Comparison of severe trauma care effect before and after advanced trauma life support training

WANG Peng, LI Neng-ping, GU Yong-feng, LU Xiao-bing, CONG Jian-nong, YANG Xin, and LING Yun

Objective: To study the emergency care effect of in-hospital severe trauma patients with the injury severity score (ISS) $\geq 16$ after medical staff received advanced trauma life support (ATLS) training.

Methods: ATLS training was implemented by lectures, scenarios, field practices, and examinations. The clinical effect of in-hospital severe trauma care was compared 2 years before and after ATLS training.

Results: During 2 years (from January 1, 2004, to December 31, 2005) before ATLS training, 438 cases of severe trauma were admitted and treated emergently in our department. Among them, ISS score was $28.6 \pm 7.8$ on average, and 87 cases died with the mortality of 19.9%. The duration in emergency department and from admission to operation were $69.5 \pm 11.5$ min and $89.6 \pm 9.3$ min respectively. Two years (from January 1, 2007, to December 31, 2008) after ATLS training, 382 cases of severe trauma were admitted and treated. The ISS was $25.3 \pm 6.1$ on average and 62 cases died with the mortality of 15.1%. The duration in emergency department and from admission to operation were $47.8 \pm 10.7$ min and $61.5 \pm 9.9$ min respectively. The ISS score showed no significant difference between the two groups ($P>0.05$), but the mortality, the duration in emergency department and from admission to operation were markedly decreased after ATLS training and showed significant difference between the two groups ($P<0.05$).

Conclusion: ATLS course training can improve the emergency care effect of in-hospital severe trauma patients, and should be put into practice as soon as possible in China.

Key words: Wounds and injuries; Medical staff, hospital; Staff development; Emergency treatment

Advanced trauma life support (ATLS) training was firstly launched in the USA in 1978. It is now generally recognized by worldwide medical personnel as a standard curriculum of trauma care and guidelines on trauma care algorithm. This curriculum was written by the Committee on Trauma affiliated to American College of Surgeons (ACS), international members of ATLS, and American College of Emergency Physicians. It, possessing intellectual property rights and trade mark, cannot be used as training course by any individual or organization unless it is approved by ACS. Hence few medical professionals have received ATLS training in China and there has not been report so far regarding the training effect in China. Some medical staff in our department received 1 month's ATLS training in Singapore General Hospital (Advanced Trauma Life Support for Doctors, 7th Edition, 2004), and thereafter other medical staff in our department and relevant departments got ATLS training for 1 year. A good effect has been achieved that is reported as follows.

METHODS

General data

The clinical records of severe trauma patients with injury severity score (ISS) $\geq 16$ treated in our hospital during the period of January 1, 2004-December 31, 2005 (2 years before ATLS training) and January 1, 2007-December 31, 2008 (2 years after ATLS training) were analysed. The ISS was judged by the Abbreviated Injury Scale 2005 (AIS-2005). Those died at admission were not included in this study. Patients' age, gender, cause of injury, ISS were matched between the two series of patients ($P>0.05$, Table 1).
Training scheme

During March-April 2006, 1 director from the emergency surgery department and 2 head nurses from the emergency department received ATLS training in Singapore General Hospital. When they came back, they gave the training course to the doctors and nurses in the emergency surgery department and other relevant departments, 2 hours each time, twice a week for 20 weeks, with the total training course of 80 hours. The training courses mainly consist of following sections: primary evaluation and management of trauma, management of airway and respiration, shock, head, chest or abdominal injuries, vertebral and spinal cord injuries, muscular and skeletal injuries, injury in children, women and aged people. Each section of the trainings was composed of lectures on theory and skills on practical manipulation, as well as examinations. Only all the trainees passed the examinations that field practice proceeded. The manipulation skill and salvage process rehearsal were implemented by a scenario-mimic pattern, in which human analogue or persons was employed to simulate the real rescue circumstance.

Comparison of rescue effects

The clinical results were compared between the two series of patients, including the duration in emergency room, the time lasted from admission to operation, mortality, etc.

Statistical analysis

Measurement data were anlysed by Student’s t test and enumeration data by $\chi^2$ test using the SPSS version 12.0 software.

