

World Journal of *Clinical Cases*

World J Clin Cases 2022 October 6; 10(28): 9970-10390



Contents

Thrice Monthly Volume 10 Number 28 October 6, 2022

REVIEW

- 9970** COVID-19 and the heart
Xanthopoulos A, Bourazana A, Giamouzis G, Skoularigki E, Dimos A, Zagouras A, Papamichalis M, Leventis I, Magouliotis DE, Triposkiadis F, Skoularigis J
- 9985** Role of short chain fatty acids in gut health and possible therapeutic approaches in inflammatory bowel diseases
Caetano MAF, Castelucci P

MINIREVIEWS

- 10004** Review of the pharmacological effects of astragaloside IV and its autophagic mechanism in association with inflammation
Yang Y, Hong M, Lian WW, Chen Z

ORIGINAL ARTICLE

Clinical and Translational Research

- 10017** Effects of targeted-edited oncogenic insulin-like growth factor-1 receptor with specific-sgRNA on biological behaviors of HepG2 cells
Yao M, Cai Y, Wu ZJ, Zhou P, Sai WL, Wang DF, Wang L, Yao DF

Retrospective Study

- 10031** Analysis of the successful clinical treatment of 140 patients with parathyroid adenoma: A retrospective study
Peng ZX, Qin Y, Bai J, Yin JS, Wei BJ
- 10042** Efficacy of digital breast tomosynthesis combined with magnetic resonance imaging in the diagnosis of early breast cancer
Ren Y, Zhang J, Zhang JD, Xu JZ
- 10053** Prevention and management of adverse events following COVID-19 vaccination using traditional Korean medicine: An online survey of public health doctors
Kang B, Chu H, Youn BY, Leem J
- 10066** Clinical outcomes of targeted therapies in elderly patients aged ≥ 80 years with metastatic colorectal cancer
Jang HR, Lee HY, Song SY, Lim KH
- 10077** Endovascular treatment vs drug therapy alone in patients with mild ischemic stroke and large infarct cores
Kou WH, Wang XQ, Yang JS, Qiao N, Nie XH, Yu AM, Song AX, Xue Q

Clinical Trials Study

- 10085** One hundred and ninety-two weeks treatment of entecavir maleate for Chinese chronic hepatitis B predominantly genotyped B or C

Xu JH, Wang S, Zhang DZ, Yu YY, Si CW, Zeng Z, Xu ZN, Li J, Mao Q, Tang H, Sheng JF, Chen XY, Ning Q, Shi GF, Xie Q, Zhang XQ, Dai J

Observational Study

- 10097** Dementia-related contact experience, attitudes, and the level of knowledge in medical vocational college students

Liu DM, Yan L, Wang L, Lin HH, Jiang XY

SYSTEMATIC REVIEWS

- 10109** Link between COVID-19 vaccines and myocardial infarction

Zafar U, Zafar H, Ahmed MS, Khattak M

CASE REPORT

- 10120** Successful treatment of disseminated nocardiosis diagnosed by metagenomic next-generation sequencing: A case report and review of literature

Li T, Chen YX, Lin JJ, Lin WX, Zhang WZ, Dong HM, Cai SX, Meng Y

- 10130** Multiple primary malignancies – hepatocellular carcinoma combined with splenic lymphoma: A case report

Wu FZ, Chen XX, Chen WY, Wu QH, Mao JT, Zhao ZW

- 10136** Metastatic multifocal melanoma of multiple organ systems: A case report

Maksimaityte V, Reivytyte R, Milaknyte G, Mickys U, Razanskiene G, Stundys D, Kazenaite E, Valantinas J, Stundiene I

- 10146** Cavernous hemangioma of the ileum in a young man: A case report and review of literature

Yao L, Li LW, Yu B, Meng XD, Liu SQ, Xie LH, Wei RF, Liang J, Ruan HQ, Zou J, Huang JA

- 10155** Successful management of a breastfeeding mother with severe eczema of the nipple beginning from puberty: A case report

Li R, Zhang LX, Tian C, Ma LK, Li Y

- 10162** Short benign ileocolonic anastomotic strictures - management with bi-flanged metal stents: Six case reports and review of literature

