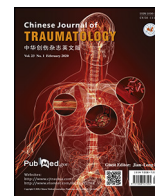




Contents lists available at ScienceDirect

# Chinese Journal of Traumatology

journal homepage: <http://www.elsevier.com/locate/CJTee>

## Review Article

# Annual review of Chinese Journal of Traumatology 2019

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## ARTICLE INFO

### Article history:

Received 6 January 2020

Received in revised form

8 January 2020

Accepted 9 January 2020

Available online 21 January 2020

## ABSTRACT

Trauma is the leading cause of death in people under the age of 45 years, and it has gained wide attention from academics worldwide. Therefore, more and more studies have reported on trauma and related fields in recent decades. In 2019, Chinese Journal of Traumatology (CJTee) published 69 articles covering traffic medicine, wound healing, bone trauma, emergency care, and other hot topics of traumatology. Here we reviewed a series of articles published in CJTEE on the topics mentioned above, try to give a brief introduction of progress in trauma field.

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## Introduction

In 2019, as a journal focusing on global academic progress made in trauma and related fields, Chinese Journal of Traumatology (CJTee) published 62 original articles and 7 case reports from 12 countries, covering such areas as traffic medicine, administration of traumatic complications, bone trauma, emergency medical care, and disaster medicine. It is worth to notice that CJTEE carried out the first guideline in the world about application of vacuum sealing drainage (VSD) on abdominal trauma. Six special topics have been reported: VSD for Trauma Surgery; Transportation Safety and Efficiency; Trauma Care and Emergency Workflow; Fracture Nonunion; Elbow Fracture and Emergency Care, Can We Do More. The present article reviewed the articles focused on those hot topics published in CJTEE in 2019.

## Traffic medicine

Road traffic injuries cause about 1.35 million deaths globally every year, ranking the 8th cause of all-age fatalities.<sup>1</sup> However, it is predicted to be the 5th leading cause of death worldwide in 2030, making the situation even worse. The Decade of Action for Road Safety 2011–2020, officially proclaimed by the United Nations General Assembly in March 2010, seeks to save millions of lives by building road safety management capacity; improving the safety of

road infrastructure; further developing the safety of vehicles; enhancing the behavior of road users; and improving post-crash response.<sup>2,3</sup> In the past nine years, the road traffic safety has been generally improved around the world, but the situation in some developing countries has room for improvement. The global status report on road safety 2018 shows that the death rate was three times higher in low-income countries than in high-income countries.<sup>1</sup> For developing countries, there are urgent needs to improve the road traffic environment; and road traffic safety prevention measures in developed countries could be references.

With the immediate past president of the International Traffic Medicine Association-Prof. Zheng-guo Wang as the editor-in-chief, CJTEE has attracted a large number of authors at home and abroad to share their points of view on road traffic safety. Statistics showed that most of the articles submitted to our journal were from developing countries, which means that researchers from developing countries are paying more and more attention to road traffic safety. In the year 2019, 3 original articles focused on motorcycle crashes were published in CJTEE, respectively from Indonesia, Malaysia and Iran. They analyzed the risk factors of motorcycle accidents and the mechanism of motorcycle crash injury, providing some suggestions on crash prevention and injury treatment strategy. We think the main reason is that more than half of global road traffic deaths are amongst pedestrians, while cyclists and motorcyclists are often neglected in road traffic system design in many countries.<sup>1</sup> However, motorcycles are much more popular than cars in less-developed areas. Due to economic and management costs, road traffic administrators and designers often ignore this fact. As a result, motorcycle accidents in those areas are more frequent with higher mortality rates. Prevention is prior to treatment. For traffic

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Peer review under responsibility of Chinese Medical Association.

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accident prevention, the road designers and traffic lawmakers have to take all the four factors fully into account: pedestrians, vehicles, roads and environment.

Road traffic injuries are the leading killer of children and young adults.<sup>1</sup> Improving children's road traffic safety is a responsibility of the whole society. It requires the concerted efforts of the whole society and the need for comprehensive protection from legislation. Provisions on child safety seats that were added in the latest version of Shanghai Road Traffic Management Regulations in 2017 prohibited the following acts when driving a motor vehicle: minors under age 12 riding the passenger seats; no equipment or improper use of safety seats for children under age 4. In 2nd issue of this journal in 2019, Niu et al. reported that after the new provisions, the awareness of children's traffic safety in Shanghai generally increased, and the use of safety seats was prevalent. As a first-tier city in China, Shanghai has mandated children's safety on roads. It is expected that in the near future, other regions in China will gradually modify relevant laws and regulations to improve children's traffic safety level.

