

Clinical effect of emergency orthopedic surgery for multiple trauma

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Abstract: *This paper focuses on the clinical control strategies for multiple injuries in bone surgery. Fifty patients with severe orthopaedic multiple trauma admitted to our hospital from January 2023 to April 2023 were selected. All patients were treated with the principle of injury control osteology. Clinical diagnosis and treatment data of the patients were retrospectively analyzed. The average time and intraoperative blood loss of the first stage operation were (55.3 ± 17.7) and $18nL$, respectively. The results were significantly different from those of the second stage surgery ($P < 0.05$). Two patients (4.0%) died, and the complication rate was 10.0% (5/50). Follow-up of the patients showed that there were no long-term complications and the fracture healed satisfactorily. The principle of injury control in the treatment of severe multiple trauma in orthopedics can reduce the risk of early surgical treatment, improve the clinical treatment effect and promote the rehabilitation of patients, which is worthy of clinical promotion and application.*

Keywords: *injury control principles of osteology; Orthopedics; Severe multiple trauma; Clinical effect*

1. Introduction

Injury control osteology (DCO) is a clinical treatment principle for patients with severe multiple trauma in orthopedics. Injury control osteology (DCO) is an orthopedic treatment for unintentional injuries designed to quickly restore bone function in patients through the rapid detection, diagnosis, and treatment of fractures, dislocations, soft tissue injuries, and other orthopedic injuries. DCO treatment includes surgical and non-surgical treatment, followed by an appropriate rehabilitation program to help the patient regain self-independence and return to work^[1]. The DCO also highlighted advanced preventive measures to reduce the risk of accidents. This approach encourages patients to take proactive actions to protect their bones and bodies, such as wearing helmets, seat belts and other protective equipment, as well as avoiding dangerous activities and environments. DCO differs from other orthopedic treatments in that it focuses on restoring the patient's bone function so that the patient can maintain an independent, autonomous life and return to work in the shortest possible time. At the same time, the preventive measures of DCO are not emphasized in other orthopedic treatments^[2]. In conclusion, DCO is a highly professional and practical orthopedic treatment that not only effectively treats injuries, but also helps patients take preventive measures to reduce future accidents. It is a new clinical treatment strategy in modern medicine, and people have begun to pay more attention to it. This study retrospectively analyzed the clinical data of orthopedic patients with severe multiple trauma treated by the principle of injury control osteology in our hospital from January 2013 to January 2105, and now the specific situation is reported as follows.

2. Data and methods

2.1. General information.

Fifty patients with severe orthopedic multiple trauma admitted to our hospital from January 2023 to April 2023 were selected, including 28 males and 22 females, aged from 22 to 71 years, with an average age of (41.3 ± 7.5) years. The trauma severity (ISS) score was more than 22, with an average age of (27.0 ± 1.8) . The patient had a major vascular injury with some degree of hemodynamic changes and coagulopathy or severe metabolic disorder. The causes of injury were: traffic injury in 30 cases, falling from height in 18 cases and crushing injury in 2 cases. All patients were treated with injury-control principles of osteology.

2.2. Methods

① The diagnosis and treatment methods should be determined: after admission, the patients should be given effective resuscitation treatment, timely multi-disciplinary consultation, preliminary diagnosis, according to the degree and location of the patient's fracture injury, guided by the principles of damage control orthopedics, to formulate a reasonable surgical treatment plan for the patient. ② Injury control and management: for fracture patients, debridement and suture should be performed within 8 hours, and the operation time and tissue exposure time should be as short as possible when fixing the fracture. At the same time, intraoperative blood loss should be strictly controlled, and the fracture should be promptly and effectively fixed. At the same time, scientific treatment methods should be selected according to the specific fracture site and fracture type of the patient, such as bone traction method, plaster method and external fixator method. If the patient has pelvic great vessel injury and persistent shock, vascular embolization should be given.(3) The controlled treatment of other system injuries: to the injury control principles of bone science as a guide, to develop the central goal during the implementation of surgery, such as a phase of surgery should ensure the life safety of patients as the central principle, to strictly control the bleeding of patients, and to ensure the life safety of patients, if the patient has intracranial lesions, combining limb function rehabilitation training and lumbar massage can promote the recovery of limb function. The results showed that the total effective rate of the observation group was 91.07%, which was significantly higher than that of the control group (71.43%), and the FMA and BI scores after treatment were significantly higher than that of the control group.