Kasapidis P, Mavrogenis G, Mandrekas D, Bazerbachi F

- 10172** Simultaneous bilateral floating knee: A case report

Wu CM, Liao HE, Lan SJ

- 10180** Chemotherapy, transarterial chemoembolization, and nephrectomy combined treated one giant renal cell carcinoma (T3aN1M1) associated with Xp11.2/TFE3: A case report

Wang P, Zhang X, Shao SH, Wu F, Du FZ, Zhang JF, Zuo ZW, Jiang R

- 10186** Tislelizumab-related enteritis successfully treated with adalimumab: A case report

Chen N, Qian MJ, Zhang RH, Gao QQ, He CC, Yao YK, Zhou JY, Zhou H

- 10193** Treatment of refractory/relapsed extranodal NK/T cell lymphoma with decitabine plus anti-PD-1: A case report
Li LJ, Zhang JY
- 10201** Clinical analysis of pipeline dredging agent poisoning: A case report
Li YQ, Yu GC, Shi LK, Zhao LW, Wen ZX, Kan BT, Jian XD
- 10208** Follicular lymphoma with cardiac involvement in a 90-year-old patient: A case report
Sun YX, Wang J, Zhu JH, Yuan W, Wu L
- 10214** Twin reversed arterial perfusion sequence-a rare and dangerous complication form of monochorionic twins: A case report
Anh ND, Thu Ha NT, Sim NT, Toan NK, Thuong PTH, Duc NM
- 10220** Potential otogenic complications caused by cholesteatoma of the contralateral ear in patients with otogenic abscess secondary to middle ear cholesteatoma of one ear: A case report
Zhang L, Niu X, Zhang K, He T, Sun Y
- 10227** Myeloid sarcoma with ulnar nerve entrapment: A case report
Li DP, Liu CZ, Jeremy M, Li X, Wang JC, Nath Varma S, Gai TT, Tian WQ, Zou Q, Wei YM, Wang HY, Long CJ, Zhou Y
- 10236** Alpha-fetoprotein-producing hepatoid adenocarcinoma of the lung responsive to sorafenib after multiline treatment: A case report
Xu SZ, Zhang XC, Jiang Q, Chen M, He MY, Shen P
- 10244** Acute mesenteric ischemia due to percutaneous coronary intervention: A case report
Ding P, Zhou Y, Long KL, Zhang S, Gao PY
- 10252** Persistent diarrhea with petechial rash - unusual pattern of light chain amyloidosis deposition on skin and gastrointestinal biopsies: A case report
Bilton SE, Shah N, Dougherty D, Simpson S, Holliday A, Sahebjam F, Grider DJ
- 10260** Solitary splenic tuberculosis: A case report
Guo HW, Liu XQ, Cheng YL
- 10266** Coronary artery aneurysms caused by Kawasaki disease in an adult: A case report and literature review
He Y, Ji H, Xie JC, Zhou L
- 10273** Double filtration plasmapheresis for pregnancy with hyperlipidemia in glycogen storage disease type Ia: A case report
Wang J, Zhao Y, Chang P, Liu B, Yao R
- 10279** Treatment of primary tracheal schwannoma with endoscopic resection: A case report
Shen YS, Tian XD, Pan Y, Li H
- 10286** Concrecence of maxillary second molar and impacted third molar: A case report
Su J, Shao LM, Wang LC, He LJ, Pu YL, Li YB, Zhang WY

