFISS and expert score was greater. This finding suggests that the MFISS is more suitable for scoring maxillofacial injuries.

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Scoring of injury severity is an important part of trauma research. It is an effective method of evaluating the prognosis of patients who have experienced trauma. The Abbreviated Injury Scale (AIS),¹ based on the anatomy, was first proposed in 1971 and has been revised repeatedly. In 1974, Baker et al² found that the severity and mortality of the injury changed regularly with the sum of the square of the 3 greatest AIS grades in 3 different body areas (this rule still holds true for multiple injuries), and the Injury Severity Score (ISS) was proposed. The AIS-ISS system has become the most

widely used scoring system in the world. The main indicator of the AIS-ISS scoring system is the probability of survival. The direct threat of lethality from maxillofacial trauma is low. However, injuries can damage the appearance and function of patients and lead to permanent disability and psychological harm.³ Therefore, the AIS-ISS scoring system is not suitable for the assessment of the severity of maxillofacial trauma. Specialists in maxillofacial surgery have established various injury scoring systems according to the characteristics of maxillofacial trauma; however, none has

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Table 1. INJURY TYPE FOR STUDY COHORT OF 28 PATIENTS

Injury Type	Patients (n)
Soft tissue	2
Mandible fracture	12
Maxillary fracture	2
Maxillary and mandible fracture	3
Fracture of zygoma and zygomatic arch	2
Fracture of zygoma, zygomatic arch and maxilla	4
Fracture of zygoma, zygomatic arch, and mandible	1
Panfacial fracture	2

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been as widely accepted and used as the AIS-ISS scoring system. The main reason has been no reference standard is available for grading systems of injury severity.

In maxillofacial trauma, all the complications are focused on dysfunction and facial deformities (similar to the situation with hand injuries). In 1996, 5 hand injury specimens were selected and graded by 25 hand surgeons. Campbell and Kay⁴ modified the Hand ISS in line with the reference standard set by the 25 experienced surgeons. Catapano et al⁵ performed a similar study in 2010 using a Facial Fracture Severity Scale (FFSS). Hence, expert opinions are very important in the assessment of injury severity.

In the present study, 4 commonly used systems were selected to grade injury severity: the New Injury Severity Score (NISS), Facial Injury Severity Scale (FISS), Maxillofacial Injury Severity Score (MFISS), and Maxillofacial Injury Severity Score (MISS). We then graded the injury severity of 28 patients using these systems. Experts in maxillofacial surgery also graded the injury severity of these patients. The results were analyzed to identify the scoring system that had results most consistent with the expert score.

Patients and Methods

PATIENTS

From February to September 2013, we selected 28 inpatients with maxillofacial trauma (25 males and 3 females; 3 to 64 years old) from the Peking University School and Hospital of Stomatology (Beijing, China). Our institutional ethics committee approved the study, and all patients provided written informed consent to participate. The inclusion criteria were a definitive diagnosis of maxillofacial trauma and detailed description of the physical examination; preoperative imaging data and facial and occlusion photographs available; at

preregistration, the soft tissue injury had occurred less than 24 hours previously and the maxillofacial fracture less than 3 weeks previously. All 28 inpatients underwent surgery by the same 2 surgeons of our research team. The injury types of the 28 patients are listed in Table 1.

METHODS

Scoring Method Used by Experts in Maxillofacial Surgery

We designed an expert scoring table. The items included injury site, injury type, surgical procedure complexity, and predicted complications. Each item was graded from 0 to 5 (with 5 the most severe). The information relating to our 28 patients was sent to 35 experts in maxillofacial surgery by electronic mail (email). All 35 experts were professors or associate professors of maxillofacial surgery in public hospitals in China. They had more than 5 years of clinical experience in maxillofacial trauma and had undertaken more than 100 surgical procedures on trauma patients annually. The experts provided scores for the 4 parameters according to their clinical experience to provide a final score for the expert scoring table. The completed table was then returned to us.

For example, a 31-year-old female experienced a right condylar fracture after falling. We emailed the information related to the patient's specialized physical examination, preoperative facial, mouth-opening, and occlusion photographs (Fig 1), and imaging data (Fig 2) to the expert. The expert scoring table was also provided. Next, the expert rated the patient by referring to the patient information and graded the injury severity in the expert scoring table according to their experience. Finally, the completed tables were returned to us by email (Table 2). The results for each patient from all the experts were then calculated.

Grading of Injury Severity Using 4 Scoring Systems

Three experts in maxillofacial trauma from our research team graded the 28 patients using the NISS, FISS, MFISS, and MISS. The AIS standard used in all the scoring systems was the 2005 version. The mean value of the scores from the 3 experts was considered the final score of each patient.

STATISTICAL ANALYSIS

The data were analyzed using the Statistical Package for Social Sciences, version 11.0 (SPSS, Chicago, IL). Using 95% confidence intervals, the 2 largest deviations in the score of each patient provided by the 35 experts were removed. The mean value for each case provided by the remaining 33 experts was then defined as the final score.

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