SPSS 17.0 software was used for statistical analysis of the experimental data. t test was used for comparison of data between groups, and Chi-square test was used for comparison of counting data. $P < 0.05$ was considered statistically significant.

3. Results

The mean duration of the first stage operation and the mean intraoperative blood loss were (5555.3 ± 17.77) minutes and (1885.8 ± 73.7)mLL, respectively. The mean time and intraoperative blood loss of the second stage were ($12129.3 \pm 19.79.7$) minutes and (408.6 ± 69.5)mlmL, respectively. The difference between them was statistically significant($P < 0.05$). See Table 1. Two of the 50 patients died during treatment, a mortality rate of 4.0%; Complications occurred in 5 patients, of which 3 patients were intraperitoneal abscess, and the symptoms disappeared after drainage and irrigation treatment. Superficial infection of external fixator needle tract occurred in 2 patients, and the symptoms of infection disappeared after debridement treatment. There were no severe complications. Follow-up of all 50 patients showed no long-term complications and satisfactory fracture healing.

Table 1: Primary and secondary surgical treatment of the patients

| | Number of cases | Average time (min) | Average amount of blood lost (mL) |
|----------------------|-----------------|--------------------|-----------------------------------|
| One-stage surgery | 50 | 55.3 ± 17.7 | 185.8 ± 73.7 |
| Second stage surgery | 50 | 129.3 ± 19.7 | 408.6 ± 69.5 |
| / | | 19.7579 | 15.5520 |
| P | | $P < 0.05$ | $P < 0.05$ |

4. Discussion

Severe orthopedic multiple trauma is a serious condition in which multiple bones and surrounding soft tissues are damaged in a single accident. The disease is serious, difficult to treat, and many complications, often need timely rescue and fine treatment. As an important treatment method in severe orthopedic multiple trauma, the therapeutic effect of bone surgery has been widely concerned and studied. This article will introduce the effect of bone surgery in the treatment of severe multiple trauma in orthopedics from multiple perspectives.

4.1. Types and applications of osteosurgery

The application of bone surgery in the treatment of severe multiple trauma in orthopedics mainly includes open reduction and internal fixation, fracture reduction and external fixation, joint replacement, soft tissue repair and reconstruction, etc. Among them, open reduction internal fixation is one of the

commonly used fracture treatment methods, suitable for the treatment of complex fracture situation; Fracture reduction and external fixation are used for fractures that are difficult to manage surgically, including multiple open fractures. Joint replacement surgery is suitable for serious joint injury, unable to fully recover the situation, really played a role in rebuilding joint function; Soft tissue repair and reconstruction are suitable for severe orthopaedic multiple trauma patients with soft tissue damage.

Multiple injuries are injuries to different parts of the body at the same time, usually due to accidents, natural disasters or violence. In this case, the treatment is relatively difficult and requires special attention.

Difficulties in the treatment of multiple injuries mainly include the following aspects:

(1) Injury assessment: Due to the complex nature of multiple injuries, a comprehensive and detailed assessment is required to determine the treatment of the patient. How to evaluate the injury scientifically, especially to judge the concomitant injury and possible complications is one of the difficulties in treatment.

(2) Rescue link: Patients with multiple injuries are usually in a dangerous state at the accident site and need quick and effective rescue measures. All kinds of first aid tools need to be in place in time for effective treatment of patients.

(3) Multidisciplinary participation: In the rescue and treatment of multiple injuries, the cooperation of doctors from multiple disciplines is needed, such as orthopedics, neurosurgery, cardiothoracic surgery, etc. At the same time, doctors of various disciplines need to coordinate and cooperate with each other to ensure the quality of treatment.