- 10293** Rare leptin in non-alcoholic fatty liver cirrhosis: A case report
Nong YB, Huang HN, Huang JJ, Du YQ, Song WX, Mao DW, Zhong YX, Zhu RH, Xiao XY, Zhong RX
- 10301** One-stage resection of four genotypes of bilateral multiple primary lung adenocarcinoma: A case report
Zhang DY, Liu J, Zhang Y, Ye JY, Hu S, Zhang WX, Yu DL, Wei YP
- 10310** Ectopic pregnancy and failed oocyte retrieval during *in vitro* fertilization stimulation: Two case reports
Zhou WJ, Xu BF, Niu ZH
- 10317** Malignant peritoneal mesothelioma with massive ascites as the first symptom: A case report
Huang X, Hong Y, Xie SY, Liao HL, Huang HM, Liu JH, Long WJ
- 10326** Subperiosteal orbital hematoma concomitant with abscess in a patient with sinusitis: A case report
Hu XH, Zhang C, Dong YK, Cong TC
- 10332** Postpartum posterior reversible encephalopathy syndrome secondary to preeclampsia and cerebrospinal fluid leakage: A case report and literature review
Wang Y, Zhang Q
- 10339** Sudden extramedullary and extranodal Philadelphia-positive anaplastic large-cell lymphoma transformation during imatinib treatment for CML: A case report
Wu Q, Kang Y, Xu J, Ye WC, Li ZJ, He WF, Song Y, Wang QM, Tang AP, Zhou T
- 10346** Relationship of familial cytochrome P450 4V2 gene mutation with liver cirrhosis: A case report and review of the literature
Jiang JL, Qian JF, Xiao DH, Liu X, Zhu F, Wang J, Xing ZX, Xu DL, Xue Y, He YH
- 10358** COVID-19-associated disseminated mucormycosis: An autopsy case report
Kyuno D, Kubo T, Tsujiwaki M, Sugita S, Hosaka M, Ito H, Harada K, Takasawa A, Kubota Y, Takasawa K, Ono Y, Magara K, Narimatsu E, Hasegawa T, Osanai M
- 10366** Thalidomide combined with endoscopy in the treatment of Cronkhite-Canada syndrome: A case report
Rong JM, Shi ML, Niu JK, Luo J, Miao YL
- 10375** Thoracolumbar surgery for degenerative spine diseases complicated with tethered cord syndrome: A case report
Wang YT, Mu GZ, Sun HL

LETTER TO THE EDITOR

- 10384** Are pregnancy-associated hypertensive disorders so sweet?
Thomopoulos C, Ilias I
- 10387** Tumor invasion front in oral squamous cell carcinoma
Cuevas-González JC, Cuevas-González MV, Espinosa-Cristobal LF, Donohue Cornejo A

ABOUT COVER

Editorial Board Member of *World Journal of Clinical Cases*, Kaleem Ullah, FCPS, MBBS, Assistant Professor, Solid Organ Transplantation and Hepatobiliary Surgery, Pir Abdul Qadir Shah Jeelani Institute of Medical Sciences, Gambat 66070, Sindh, Pakistan. drkaleempk@gmail.com

AIMS AND SCOPE

The primary aim of *World Journal of Clinical Cases* (WJCC, *World J Clin Cases*) is to provide scholars and readers from various fields of clinical medicine with a platform to publish high-quality clinical research articles and communicate their research findings online.

WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

INDEXING/ABSTRACTING

The WJCC is now abstracted and indexed in Science Citation Index Expanded (SCIE, also known as SciSearch®), Journal Citation Reports/Science Edition, Current Contents®/Clinical Medicine, PubMed, PubMed Central, Scopus, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Superstar Journals Database. The 2022 Edition of Journal Citation Reports® cites the 2021 impact factor (IF) for WJCC as 1.534; IF without journal self cites: 1.491; 5-year IF: 1.599; Journal Citation Indicator: 0.28; Ranking: 135 among 172 journals in medicine, general and internal; and Quartile category: Q4. The WJCC's CiteScore for 2021 is 1.2 and Scopus CiteScore rank 2021: General Medicine is 443/826.

RESPONSIBLE EDITORS FOR THIS ISSUE

Production Editor: *Xu Guo*; 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.wjnet.com/2307-8960/editorialboard.htm>

PUBLICATION DATE

October 6, 2022

COPYRIGHT

© 2022 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

<https://www.wjnet.com/bpg/gerinfo/204>

GUIDELINES FOR ETHICS DOCUMENTS

<https://www.wjnet.com/bpg/GerInfo/287>

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

<https://www.wjnet.com/bpg/gerinfo/240>

PUBLICATION ETHICS

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

PUBLICATION MISCONDUCT

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

ARTICLE PROCESSING CHARGE

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

STEPS FOR SUBMITTING MANUSCRIPTS

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

ONLINE SUBMISSION

<https://www.f6publishing.com>



Simultaneous bilateral floating knee: A case report

Chi-Ming Wu, Hung-En Liao, Shou-Jen Lan

Specialty type: Orthopedics

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): 0

Grade C (Good): C, C

Grade D (Fair): 0

Grade E (Poor): 0

P-Reviewer: Luo ZW, China;