As a dynamic open system, road traffic safety is restricted by the internal constraints, disturbed by the external environment, and is closely related to such factors as people, vehicles and road environment. A research team from Chongqing University of Science and Technology analyzed the economic factors affecting road traffic safety. They believed that the more developed for the economic level in a region, the more investments into road traffic construction, the better environment for the road traffic, the lower incidence and mortality of traffic accidents. This is the reason why death rate was three times higher in low-income countries than in high-income ones.<sup>1</sup>

Another point worth pondering is that although great progress has been made in the management of traffic safety, there are still deficiencies in some details. He et al. from Hunan province of China reported conflicting left-turning traffic light—a prevailing situation in Changsha, which did not improve the efficiency of road traffic, but increased the risk of collision between vehicles and pedestrians. It's a reminder for designers of road traffic signs that details neglected in daily life were frequently causing lethal injury, though the situation was only reported in one city of China.

In recent years, China's road traffic safety situation has been improved with the total number of road traffic accidents, deaths and injuries decreased year by year, but the number of deaths and traffic accidents remains at a high level. The only fundamental solution of improving the level of road traffic safety is to increase investment in road construction, optimize road design, strictly modify and advance legislation and justice related to traffic safety.

Road traffic safety is a global issue. The urgent issue for developing countries (including China) is to formulate traffic regulations and strategies – based on their own level of economic development and exploration of the advanced traffic management experience from developed countries – suitable for local circumstances. CJTEE will pay continual attention to the epidemiological research of traffic medicine (especially corresponding measures to reduce traffic crashes in different conditions), promote research level on emergency medical rescue, and encourage such developed countries as Sweden, the United States, Germany, Japan, etc. to actively share their experiences in road traffic safety and road traffic injury treatment.

## VSD and wound healing

VSD, initially used by Germany surgeon-Dr. Fleishmann in 1992, is an innovative method for dealing with various complex wounds and deep draining. After nearly 30 years of clinical application and consistent development, VSD has become a standardized method

for wound management in orthopedics and trauma surgery department. It is widely used in abdominal trauma surgery, but related application guidelines have never been established. In the first issue of CJTEE, “Chinese Trauma Surgeon Association for management guidelines of Vacuum sealing drainage application in abdominal surgeries—Update and systematic review” has been published as the first VSD guideline for abdominal trauma, in order to promote the wider and standardized use of VSD in the field.

By using VSD to manage abdominal trauma, the time is significantly shortened, further leading to reduction of patient's pain and the workload of medical staff. By using VSD sealing, cross infection and formation of dead space can be effectively avoided, and the wound surface can be reduced. Studies show that the wounds with VSD lymphocytic infiltration subsides fast, collagen synthesis is early in the proliferative phase, and contractile fiber synthesis is enhanced during the repair phase. This guideline also addresses common issues with clinical application of VSD in abdominal trauma. By answering the frequently asked questions, 11 points that should be noticed in the VSD application are clarified as the followings.

1. Polyvinyl alcohol foam is recommended to be used in intraperitoneal and retroperitoneal cavities, while polyurethane or polyvinyl alcohol foam is recommended for superficial incisions and external areas of sutured incisions.
2. For abdominal incisions with a primary suture which have a high risk of infection, prophylactic use of VSD is recommended to help reduce the onset of incision infection.
3. The use of VSD in severely contaminated/infected abdominal surgical sites is recommended, which can prevent/treat infections, quicken stage II closure of the incision, and shorten hospital stay.
4. VSD is recommended as the preferred method for temporary abdominal closure (TAC) and intraabdominal volume increment under the conditions such as severe abdominal trauma, infection, and liver transplantation.
5. Application of VSD after inflammation, injury or surgery in the intraabdominal organs, such as the liver, biliary tract, pancreas, and duodenum, can facilitate adequate drainage, prevent and control infections, and promote wound healing.
6. VSD facilitates adequate drainage, controls infections, and promotes wound healing in the treatment of enterocutaneous, enteroatmospheric, and pancreatic fistulas.
7. Use of VSD technique for the treatment of intra-abdominal and extraperitoneal abscesses facilitates adequate drainage, controls infection, and promotes wound healing.
8. VSD can be used for the treatment of abdominal wounds, wound cavities, and defects with various causes and can facilitate adequate drainage, control infections, promote granulation tissue hyperplasia and wound healing, and shorten the repair time.
9. Direct contact of VSD foams with blood vessels should be avoided. The use of spacers with self-tissue or artificial materials is recommended and close observation of drainage traits is nonnegligible.
10. When using VSD, the risk of intestinal injury should be monitored.
11. During the application of VSD, the occurrence of peritoneal adhesions should be monitored. When applying VSD-assisted TAC, placement of a plastic film between the intestine and the abdominal wall helps reduce adhesions and improve early closure of the fascia.