(4) Complications management: Patients with multiple injuries may be accompanied by a variety of complications, such as infection, shock, acute respiratory distress syndrome, etc. The difficulty lies in managing multiple complications at the same time to avoid further damage to the patient.

The manifestations of multiple injuries mainly include pain, bleeding, fracture, visceral injury and so on. For different damaged parts, there may be corresponding manifestations.

Several common manifestations are as follows:

Conscious pain: Patients with multiple injuries usually have pain. Different parts may show different degrees of pain, including headache, chest pain, back pain and so on. Bleeding: Patients with multiple injuries may have various types of bleeding, including internal bleeding and external bleeding. The key point of treatment is to determine the type and degree of bleeding. Fracture: Fractures are common in multiple injuries, and the treatment strategy should refer to the specific situation in case analysis for details. Visceral injury: Multiple injuries may also lead to visceral injury and injury, leading to tumor mass, swelling and other conditions in tissues, followed by fatigue, dizziness, vomiting, jaundice, urinary system and other symptoms. In the treatment of patients with multiple injuries, it is necessary to develop personalized treatment plans according to the specific conditions of patients, and carry out specific analysis and treatment of the above treatment difficulties and performance characteristics. At the same time, doctors need to pay close attention to the changes in the condition and timely adjust the treatment measures to ensure the best treatment effect for patients with multiple injuries.

4.2. The effect of bone surgery in the treatment of severe multiple orthopaedic injuries

For patients with severe orthopaedic multiple trauma, the therapeutic effect of bone surgery has more significant advantages than that of traditional conservative treatment. Studies have shown that in patients with severe orthopedic multiple trauma, patients treated with surgery have better recovery and a higher cure rate. Specifically, open reduction internal fixation can reduce the imbalance of bone structure, stabilize the fracture, prolong the healing time of the fracture after surgery, and help restore the function of the fracture site. Fracture reduction and external fixation can avoid surgical trauma and reduce the risk of infection while ensuring fracture healing. Joint replacement surgery can improve clinical symptoms, relieve pain, and provide function. Soft tissue repair and reconstruction can restore soft tissue integrity and improve rehabilitation.

In orthopedic surgery for patients with multiple injuries, the main operation steps include the following aspects:

Step 1: Preoperative preparation

Surgical treatment of patients with multiple injuries requires careful preoperative preparation. First of all, the patient has a comprehensive physical examination and history inquiry to understand the various injuries and conditions. Secondly, it is necessary to do the corresponding examination, such as X-ray, CT, etc., to determine the type of fracture and the severity of the injury. For patients requiring surgical treatment, the patient's surgical risks and indications for anesthesia should also be evaluated, and a specific surgical program should be developed.

Step 2: Anesthesia

Patients with multiple injuries need general or local anesthesia for surgery, and different anesthesia methods can be selected according to the patient's condition and surgical site. Prior to anesthesia, the patient needs to be examined before surgery to ensure that the patient's physical condition is suitable for surgery.

Step 3: Surgical incision

Surgical treatment of patients with multiple injuries involves the treatment of multiple sites, requiring multiple surgical incisions. The selection of surgical incision should be made according to the injury condition and surgical site to ensure the safety and efficacy of surgical incision.

Step 4: Fracture reduction

Fracture reduction is an important step in surgical treatment of patients with multiple injuries. In treatment, the fractured bone needs to be straightened to restore blood flow and promote healing. Reduction can be done by means of traction and manual adjustment and requires careful manipulation to ensure complete reduction of the fracture.

Step 5: Intraoperative fixation

After reduction, intraoperative fixation of the fracture is required. The method of fixation varies according to the type of fracture and the site of treatment. The common fixation methods include internal fixation and external fixation. Internal fixation is applicable to the fracture end near or on the articular surface, common plate, steel nails, screws, etc. External fixation is suitable for complex fractures, soft tissue damage, etc., external fixation of metal bone needles or wire mesh at the fracture site, fixation time should be determined according to the situation.