Sangani V, United States

Received: March 23, 2022

Peer-review started: March 23, 2022

First decision: May 31, 2022

Revised: June 30, 2022

Accepted: July 27, 2022

Article in press: July 27, 2022

Published online: October 6, 2022



Chi-Ming Wu, Department of Orthopaedic, Jen-Ai Hospital, Taichung 42481, Taiwan

Chi-Ming Wu, Department of Orthopaedic, National Defense Medical Center, Taipei 11490, Taiwan

Chi-Ming Wu, Hung-En Liao, Shou-Jen Lan, Department of Healthcare Administration, Asia University, Taichung 41354, Taiwan

Shou-Jen Lan, Department of Medical Research, China Medical University Hospital, China Medical University, Taichung 40402, Taiwan

Shou-Jen Lan, School of Medical Science, Putian University, Putian 351100, Fujian Province, China

Corresponding author: Shou-Jen Lan, PhD, Professor, Department of Healthcare Administration, Asia University, No. 500 Lioufeng Road, Wufeng District, Taichung 41354, Taiwan. shoujenlan@gmail.com

Abstract

BACKGROUND

The phrase "floating knee is a flail knee joint," referring to ipsilateral femoral and tibial fractures, was first used by Blake and McBryde in 1975. This condition is often caused by a high-energy trauma with often extensive injury to the soft tissues, and is accompanied by life-threatening systemic complications, including head, chest or abdominal injuries and a high incidence of fat embolism. Floating knee is a severe and uncommon injury pattern.

CASE SUMMARY

A 27-year-old man sustained multiple injuries when the electric motorcycle he was riding was hit by a van. His injuries included traumatic hypovolemic shock, comminuted and open type II fractures of the left femoral shaft, fracture of the right femoral shaft, comminuted fracture of the bilateral tibial and fibular shaft, and multiple lacerations and abrasions on his forehead, lower lip, neck and limbs. The diagnosis was simultaneous bilateral floating knee complicated with soft tissue injuries. After emergency treatment and the exclusion of life-threatening complications, open reduction and internal fixation were successfully performed using plates and screws in the bilateral femoral and tibial shafts.

CONCLUSION

Simultaneous bilateral floating knee is a rare and severe injury pattern. The treatment is challenging, and complications. We present a case report of a young adult who suffered from bilateral floating knees during road traffic accident. We

also offer our treatment experience of this complex injury and review past literature.

Key Words: Floating knee; Femoral and tibial fractures; High-energy trauma; Life-threatening complications; Fat embolism syndrome; Case report

©The Author(s) 2022. Published by Baishideng Publishing Group Inc. All rights reserved.

Core tip: Blake and McBryde first used the term floating knee (FK) in 1975. FK often induces severe life-threatening complications, including head injury, intra-abdominal bleeding, vascular rupture, fat embolism syndrome, and acute respiratory distress syndrome. Treatment of FK is challenging. An urgent primary assessment and resuscitation followed by suitable and timely definitive treatment comprising systemic soft tissue and fracture considerations reduces the risk of complications. Simultaneous bilateral FK is extremely rare. We report a case of simultaneous bilateral FK, which included bilateral femoral, tibial, and fibular fractures caused by an electric motorcycle accident, and discuss its therapy process and associated complications.

