

World Journal of *Clinical Cases*

World J Clin Cases 2023 September 6; 11(25): 5840-6030



Contents

Thrice Monthly Volume 11 Number 25 September 6, 2023

REVIEW

- 5840 Mechanism and recent updates on insulin-related disorders

Kumar S, Senapati S, Bhattacharya N, Bhattacharya A, Maurya SK, Husain H, Bhatti JS, Pandey AK

MINIREVIEWS

- 5857 Progress in the study and treatment of peri-device leak after left atrial appendage closure

Qi YB, Chu HM

ORIGINAL ARTICLE

Case Control Study

- 5863 Application of lesser trochanteric reduction fixator in the treatment of unstable intertrochanteric fractures

Hui YM, Zeng G, Liu PY, Chai B

- 5870 Risk factors for post-traumatic stress disorder among young and middle-aged cancer patients in the intensive care unit: A case-control study

Chen L, Wang GZ, Chi YY, Zhao J

Retrospective Cohort Study

- 5878 Effect of different ventilation methods combined with pulmonary surfactant on neonatal acute respiratory distress syndrome

Qing Q, Zha P, Dai LY, Wang Y

Retrospective Study

- 5887 Hepatic MR imaging using IDEAL-IQ sequence: Will Gd-EOB-DTPA interfere with reproductivity of fat fraction quantification?

Tian Y, Liu PF, Li JY, Li YN, Sun P

- 5897 Conservative management of multi-trauma induced peritonitis: Experience, outcomes, and indications

Chen Q, Zhu T, Liu JK, Ding J, Chen L

- 5903 Analysis of prognostic factors in patients with emergency sepsis

Ning XL, Shao M

CASE REPORT

- 5910 Clinicopathological study of malignant peripheral nerve sheath tumors in the head and neck: Case reports and review of literature

Li L, Ma XK, Gao Y, Wang DC, Dong RF, Yan J, Zhang R

- 5919** Synchronous multiple lung cancers with hilar lymph node metastasis of small cell carcinoma: A case report
Yoshino R, Yoshida N, Yasuda S, Ito A, Nakatsubo M, Yuzawa S, Kitada M
- 5926** Ultrasound-guided carotid angioplasty and stenting in a patient with iodinated contrast allergy: A case report
Li L, Wang ZY, Liu B
- 5934** Parathyroid carcinoma: Three case reports
Shi C, Lu N, Yong YJ, Chu HD, Xia AJ
- 5941** Median neuropathy after multiple punctures of the forearm for catheterization: A case report
Suzuki T, Matsui Y, Momma D, Endo T, Iwasaki N
- 5947** Novel COL4A3 synonymous mutation causes Alport syndrome coexistent with immunoglobulin A nephropathy in a woman: A case report
Chen YT, Jiang WZ, Lu KD
- 5954** Non-retroareolar male mucinous breast cancer without gynecomastia development in an elderly man: A case report
Sun Q, Liu XY, Zhang Q, Jiang H
- 5962** Autosomal dominant non-syndromic hearing loss caused by a novel mutation in MYO7A: A case report and review of the literature
Xia CF, Yan R, Su WW, Liu YH
- 5970** Predicting apical hypertrophic cardiomyopathy using T-wave inversion: Three case reports
Kang L, Li YH, Li R, Chu QM
- 5977** Bilateral thigh pyomyositis in an otherwise healthy middle-aged woman: A case report
Cui M, Zhang G, Zhang N, Han L, Ma ZQ
- 5982** Creutzfeldt-Jakob disease presenting as Korsakoff syndrome caused by E196A mutation in PRNP gene: A case report
Zhang YK, Liu JR, Yin KL, Zong Y, Wang YZ, Cao YM
- 5988** Incomplete distal renal tubular acidosis uncovered during pregnancy: A case report
Seong EY, Kim DW, Kim HJ, Rhee H, Song SH
- 5994** Single omental metastasis of renal cell carcinoma after radical nephrectomy: A case report
Chung JW, Kang JK, Lee EH, Chun SY, Ha YS, Lee JN, Kim TH, Kwon TG, Yoon GS
- 6000** Myeloid sarcoma as the only manifestation in a rare mixed lineage leukemia-fusion-driven acute myeloid leukemia: A case report
Tang SJ, Zhang QG
- 6005** Carotid-cavernous fistula following mechanical thrombectomy of the tortuous internal carotid artery: A case report
Qu LZ, Dong GH, Zhu EB, Lin MQ, Liu GL, Guan HJ