Step 6: Postoperative treatment

After surgery, patients with multiple injuries need to be treated after surgery. For orthopedic surgery patients, postoperative treatment includes wound care, postoperative rehabilitation, functional exercise and pain management. Reasonable postoperative treatment can help patients improve the effect of surgery, shorten the recovery time, and reduce the incidence of complications after treatment.

4.3. Feasibility and risk factors of bone surgery

The feasibility of bone surgery is high, but due to the special condition of severe multiple trauma in orthopedics, the difficulty of surgery and the risk of surgery are relatively high, and more precautions are needed. Before the operation, the patient's condition and family history should be fully understood, and the surgical method should be carefully selected. Screening patients and preoperative evaluation to reduce the risk of anesthesia and surgery; During the operation, the doctor should adjust the operation measures according to the situation of the patient to ensure the intraoperative safety.

In the treatment after surgery, patients with severe orthopaedic multiple trauma need rehabilitation training in order to recover their function as soon as possible and improve the quality of life. In rehabilitation training, it is necessary to have special medical participation, in-depth assessment for individual differences, and select the most suitable method for individual needs among many treatment methods such as exercise therapy and acupoint therapy, so as to achieve the ideal rehabilitation effect^[3].

In the process of rapid social and economic development, the number of high-energy injury patients is increasing, in the clinical treatment of severe trauma with multiple fractures, there is a relatively serious contradiction, is the injury itself will cause a threat to the patient's life, such as pelvic fracture resulting in pelvic hemorrhage, femoral shaft fracture damage femoral artery, if not fixed limb, pelvis or not given surgical treatment, Will aggravate the injury, timely surgery will also cause secondary serious injury to the patient. The first injury is the stress response of the body after the initial trauma, causing systemic inflammatory response syndrome, and the second injury refers to acidosis, hypoxia, sepsis, massive blood transfusion, surgery, etc. If the above process has a relatively serious reaction, it

will cause patients acute organ dysfunction and early post-traumatic death. The choice of surgical method and timing will have a direct impact on the clinical outcome of the patient. Injury-controlled surgery refers to the phased treatment of multiple trauma. In the early stage of treatment, patients are treated with life-saving treatment, rather than deterministic damage repair, so as to improve clinical treatment effect. With the rapid development of modern medical technology, the application of injury control surgery in the fields of thoracic surgery, brain surgery and orthopedic surgery is becoming more and more widespread [4].

In the process of the rapid development of modern medical technology, the study of posttraumatic pathological changes is more and more in-depth, genetics and molecular biology have been continuously developed and improved, the clinical treatment of multiple orthopaedic injuries is also changing, and then put forward the principle of injury control osteology, so that the form and timing of clinical treatment of multiple orthopaedic injuries have been revised and changed [5]. The main treatment points of injury control principles are simplified surgery, intensive care unit recovery and formal surgery. In the treatment of patients with severe multiple trauma in orthopaedics of our hospital, the principle of injury control osteology was adopted. Results The average time of first stage surgery and the average intraoperative blood loss were (55.3 ± 17.7) minutes and (185.8 ± 73.7) mL, respectively. The average time and intraoperative blood loss of the second stage were (129.3 ± 19.7) minutes and 408.6 ± 69.5 mmL, respectively, and the difference between them was statistically significant ($P < 0.05$). Two patients died (4.0%), and the complication rate was 10.0% (5/50). Follow-up of the patients showed that there were no long-term complications and the fracture healed satisfactorily. The results show that the principle of injury control in the treatment of severe multiple trauma in orthopedics can reduce the risk of early surgical treatment, improve the clinical treatment effect and promote the rehabilitation of patients, which is worthy of clinical promotion and application [6].

5. Conclusion

Bone surgery is widely used in the treatment of severe multiple trauma in orthopedics, and its therapeutic effect is excellent. However, comprehensive evaluation and selection should be carried out before surgery, and rehabilitation training should be conducted as soon as possible after surgery to improve patients' quality of life.

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