Citation: Wu CM, Liao HE, Lan SJ. Simultaneous bilateral floating knee: A case report. *World J Clin Cases* 2022; 10(28): 10172-10179

URL: <https://www.wjgnet.com/2307-8960/full/v10/i28/10172.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v10.i28.10172>

INTRODUCTION

Blake and McBryde used the term floating knee (FK) in 1975, referring to ipsilateral fractures of the femur and tibia that disconnect the knee joint from the rest of the lower limb[1,2]. FK damage is a flail knee joint and includes associated diaphyseal, metaphyseal, and intra-articular fractures[3,4]. The exact incidence of FK remains undetermined[5], but it is likely to be infrequent, with Letts *et al*[6] reporting an incidence of 2.6% of all fractures in 1986. The incidence of FK, caused by high-velocity and high-energy trauma, is increasing because of changing lifestyles, high-speed motor vehicles, and poor road conditions[7]. FK often induces severe life-threatening complications, such as head injury, intra-abdominal bleeding, vascular rupture, fat embolism syndrome (FES), acute respiratory distress syndrome (ARDS), and soft tissue injury[8-10]. Simultaneous bilateral FK is extremely rare, constituting an unusual fracture pattern. No study has reported the exact incidence. In this study, we report a case of simultaneous bilateral FK, which included bilateral femoral, tibial, and fibular midshaft fractures caused by an electric motorcycle accident. We also offer our treatment experience and discuss its associated complications of this complex injury, based on past literature review.

CASE PRESENTATION

Chief complaints

A 27-year-old man, a laborer from Vietnam, sustained head injury and severe pain as well as swelling and deformity in both lower limbs as a result of a road traffic accident on July 7, 2018.

History of present illness

The patient had no medical history.

History of past illness

The patient had no special past illness.

Personal and family history

The patient had no history of drug allergies, smoking, or drinking, and no relevant family history.

Physical examination

The patient was brought by ambulance to our emergency room (ER) for treatment. A general examination revealed that the patient had a head injury with a Glasgow Coma Scale score of E4V5M3 and clear consciousness, and he was able to communicate. The initial vitals revealed hypotension (82/55 mmHg), tachycardia (107 beats/min), and a respiration rate of 26 breaths/min. During the clinical

physical examination, the patient was bedridden and was incapable of stepping on or making small motions with either foot. Multiple bleeding lacerations were observed on the left forehead (3.0 × 2.0 cm), lower lip (2.0 × 1.0 cm), anterior neck (4.0 × 1.0 cm), left anterior thigh (2.5 × 2.0 cm), left posterior heel (4.0 × 1.0 cm), and right posterior thigh (3.0 × 1.0 cm). Multiple abrasions were also identified on his face, body and limbs. The thighs and lower limbs appeared deformed, with free floating bone fragments. Distal pulses, including in the bilateral popliteal artery, posterior tibial artery, and pedal dorsal artery, were palpable.

Laboratory examinations

Routine blood tests revealed that hemoglobin was 9.5 mg/dL, and other blood chemistry results, including for liver and kidney function and electrolyte assessment, were all within the normal range.

Imaging examinations

A plain radiograph revealed displaced bilateral femoral, tibial, and fibular midshaft fractures (Figure 1). Computed tomography (CT) identified no notable intracranial, intrathoracic, or intra-abdominal bleeding.

FINAL DIAGNOSIS

Based on the examination and imaging findings, the main diagnoses were traumatic hypovolemic shock, comminuted and open type II fracture of the left femoral shaft, fracture of the right femoral shaft, comminuted fracture of the bilateral tibial and fibular shaft, and multiple lacerations and abrasions on the forehead, lower lip, neck and limbs.

TREATMENT

The patient received a blood transfusion of 2 U of packed red blood cells (RBCs) to treat hypovolemic shock. Primary suture of the forehead and lower lip wounds was performed in the ER. Within 4 h of sustaining the injury, after the laboratory data had been received and life-threatening complications excluded, the patient was transferred to the operating theater for surgery. The surgical procedure was performed on the left side first because of the greater number of comminuted and open left femoral fractures. The patient received general anesthesia at 08:10 h and was placed on the operating table in the right lateral decubitus position. After sterilization and draping, we performed open reduction and internal fixation (ORIF) with a locking plate in the left femoral shaft. The operating table was then tilted backward approximately 20° to expose the anterior of the leg more fully, and ORIF was performed using a narrow dynamic compression plate (DCP). Two 1/8 Hemovac drains were then inserted into the thighs and calves, and the wound was closed in layers. Finally, with an 18-gauge needle, we punctured hundreds of small holes around the closed wound in the left leg and thigh, imitating a Chinese medicine blood-letting method, to allow the accumulated blood in the tissue to flow out to prevent skin necrosis and compartment syndrome (Figure 2). The same ORIF procedure was performed on the right femoral fracture using a broad DCP and on the tibial fracture using a narrow DCP after changing the patient's position to left lateral decubitus (Figure 3). The surgical procedure was completed at 02:50 h on the following day. The total operative time was 6 h 40 min. The estimated blood loss was 0.9 L intraoperatively, and the patient received 4 U of packed RBC and 4.2 L of crystalloid solution.