RESULTS

Before ATLS training, we treated 438 cases of severe trauma. Among them, 71 patients received emergency operation and 87 patients died with the mortality of 19.9%. The time lasted in casualty and from admission to operation was 69.5 min±11.5 min and 89.6 min±9.3 min respectively. After ATLS training, 382 severely injured patients were treated. Among them 59 patients received emergency operation and 62 patients died with the death rate of 15.1%. The time during the casualty and lasted from admission to operation was 47.8 min±10.7 min and 61.5 min±9.9 min respectively. There were significant differences in the mortality, the time during the casualty and from admission to operation between the two groups ($P<0.05$). All the parameters were markedly decreased after the medical staff received ATLS training (Table 2).

According to the cause of injury and wound modes, the patients were classified as penetrating injury or blunt injury. For patients with penetrating injury, there were no significant differences in the age, gender, mortality, time taken in casualty and from admission to operation before and after ATLS training ($P>0.05$, Table 3).

For patients with blunt injury, there were no significant differences in age, gender between the two groups ($P>0.05$), but there were significant differences in mortality, time taken in casualty and from admission to operation before and after ATLS training ($P>0.05$, Table 4).

<table>
<thead>
<tr>
<th>ATLS training</th>
<th>Age (years, $\bar{x} \pm s$)</th>
<th>Gender</th>
<th>Cause of injury</th>
<th>ISS $\bar{x} \pm s$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Male</td>
<td>Traffic crash</td>
<td>286</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td>Falling</td>
<td>95</td>
</tr>
<tr>
<td>Before (n=438)</td>
<td>43.7± 8.2</td>
<td>335</td>
<td>Others</td>
<td>286</td>
</tr>
<tr>
<td></td>
<td></td>
<td>103</td>
<td></td>
<td>95</td>
</tr>
<tr>
<td>After (n=382)</td>
<td>46.9± 9.1</td>
<td>285</td>
<td>Traffic crash</td>
<td>261</td>
</tr>
<tr>
<td></td>
<td></td>
<td>97</td>
<td>Falling</td>
<td>82</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Others</td>
<td>25.3±6.1</td>
</tr>
</tbody>
</table>

Table 1. Comparison of general data of the patients treated 2 years before and after ATLS training by our medical staff

<table>
<thead>
<tr>
<th>ATLS training</th>
<th>Death (n, %)</th>
<th>Time in casualty (min, $\bar{x} \pm s$)</th>
<th>Time from admission to operation (min, $\bar{x} \pm s$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before (n=438)</td>
<td>87 (19.9)</td>
<td>69.5±11.5</td>
<td>89.6±9.3</td>
</tr>
<tr>
<td>After (n=382)</td>
<td>62 (15.1) *</td>
<td>47.8±10.7</td>
<td>61.5±9.9 *</td>
</tr>
</tbody>
</table>

* $P<0.05$, as compared with before training.
**DISCUSSION**

ATLS is a training curriculum and reprinted every 4 years. It aims at directing medical workers how to adopt simple, safe, effective, and timely algorithms to evaluate and manage traumatic patients during the period from arrival at emergency room to the implementation of definite management such as operation, admission to the ward or ICU. This period, being called 1 golden hour, is short but vital to raise wound healing rate and obviate secondary or aggravated injuries. Currently, over 50 countries or areas including Hong Kong and Taiwan have participated in the International Committee on Trauma, and get permission authoritatively for ATLS training and achieved sound effects.1-8 The mainland of our country, however, has not joined in the International Committee on Trauma yet, and therefore ATLS training cannot widely be implemented. Although there are chapters concerning trauma care in current teaching materials, the content about in-hospital emergency management is not consummate and systematic. Some currently used rescue procedures and methods are not reasonable. The preoperative time consumed in emergency room is too long, which is closely correlated to prognosis, that is, the longer the time spent in emergency room, the higher the fatality is.

After ATLS training conducted in our hospital, we clearly get to know how to give the patients the most reasonable and effective remedy within the shortest time. The levels of first aid and emergency surgery have greatly been improved.9 The death rate of severely injured patients has further been diminished. The time in emergency room and from admission to operation has evidently been cut down. Consequently the clinical effects are ameliorated.