- 6012** Successful treatment of a case of COVID-19 pneumonia following kidney transplantation using paxlovid and tocilizumab
Chen Q, Niu YL
- 6019** Diagnosis and treatment of Whipple disease after kidney transplantation: A case report
Chen Q, Niu YL, Zhang T
- 6025** Monkeypox presenting as a chancre-like rash: A case report
Zhu WF, Song SJ, Wei LW, Qiao JJ

ABOUT COVER

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RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Si Zhao*; Production Department Director: *Xiang Li*; Editorial Office Director: *Jin-Lei Wang*.

NAME OF JOURNAL

World Journal of Clinical Cases

ISSN

ISSN 2307-8960 (online)

LAUNCH DATE

April 16, 2013

FREQUENCY

Thrice Monthly

EDITORS-IN-CHIEF

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

EDITORIAL BOARD MEMBERS

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

September 6, 2023

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PUBLICATION ETHICS

<https://www.wjgnet.com/bpg/GerInfo/288>

PUBLICATION MISCONDUCT

<https://www.wjgnet.com/bpg/gerinfo/208>

ARTICLE PROCESSING CHARGE

<https://www.wjgnet.com/bpg/gerinfo/242>

STEPS FOR SUBMITTING MANUSCRIPTS

<https://www.wjgnet.com/bpg/GerInfo/239>

ONLINE SUBMISSION

<https://www.f6publishing.com>

Retrospective Study

Conservative management of multi-trauma induced peritonitis: Experience, outcomes, and indications

Qi Chen, Tao Zhu, Jia-Kang Liu, Jun Ding, Lina Chen

Specialty type: Surgery**Provenance and peer review:**

Unsolicited article; Externally peer reviewed.

Peer-review model: Single blind**Peer-review report's scientific quality classification**

Grade A (Excellent): 0

Grade B (Very good): B

Grade C (Good): 0

Grade D (Fair): D

Grade E (Poor): 0

P-Reviewer: Ghimire R, Nepal; Lieto E, Italy**Received:** May 17, 2023**Peer-review started:** May 17, 2023**First decision:** June 15, 2023**Revised:** June 27, 2023**Accepted:** August 7, 2023**Article in press:** August 7, 2023**Published online:** September 6, 2023**Qi Chen, Tao Zhu, Jia-Kang Liu, Jun Ding,** Department of Surgery, Shuguang Hospital Affiliated to Shanghai University of Traditional Chinese Medicine, Shanghai 201203, China**Lina Chen,** Department of Laboratory Medicine and Pathobiology, University of Toronto, Toronto M5S 1A8, Ontario, Canada**Corresponding author:** Lina Chen, FRCPC, MD, MMed, MSc, Assistant Professor, Attending Doctor, Consultant Physician-Scientist, Department of Laboratory Medicine and Pathobiology, University of Toronto, No. 1 King's College Circle, Toronto M5S 1A8, Ontario, Canada.lina.chen@utoronto.ca

Abstract

BACKGROUND

The concept of mandatory laparotomy in treating traumatic peritonitis has been increasingly questioned recently.

AIM

To summarize and share the experience of conservative treatment of patients with multi-trauma induced peritonitis.

METHODS

A retrospective review was performed on patients with multiple injury induced traumatic peritonitis.

RESULTS

A total of 184 patients with multiple injury induced traumatic peritonitis were reviewed. 46 of them underwent conservative treatment. None of the 46 patients with conservative treatment switched to surgical treatment, and all of them were cured and discharged after successful conservative treatment. No significant abnormal findings were observed at regular follow-up after discharge.

CONCLUSION

Conservative management is safe, effective, feasible, and beneficial in hemodynamically stable patients with traumatic peritonitis if there is no definite evidence of severe abdominal visceral organ injury.

Key Words: Trauma; Peritonitis; Damage control; Conservative treatment

Core Tip: A retrospective review was performed on 184 patients with multiple injury induced peritonitis. It reveals that conservative management is safe, effective, feasible, and beneficial in hemodynamically stable patients with traumatic peritonitis if there is no definite evidence of severe abdominal visceral organ injury.