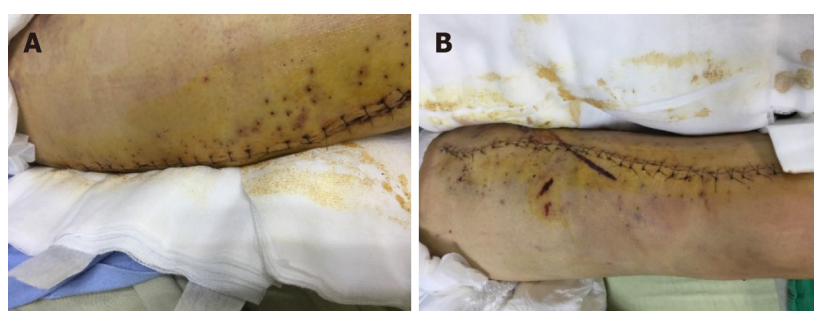
OUTCOME AND FOLLOW-UP

The patient remained intubated following surgery, and his ventilatory and vital signs were closely monitored in the surgical intensive care unit. Initially, antibiotics (1.0 g cefazolin every 6 h and 80 mg gentamycin every 12 h) were administered to prevent wound infection, and nonsteroidal anti-inflammatory drugs were administered for 2 d to relieve pain. The patient's recovery was positive, and his respiratory condition was smooth. We removed the endotracheal tube after weaning him off the ventilator on July 10, 2018, but a petechial rash on both forearms and progressive shortness of breath with dyspnea and hypoxemia were detected, resulting in emergency endotracheal intubation 9 h later. The patient was sedated using propofol infusion. Simultaneously, we performed further tests, including chest X-ray and blood, arterial blood gas, C-reactive protein (CRP), and D-dimer tests, with the following results: body temperature 38.0°C, white blood cell count 11 320/μL, hemoglobin 8.8 g/dL, CRP 14.15 mg/dL, D-dimer 6915 ng/mL, PO₂ 37 mmHg, PCO₂ 43 mmHg, and O₂ saturation 73%. These results indicated FES and pneumonia, and we therefore consulted a pulmonologist and cardiologist. The cardiologist administered an anticoagulant (6000 IU clexane every 12 h) to improve FES. An infectious disease specialist was also consulted, who prescribed antibiotics (500 mg vancomycin intravenously



DOI: 10.12998/wjcc.v10.i28.10172 Copyright ©The Author(s) 2022.

Figure 1 Initial plain radiographs revealed displaced bilateral femoral, tibial, and fibular midshaft fractures. A and B: Bilateral femoral fractures; C and D: Tibial fracture.



DOI: 10.12998/wjcc.v10.i28.10172 Copyright ©The Author(s) 2022.

Figure 2 The photographs showed that we punctured hundreds of small holes around the closed wound using an 18-gauge needle in the thigh and leg, imitating a Chinese medicine bloodletting method, to allow the accumulated blood in the tissue to flow out to prevent skin necrosis and compartment syndrome. A: Thigh; B: Leg.

every 12 h and 500 mg boojum intravenously every 8 h) to treat pneumonia. The patient's condition improved gradually, and sedation was withdrawn on July 14, 2018. After several days of treatment, chest X-ray and CT with contrast revealed no abnormal findings. The patient was weaned off the ventilator, and the endotracheal tube was removed successfully on July 16, 2018. He was transferred to the ordinary ward the following day, where he remained until his condition was stable. The patient was discharged on July 23, 2018.