The guideline clarified the materials, application conditions and risk factors of VSD, which provides great reference for the clinical

application of VSD in abdominal trauma. CJTEE will continue to report the application of VSD on trauma in other parts, and further researches on the indications, contraindications, and related pathophysiology of VSD.

Wound healing and tissue repair are extremely important in the late stage of trauma treatment, especially during the stages of large-area avulsion repair or refractory wound repair—a slow process that often requires a large amount of medical resources for management. It is a focus for experts and scholars about how to promote rapid wound healing. A research team of China Pharmaceutical University turned to a jellyfish called *Rhopilema esculentum*. According to their study, collagen peptides extracted from *Rhopilema esculentum* jellyfish effectively accelerated the wound healing process and could be expected to be applied in clinical treatment. In addition, with the incoming era of AI, the role of surgical robots in wound repair has become increasingly apparent. Surgical robots can elevate skin flap more accurately and shorten the time of tissue harvest. Furthermore, robotic-assisted surgery has the advantage of minimal tissue trauma and thus forms minimal scar.

It is worth to notice that cases with chronic refractory wounds have continued to increase with the aging population in the past 20 years, and its management is also a major challenge for medical staff. Lu's team from Shanghai provided new solutions for chronic wound management by developing a phone APP (WoundCareLog) to document wound diagnosis and treatment, especially the creative application of endoscopic technology to the exploration and treatment of sinus in refractory wounds. From the history of the 4 Rs in surgery development, regenerative medicine will be not only another new stage with resection, repair, and replacement, but the main dynamic for the development of trauma medicine. With the rapid development of tissue engineering, nuclear cytokine therapy and gene therapy, the level of wound management will be further improved.

CJTEE believes that presently there are still many urgent problems (such as prolonged healing, scars caused by excessive healing of wounds, etc.) to be solved in chronic wound healing, as a result of less knowledge about the mechanisms of inflammation regulation and immune nutrition during wound healing. Other similar difficulties include the necessity of better application of such new technologies as artificial intelligence and endoscopic technology to repairing wounds, and of professional and standardized training procedure of therapists.

### Bone trauma

Bone trauma accounts for a large proportion among trauma cases, therefore, an amount of articles on bone trauma have been published in CJTEE in 2019. Dr. Leiblein from Germany conducted retrospective study on humerus nonunion. According to assessment of demographic data, pathology, surgical treatment and outcome of humerus nonunion cases, he concluded the 4 main causes of humerus nonunion: non-viable/atrophy, viable/hypertrophy, infection, deflection, and each of their treatments must fully consider the specific situations. In general, the first step is to rule out the possibility of infection by testing tissue samples; the second is to create basic conditions for bone healing: osteoporosis filled, fixed and debrided. A researcher from India pointed out that olecranon to 5th metacarpal head (O-MH) measurement can be used to reliably predict the tibial nail length. This is an interesting result; further clinical significance is waiting to verify.

There is no breakthrough on researches of trauma orthopedics in recent years. After all, the improvement of clinical technology depends on new theories, especially the introduction of new technologies in other fields. With the arriving 5G era, it is believed

that some emerging technologies such as AI and 3D printing will significantly promote the clinical progress of traumatology. Additionally, we believe with further research on regulation mechanism of the immune inflammatory system on osteoblasts and osteoclasts, and other basic theoretical innovation, the treatment of bone trauma will be significantly improved.

CJTEE will keep following the new theories and technologies in this field, especially the basic researches on bone trauma. CJTEE also encourage and support researchers from worldwide to share their points of view on this topic.