Citation: Chen Q, Zhu T, Liu JK, Ding J, Chen L. Conservative management of multi-trauma induced peritonitis: Experience, outcomes, and indications. *World J Clin Cases* 2023; 11(25): 5897-5902

URL: <https://www.wjgnet.com/2307-8960/full/v11/i25/5897.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v11.i25.5897>

INTRODUCTION

Peritonitis refers to the inflammation of the peritoneum. Symptoms and signs may include abdominal pain and tenderness, abdominal guarding and rigidity, rebound tenderness, and fever. A diagnosis of peritonitis is based primarily on the clinical manifestations described above. Rigidity is the most specific exam finding for diagnosing peritonitis. Peritonitis can be caused by infection, chemical, and injuries. Traumatic peritonitis is caused by injury and in most cases requires surgical treatment[1]. Given the great risk of missing occult injuries, mandatory laparotomy has been a well-known guideline in treating traumatic peritonitis. However, recently, this concept has been increasingly questioned[2,3], especially in patients with low risk of a true rupture or bleeding of intraabdominal viscera. In fact, such patients are complicated by severe injury. Their conditions may deteriorate if an inappropriate exploratory laparotomy is performed, causing serious physiological dysfunction, even death[4]. The recent study retrospectively reviewed 43 cases of blunt trauma to abdominal solid organs and found 20 (47%) cases attempted conservative management with successful rate of 90% (18 out of 20 cases)[5]. We aim to review the outcomes of conservative management of traumatic peritonitis and explore the indications for managing it conservatively.

MATERIALS AND METHODS

Patients presented with traumatic peritonitis caused by multiple injuries to the Shuguang Hospital, China from April 2016 to June 2022 were reviewed. Confidentiality of all patients' information was maintained and permission from the hospital ethical committee for the use of medical data and publishing of the study results was obtained.

Demographic data, clinical parameters, laboratory values, diagnostic examinations, management strategies and outcomes were analyzed. Hemodynamic instability was defined as systolic blood pressure < 90 mmHg, or > 90 mmHg but requiring bolus infusions/transfusions and/or vasopressor drugs. Positive abdominal findings included abdominal pain, rigidity of abdominal wall muscles and positive rebound sign on examination. The injury severity score (ISS) was calculated using the organ injury scaling committee of the American association for the surgery of trauma[6]. The amount of peritoneum fluid was calculated by abdominal ultrasound and defined as: Small when the fluid was limited in pelvis or only between bowels with the maximal fluid depth (AP diameter) of 2-4 cm; medium when the maximal fluid depth (AP diameter) was 4-8 cm; large when the fluid was diffusely present in pelvis and abdomen with the maximal fluid depth (AP diameter) more than 8 cm.

RESULTS

A total of 184 patients with multiple traumas induced traumatic peritonitis were admitted from April 2016 to June 2022, including 116 males and 68 females with a mean age of 35.3 ± 10.5 years old. The causes of trauma included 85 cases of traffic injuries, 63 cases of falls from height, 20 cases of injuries from hitting by heavy objects, 16 cases of fights and assaults. The average ISS score was $26.5 \text{ points} \pm 14.9 \text{ points}$, including 42 cases of combined brain trauma, 67 cases of thoracic trauma, and 64 cases of spinopelvic or extremity fracture.

All the patients completed the relevant laboratory examination after admission in emergency room, including physical exam, routine urinalysis for hematuria, serology for cardiac enzymes, blood lactate, liver and kidney function, electrolytes, coagulation test, arterial blood gas analysis. All had emergency electrocardiogram, focused assessment with sonography in trauma (FAST), head, chest, abdomen and pelvis rapid spiral computed tomography (CT) examination, and extremity X-rays.

We identified that 46 patients were treated conservatively, accounting for 25% of the total cases. All of them were managed successfully by conservative treatment alone. None of them switched to surgical treatment. The patient demographics and outcomes are summarized in Table 1. The causes of peritonitis are listed in Table 2.

