



Original Article

Interventional treatment experience in multiple injury with major abdominal or pelvic injuries: 160 cases analysis

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ARTICLE INFO

Article history:

Received 10 September 2017

Received in revised form

17 October 2017

Accepted 27 November 2017

Available online 31 January 2018

Keywords:

Abdominal injury

Multiple trauma

Embolization

Haemorrhage

Prognosis

ABSTRACT

Purpose: To observe the therapeutic effect of interventional embolization and haemorrhage control in multiple trauma patients with a major abdominal or pelvic injury.

Methods: Data of 160 multiple trauma patients with a major abdominal or pelvic injury were retrospectively analyzed. They were admitted into the Department of Emergency of the First Affiliated Hospital of Zunyi Medical College from October 2013 to April 2016. Eighty-seven patients who received emergent intervention for embolization and haemorrhage control were set as group A, including 72 males and 15 females, with an average age of (39.32 ± 14.0) years. Patients underwent emergent intervention for embolization and hemostasis. The other 73 patients who received traditional surgeries were set as group B, including 62 males and 11 females, with an average age of (38.48 ± 13.12) years. The time from admission to emergency intervention, the time of interventional embolization, transfusion during hospitalization, length of stay and prognosis were observed. The whole treatment and prognosis were compared between group A and group B.

Results: In group A, the average time from admission to intervention exploration was (132.05 ± 86.80) min, the average operation time was (149 ± 49.69) min, the average hospitalization time was (18.37 ± 4.71) days, the average amount of RBC transfusion during hospitalization was (7.2 ± 4.33) units, and the mortality was 4.60% (4 patients died). The corresponding data in group B were respectively (138.95 ± 82.49) min, (183 ± 52.39) min, (22.72 ± 6.63) days, (12.23 ± 5.43) units, and 9.59% (7 cases died). There was no statistical difference in the time from admission to operation between the two groups ($p > 0.05$), but there was statistical difference in operation time, RBC transfusion, hospitalization time, prognosis, and mortality between the two groups (all $p < 0.05$).

Conclusion: The emergent intervention for embolization and haemorrhage control of multiple trauma patients with a major abdominal or pelvic injury and visceral organ haemorrhage has the advantages of less trauma, shorter operation time, shorter hospital stay, less blood transfusion in comparison to the traditional emergency surgeries.

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Introduction

Multiple injuries are caused by high-energy insult, which are characterized by severe, widespread, and suddenly occurred damages, and are easy to be miss-diagnosed or misdiagnosed in clinical practice. Timely and correct diagnosis and effective treatment are related to a fair prognosis for these patients. With the

development of society and transportation, the number of patients with multiple traumas has been significantly increased.¹ The mortality rate of multiple trauma patients is still high. In recent years, the vessel intervention for embolization and haemorrhage control has been rapidly developed because of its advantages of less trauma and good hemostatic effect, and has been widely used in the treatment of the liver, spleen, and kidney injury and haemorrhage of pelvic fractures.^{2–4} In this paper, the authors retrospectively analyzed the data of 87 cases of abdominal or pelvic injuries who received interventional exploration for embolization and haemorrhage control and 73 cases of abdominal or pelvic injuries who received traditional surgeries from October 2013 to April 2016

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Peer review under responsibility of Daping Hospital and the Research Institute of Surgery of the Third Military Medical University.

in the First Affiliated Hospital of Zunyi Medical College, so as to improve the success rate of multiple injuries and to provide more treatment ways.

Materials and methods

General information

A total of 160 multiple trauma patients with a major abdominal or pelvic injury were emergently admitted and treated in our department from October 2013 to April 2016. The 87 patients who received intervention treatment were set as group A. Inclusion criteria were as follows: emergently admitted multiple traumatic patients with a major abdominal or pelvic injury and enhanced CT examination clearly indicated abdominal viscera (liver, spleen and kidney) injury and hematoceleia and gross hematuria; pelvic fracture patients with bleeding, hematoma formation and unstable vital signs; severe patients who can not tolerate conventional surgery. Patients with abdominal hollow viscus injuries who need emergent surgeries were excluded. In group A, there were 72 males and 15 females, with an average age of (39.32 ± 14.0) years; among them, there were 55 cases (63.2%) of traffic injury, 29 cases (33.3%) of high-falling injury, and 3 cases (3.5%) of crush injury. During the same period, 73 cases of abdominal or pelvic injury who were treated by traditional surgeries were classified as group B. The inclusion criteria were as follows: abdominal organ injured patients with massive hematoceleia or hollow viscus injury who need emergent operation. Among them, there were 62 males and 11 females, with an average age of (38.48 ± 13.12) years. There were 48 cases (65.75%) of traffic accident injuries, 21 cases (28.77%) of falling injuries and 6 cases (8.22%) of crush injuries. The informed consents were obtained from the patients and their families and were approved by the Ethical Committee of The First Affiliated Hospital of Zunyi Medical College.

Treatment

For patients in group A, the relevant examination and diagnosis, preoperative preparation and active blood transfusion were applied for severe patients with unstable vital signs and a high suspicion of active bleeding in the emergency room. Meanwhile, we contacted the intervention physicians and specialists to assist in determining surgical options; then, patients were emergently performed interventional exploration. During the operation, the contrast agent overflow confirmed active bleeding, and coil embolization confirmed reliable hemostasis. After operation, patients were sent to emergency intensive care unit (EICU) for monitoring and close observation. In group B, the patients were diagnosed to have severe abdominal organ damage and a large amount of hematoceleia, or have hollow organ rupture, whose haemorrhage may not be controlled through intervention. These patients were performed emergency surgery, and surgical procedure was selected intra-operatively according to the site and condition of the injury.