### Emergency care

The physicians of emergency care must have ability of diagnosis, differential diagnosis and treatment of various clinical emergencies. As a measure relying more on the overall situation of emergency patients, emergency care aims at saving lives and minimizing various fatal complications with implementing timely, rapid and effective diagnosis and treatment.

Resuscitation is necessary when there is shock caused by severe trauma, however, it is difficult to determine the endpoint of resuscitation. In addition to traditional vital signs, many experts and scholars discussed the key indicators for cardiopulmonary resuscitation, but most of the relevant indicators are invasive detection which cannot be widely applied. The current widely used indicators are base deficit (BD) and lactate. The certain significance for the two indicators lies in the ability to eliminate infection and mortality in patients with trauma at an early stage. However, there is no standardized value range of lactate for everyone; BD measurement relies on blood gas analysis, but a blood gas analyzer is not available in some situations such as battlefield environments. Heydari et al. from Iran regarded that “*Increase in heart rate variability may be a new non-invasive index for the end point of resuscitation in trauma patients*”, whose findings provided new reference for emergency resuscitation endpoint.

Becker et al., researchers from Israel, put forward a question that “The emergency department length of stay: is the time running out?” According to their research, for trauma patients, there is no significant relationship between the length of emergency department stay and the length of hospital stay. One point should be noticed that the treatment time of the emergency department makes a big difference to emergency modes. Take China as an example. Trauma emergency treatments are different among areas, even varied modes of trauma rescue are used within the same area. Those modes lead to different treatment time in the emergency departments. Trauma emergency treatment usually consists of three stages: pre-hospital emergency, in-hospital emergency and traumatic intensive care unit ward (TICU) – with diverse modes in each stage. There are four main modes for pre-hospital emergency: (1) command center for dispatches solely (i.e. Guangzhou), (2) decentralized ones with multiple emergency stations located near hospitals (i.e. Shanghai), (3) independent ones with emergency departments, ICU and some specialties, even training center and technology development company, etc. (i.e. Beijing); (4) dependent ones that are affiliated to large general hospitals with medical technology and equipment of a hospital to complete the process of trauma diagnosis and treatment of pre-hospital emergency and the ability to coordinate the city's emergency network to perform pre-hospital emergency tasks (i.e. Chongqing).<sup>4</sup>

The three main modes for in-hospital emergency of China: (1) independent one with fixed medical staff (mainly internist instead of trauma and emergency medicine professionals); (2) rotation one with surgeons taking post in turn who may be unfamiliar with injuries outside the specialty and lack systematic trauma medical knowledge; (3) trauma-oriented one with half of the emergency

doctors composing of trauma doctors and with the ability to immediately notify the trauma doctor to the emergency room for the consultation in case of severe injuries.<sup>4</sup> Take Daping hospital of Chongqing as an example, the pre-hospital emergency is a dependent one, which means that the emergency department is affiliated to Daping hospital to share its medical resources, in-hospital emergency treatment is trauma-oriented, and doctors on posts can perform routine operations in the emergency department. Compared with the independent-rotation mode of emergency departments that quickly transfer to special department after completing the “life-saving task”, treatment time of this mode may be longer. Current discussion on the establishment of trauma emergency mode is plentiful, but the general trend is that emergency departments no longer serve the functions of triage, simple treatment, and containment, but develop into one with multiple disciplines and specialties – a trend that claims higher requirements for doctors in emergency departments. Another important consideration is to define the scope of admissions for emergency department, especially for medical units with trauma surgery in order for avoiding waste of medical resources caused by overlapping.

Alexander J. Walt (1988), one of the famous American surgeons, once said “death and taxes are the two most quoted inevitabilities of life; trauma qualifies as a legitimate third.” He added that “Trauma still exists even if other diseases are overcome.” The progress and development of trauma treatment is an inevitable trend of social development. Among all the current trauma researches, emphasis should not only be focused on saving lives, but also on patients’ rehabilitation; not only on the structural recovery,

but also the functional one; not only on the physical rehabilitation, but also the psychological one. In the near future, we will arrange the relevant key issues on the physical rehabilitation of trauma patients, especially the rehabilitation of psychological functions. CJTEE is looking forward to contributions with innovative ideas.

The year of 2020 is not an end to the second decade of the 21st century, but the year of a new epoch for researches in traumatology.

#### **Funding**

Nil.

#### **Ethical Statement**

Not applicably.

#### **Declaration of Competing Interest**

The author declare that they have no conflicts of interest.

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