Table 1 Patient demographics and outcomes

Characteristics	OM (n = 138)	CM (n = 46)	P value
Age (yr), mean \pm SD	42.38 \pm 15.75	40.30 \pm 12.63	P = 0.418
Median (range)	38 (16-83)	39.5 (22-67)	P = 0.602
M/F	100/38	16/30	P < 0.001
ISS score \pm SD	28.38 \pm 8.99	25.39 \pm 8.84	P = 0.037
Hemodynamic instability	102	9	P < 0.001
Spleen injury	38	26	P < 0.001
Liver injury	18	8	P = 0.305
Pancreas injury	4	5	P = 0.045
Multiple abdominal solid organ injury	5	4	P = 0.067
Bowel injury	106	3	P < 0.001
ICU admission	138	31	P < 0.001
Mortality	6	0	P = 0.339

OM: Operative management; CM: Conservative management; SD: Standard deviation; M/F: Males/females; ISS: Injury severity score; ICU: Intensive care unit.

Table 2 Causes of peritonitis

Causes		OM (n = 138)	CM (n = 46)
Major abdominal visceral damage	Major solid organ injury	60	0
	Hollow organ perforation	106	0
Bleeding	Minor injury to solid organs	0	43
	Injury to vessels	16	3
Extra-abdominal injuries	Multiple rib fractures	48	19
	Anterior abdominal wall contusion	112	10
	Low back fractures or soft tissue injuries	12	14
	Pelvic fracture, pelvic hematoma, retroperitoneum hematoma	46	6

OM: Operative management; CM: Conservative management.

A case-by-case review of the 46 conservatively managed case revealed the following characteristics: For 15 cases with a small amount of peritoneal effusion, ISS grade III or less, no definite visceral damage found, and no hemodynamic instability, conservative treatment with close observation in emergency room was performed.

Thirsty-one cases with moderate peritoneal effusion, visceral damage or hemodynamic instability were admitted into intensive care unit with close monitoring, open central venous access, active anti-shock treatment, and transfusion as needed. These cases were under close observation of abdominal symptoms and signs and image studies were repeated if clinically indicated.

The conservative management included fasting, gastrointestinal decompression, acid suppression, broad-spectrum antibiotics against infection, and TPN nutritional support. Clinical and laboratory monitoring included frequent assessment of clinical symptoms and signs, urine output, hemoglobin, hematocrit, and arterial blood gas analysis (every six hour in first 24 h, at least daily for 3 d, and the interval of reexamination was increased after the condition was stable). In addition to the FAST exam performed in emergency room, abdominal ultrasound or CT scan was repeated on the second day after admission to confirm the peritoneal effusion and assess the progress of the injury, followed with another ultrasound or CT 3-7 d post-admission. Patients were immobilized in a flat position and were guaranteed not to be at risk for possible bleeding if moved. Emotional support was provided to relieve patient anxiety and sedatives were use when necessary.

There was no conversion to surgical treatment in these 46 conservatively managed patients. All were discharged after successful conservative treatment. The average hospital stay was 14 d. Patients were followed up after discharge. All laboratory parameters were normal after 3 mo and repeated ultrasound and CT confirmed no obvious abnormal findings

in the abdominal cavity.

DISCUSSION

The peritoneum is a very thin layer of serosa composed of mesothelial cells and divided into two parts, the parietal peritoneum and the visceral peritoneum. The parietal peritoneum is mainly innervated by intercostal nerves and lumbar nerves so it is sensitive to pain. When the peritoneum of the anterior abdominal wall is stimulated, it can cause reflex abdominal muscle tension, called rigidity. It is pathognomonic for the diagnosis of peritonitis. Most peritonitis are treated with surgical operation, especially secondary peritonitis, which is often caused by injury or perforation of abdominal visceral organs[7].

In patient with multi-trauma, many second hits such as surgery and resuscitation are inappropriately applied, which may trap these patients in a vicious cycle of lethal triad consisting of hypothermia, coagulopathy and metabolic acidosis [8-10]. Therefore, damage control plays an increasing role in patient care for severe multiple trauma. The rational and cautious application of damage control surgery is extremely important in patients with severe trauma, especially abdominal injury. The current concept of damage control is applicable to all surgical specialties, and the core idea is to consider surgery as part of the overall resuscitation process[11]. The consequences of excessive surgical intervention for severely traumatized patients are dreadful[12]. Therefore, for multi-trauma patients with peritonitis, explorative laparotomy must be minimized to alleviate the unnecessary damage caused by the second hit. The cause of peritonitis must be clarified as soon as possible to decide on further treatment modalities.