Observation index

The effective therapeutic indicators are as follows: blood pressure was stable after operation or shock was rectified, vasoactive drug dosage was gradually decreased or stopped, and the heart rate was gradually slowed down until remaining stable; hemoglobin showed no progressive decline, remained stable and increased after blood transfusion; dynamic monitoring indicated decreased lactic acid, and gradually reduced local symptoms and signs. The time from emergency admission to intervention, the time of embolization, the amount of blood transfusion during hospitalization, hospital stay, prognosis and mortality were observed in patients of group A, and compared with those of group B.

Statistical analysis

SPSS 11.0 statistical software was used for data processing and analysis. Independent samples *t*-test was used for group comparison and the rate was compared using the chi-square test. $P < 0.05$ was considered statistically significant difference.

Results

For the 87 patients in group A, the average time from admission to interventional exploration was (132.05 ± 86.80) min, the average interventional surgery time was (149 ± 49.69) min, the average hospitalization time was (18.37 ± 4.71) days, the average amount of RBC transfusion during hospitalization was (7.2 ± 4.33) units, and the mortality was 4.60% (4 patients died). For 73 patients in group B, the average operation time was (138.95 ± 82.49) min, the mean operation time was (183 ± 52.39) min, the average hospitalization time was (22.72 ± 6.63) days, the average amount of RBC transfusion during hospitalization was (12.23 ± 5.43) units, and the mortality rate was 9.59% (7 cases died). There was no statistical difference in the time from admission to operation between the two groups ($p > 0.05$), and there was statistical difference in the operation time, amount of red blood cell transfusion, hospital stay, prognosis and mortality ($p < 0.05$, Table 1).

Discussion

It is confirmed that about 90% of multiple trauma patients died within a few minutes to 4 h after injury.⁵ Whether to achieve early and timely treatment is important for its prognosis. It is reported that early active bleeding is the most important factor for the death of multiple injury patients. Whether to apply emergency hemostasis is an important factor in determining the prognosis of patients. In addition to conventional anti-shock, blood transfusion, monitoring and other treatments, critically ill patients often require open emergency surgery or interventional exploration for embolization and haemorrhage control. Surgery is still the main way to treat multiple injuries in most primary hospitals. However, embolization within vessels is gradually accepted by conditional hospitals, whose application has been increased year by year.⁶

Interventional radiology, as an interdisciplinary specialty, has been developed rapidly in recent years and has significantly

Table 1
Comparison of treatment and prognosis between the two groups.

Group	Average time from admission to operation (min)	Average operation time (min)	Average amount of RBC transfusion (units)	Average hospitalization time (d)	Mortality (%)
A	132.05 ± 86.80	$149 \pm 49.69^*$	$7.2 \pm 4.33^*$	$18.37 \pm 4.71^*$	4.60*
B	138.95 ± 82.49	$183 \pm 52.39^*$	$12.23 \pm 5.43^*$	$22.72 \pm 6.63^*$	9.59*

Note: *indicates statistical difference between the two groups ($p < 0.05$).

changed clinicians' awareness of managing multiple injuries. At present, in addition to the need for the implementation of open surgery (such as the combined abdominal hollow organ damage, severe organ injury combined with massive abdominal bleeding), almost all of the vascular haemorrhage can be managed with the catheter or guide wire for temporary blood vessels occlusion, permanent embolization or stent intervention to control bleeding.⁴ Compared with the previous open surgeries to control bleeding, intervention has the advantages of minimizing the trauma, shortening the treatment time, improving the success rate of rescue and improving the prognosis of patients. Currently, it is reported that interventional exploration for embolization and haemorrhage control has been widely used in the diagnosis and treatment in multiple injury patients with abdominal organ damage and pelvic fractures. In this study, we retrospectively analyzed the interventional treatment of 87 multiple injury patients with a major abdominal organ injury or pelvic fracture combined with active bleeding (group A), and reported the mortality rate of 4.6%, which is consistent to the success rate reported by Chen et al.⁷ There was a statistical difference in comparison to the traditional surgery (group B), which had the mortality rate of 9.59% ($p < 0.05$). There was no statistical difference in the time from admission to perform intervention or to perform surgeries between the two groups ($p > 0.05$), which is associated with standardized treatment for critical trauma in the emergency room.⁸ In comparison to the traditional emergency surgeries, emergent intervention has advantages such as short operation time, less RBC transfusion during hospitalization and shorter hospital stay, with a statistical difference between the two groups ($p < 0.05$), demonstrating the advantages of emergency interventional embolization and haemorrhage control in the rescue for patients with severe trauma.⁶ Meanwhile, we have the following treatment experience: (1) Multiple trauma patients are in critical and complicated condition, often accompanied by active bleeding and need emergency haemorrhage control; the emergent rescue should follow the principle of “life-saving first” and determine the

order of treatment based on the organ damage. (2) Treatments in the emergency rescue room such as restrictive fluid resuscitation, bleeding control, early and timely transfusing blood products, and immobilization to prevent further damage improve the success rate of multiple trauma rescue.³ (3) Emergent intervention for embolization within vessels can well control active bleeding in multiple injury patients with less complications and high rescuing rate; during operation, attention should be given to select the appropriate size catheter so as to avoid too large injection pressure and thus increase bleeding.⁹ Operation should be gently performed to avoid aggravating vascular endothelial thrombosis. (4) EICU help monitor critically ill patients during the perioperative period, and early finding and treating complications can reduce postoperative mortality and morbidity, and improve the success rate of multiple critical injury.

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