The therapeutic effects of penetrating wounds, knife and stab wounds failed to show obvious improvement after ATLS training in this series. The reason is that its diagnosis is simple, the indication for operation is definite, and surgical intervention is generally imperative. Therefore some special examinations are frequently unnecessary and patients can get rapid and timely definitive surgical treatment. On the other hand for blunt wound, before ATLS training, we often asked patients to do many examinations preoperatively, such as B-ultrasound, X-ray photograph, CT or even contrast enhanced CT, which took a lot of time. In spite of active resuscitation received in some patients, the vital signs were still unstable and the opportunity for salvage was unfortunately missed. After ATLS training, we perceived that even if the definite diagnosis has not been clarified, effective therapeutic measures should be conducted. For instance, for shock patients, surgical intervention should immediately be performed once bedside ultrasonography found peritoneal effusion and positive abdominal paracentesis. In that case, it is inappropriate to postpone operation because of waiting for blood pressure elevation or CT examination result. Combining ATLS stratage9,10 with our experience, we used table-form medical records, which not only facilitate doctors recording and understanding the whole rescue process, but also assist doctors to make a complete evaluation on patients’ condition and establish resuscitation scheme, and meanwhile preclude misdiagnosis and missed diagnosis.

Regarding nursing care in our hospital, many previously-used methods have been modified according to

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Table 3. Comparison of clinical rescue results in penetrating injury patients before and after ATLS training

<table>
<thead>
<tr>
<th>ATLS training</th>
<th>Gender</th>
<th>Age (year, ± s)</th>
<th>Mortality (n, %)</th>
<th>Time in casualty (min, ± s)</th>
<th>Time from admission to operation (min, ± s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before (n=21)</td>
<td>Male 16</td>
<td>41.5±8.5</td>
<td>2(9.5)</td>
<td>27.8±6.7</td>
<td>41.7±8.6</td>
</tr>
<tr>
<td>After (n=18)</td>
<td>Female 5</td>
<td>43.7±7.9</td>
<td>2(11.1)</td>
<td>22.5±5.4</td>
<td>37.4±9.1</td>
</tr>
</tbody>
</table>

Table 4. Comparison of clinical rescue results in blunt injury patients before and after ATLS training

<table>
<thead>
<tr>
<th>ATLS training</th>
<th>Gender</th>
<th>Age (year, ± s)</th>
<th>Mortality (n, %)</th>
<th>Time in casualty (min, ± s)</th>
<th>Time from admission to operation (min, ± s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before (n=417)</td>
<td>Male 319</td>
<td>43.7±8.2</td>
<td>85(20.4)</td>
<td>78.9±13.4</td>
<td>95.3±18.5</td>
</tr>
<tr>
<td>After (n=364)</td>
<td>Female 98</td>
<td>43.7±8.2</td>
<td>60(16.5)*</td>
<td>55.7±10.8*</td>
<td>64.6±11.4*</td>
</tr>
</tbody>
</table>

*P<0.05, as compared with before training.
ATLS requirement, such as putting the table-form medical records, test tube, and examination sheets marked in a specially-used green channel seal into a plastic bag. It makes the rescue process orderly and conveniently and potentially avoids confusion or mess even if there are a large number of victims on the scene.11

There are some controversies about some ATLS theories and methods. ATLS claims that all traumatic patients especially shock patients should be given aggressive resuscitation, but animal experiments and clinical results in recent years have revealed that if bleeding is not controlled, aggressive resuscitation will wash away thrombus, result in hemodilution, blood pressure elevation, rebleeding, and accordingly raise death rate. So the theory of limited resuscitation is put forward.12,13 ATLS advocates that open chest cardiac compression is useless for patients with sudden cardiac arrest following closed blunt trauma, but some clinical studies found that open chest cardiac compression would raise successful rate of these patients.14

In a word, our study has demonstrated that ATLS training can certainly ameliorate the rescue effects of in-hospital severe traumatic patients, and therefore it is worthwhile of wide implementation in our country.

REFERENCES


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