The etiology of peritonitis in patients with multiple trauma is broadly classified into the following three conditions: major abdominal visceral damage including major solid organ injury and hollow organ perforation, bleeding due to minor injury to solid organs or vessels, and effect from extra-abdominal injuries[13]. Patients with major abdominal visceral damage need to undergo surgical treatment. Most of them can be done by routine laparotomy. However, damage control laparotomy should be performed if the patient condition requires. Peritonitis caused by bleeding due to minor visceral damage such as liver and spleen damage in grade three or less organ damage, conservative treatment can be performed to avoid the second hit caused by surgery[14,15]. Peritonitis caused by extra-abdominal injuries, including pelvic fracture, pelvic hematoma, retroperitoneum hematoma, frequent reassessment and repeated image studies should be performed[16,17].

In addition, symptoms from some extra-abdominal injuries can mimic peritonitis[18]. Multiple rib fractures especially of the lower quarter ribs can commonly cause abdominal pain and abdominal muscle tension. Low back fractures or soft tissue injuries can stimulate the lumbar nerves, resulting in extensive anterior abdominal wall tension and tenderness. Anterior abdominal wall contusion especially intramuscular hemorrhage can present as localized abdominal pain and tenderness. These symptoms and signs can be misleading. Surgeons need to be caution to not rush to surgical exploration and always have these in the differential diagnoses when assessing multi-trauma patients. In the absence of definitive evidence of intra-abdominal visceral injury, patients need to be closely observed for changes in clinical symptoms and signs, ancillary tests, and image. To our knowledge, these "pseudoperitonitis" has not been well studies and reported.

In this study, we retrospectively reviewed a total of 184 cases of multi trauma induced peritonitis with 46 cases treated conservatively. Under the guidance of damage control concept, these patients avoided unnecessary damage from exploratory surgery, eliminated the risk of surgical complications, and achieved good therapeutic outcomes.

CONCLUSION

Therefore, we conclude that for multi trauma patients with peritonitis, if there is no definite evidences for severe intra-abdominal visceral organ damage and patients are hemodynamically stable, conservative treatment is safe and beneficial. We recommended that conservative treatment of traumatic peritonitis should be attempted in centers with experienced surgeons, capability for precise diagnosing (ultrasound, CT, and magnetic resonance imaging), ample medical staff and equipment for uninterrupted close monitoring, and instant accessibility to operation.

ARTICLE HIGHLIGHTS

Research background

With damage control plays an increasing role in patient care for severe multiple trauma, the concept of mandatory laparotomy in treating traumatic peritonitis has been increasingly questioned recently.

Research motivation

By reveiwing the treatment modalities and outcomes of patients with multiple injury induced traumatic peritonitis, we propose the indications and share the experience of conservative managment of multi-trauma induced peritonitis.

Research objectives

To review the outcomes of conservative management of traumatic peritonitis and explore the indications for managing it

conservatively.

Research methods

A retrospective review was performed on a total of 184 patients with multiple injury induced traumatic peritonitis.

Research results

Out of 184 patients with multiple injury induced traumatic peritonitis, 46 of them underwent conservative treatment. None of the conservatively managed patients switched to surgical treatment and all of them fully recovered.

Research conclusions

In hemodynamically stable patients with traumatic peritonitis, conservative management is safe, effective, feasible, and beneficial if there is no definite evidence of severe abdominal visceral organ injury.

Research perspectives

We aim to seek collaborations from other institutions to conduct a multi-center study to further explore conservative management of multiple injury induced traumatic peritonitis.

FOOTNOTES

Author contributions: Chen Q, Zhu T, and Liu JK contributed equally to this work; Chen L designed the research study; Chen Q, Zhu T, Liu JK, and Ding J performed the research; Chen L, Chen Q, Zhu T, and Liu JK analyzed the data and wrote the manuscript; all authors have read and approved the final manuscript.

Institutional review board statement: The study was reviewed and approved by the Institutional Review Board of Shuguang Hospital Affiliated with Shanghai University of TCM (Approval No. 2023-1321-88-01).

Informed consent statement: This is a retrospective chart review study. Individual patient consent is waived according to the Research Ethics Board.

Conflict-of-interest statement: The authors have no conflicts of interest to declare.

Data sharing statement: No additional data are available.

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S-Editor: Chen YL

L-Editor: A

P-Editor: Chen YL

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