The patient underwent rehabilitation after being discharged. Approximately 4 mo after surgery, he was able to stand and walk without external support. No limited motion or claudication in the bilateral lower limbs was noted. He then returned to Vietnam, returning to work 6 mo after surgery. An X-ray 13 mo postoperatively demonstrated successful fracture union ([Figure 4](#)).

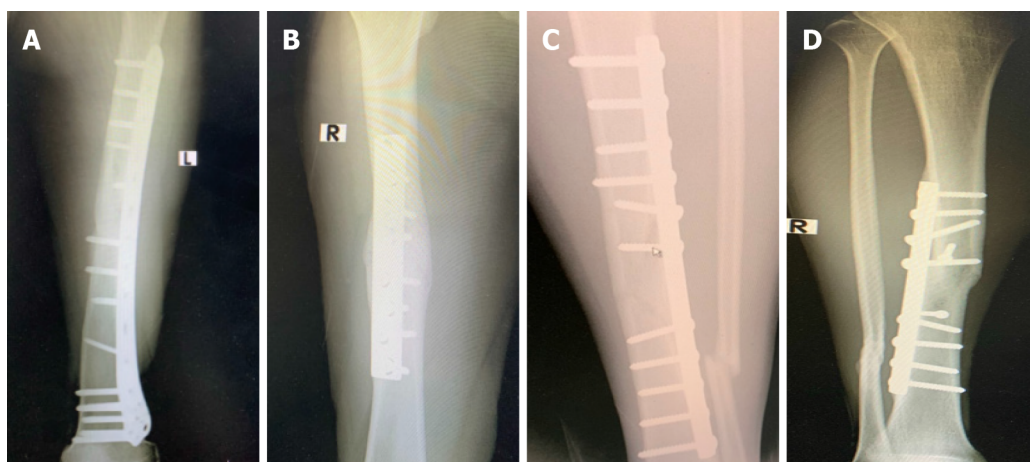
DISCUSSION

When Blake and McBryde first developed the concept of FK in 1975, they classified the injured



DOI: 10.12998/wjcc.v10.i28.10172 Copyright ©The Author(s) 2022.

Figure 3 Postoperative X-rays illustrated that the patient received open reduction and internal fixation with one locking plate in the left femoral shaft, one broad dynamic compression plate in right femoral shaft, and two narrow dynamic compression plates in bilateral tibial shafts. A: Left femoral shaft; B: Right femoral shaft; C and D: Two narrow dynamic compression plates in bilateral tibial shafts.



DOI: 10.12998/wjcc.v10.i28.10172 Copyright ©The Author(s) 2022.

Figure 4 Radiography revealed bone union of bilateral femoral and tibial fracture sites at postoperative 13 mo. A and B: Bone union of bilateral femoral; C and D: Bone union of tibial fracture.

extremities according to the fracture site: type I fractures involved femoral and tibial shaft fractures, type IIA fractures involved the knee joint, and type IIB fractures involved the hip or ankle joints[1].

In 1978, Fraser *et al*[11] revised the classification system, in which FK injuries involved the intra-articular knee joint, which affects treatment choices. Type I involves simultaneous femoral and tibial shaft fractures without extension into the knee joint, and type II fractures extend into the knee and are subdivided in the following: type IIA involves a tibial plateau fracture and an ipsilateral femoral shaft fracture; type IIB includes distal femoral fractures extending into the knee joint; and type IIC involves both tibial plateau and distal femoral fractures extending into the knee joint.

An overall incidence of 4.6% and 3.8% has been reported for bilateral femoral and bilateral tibial shaft fractures, respectively[12]. As the number of motor vehicle accidents increases, a progressive increase in

the incidence of ipsilateral femur and tibia fractures has been reported. Concomitant fractures of the ipsilateral femur and tibia are serious because of the high mortality associated with these injuries. Although the incidence of FK is undetermined[13], the related mortality rates range from 5% to 15%, and amputations are reported in up to 27% of patients. The incidence of knee ligament injuries related to FK is as high as 53% according to the literature[7,14-16].

Accurate reduction and firm fixation to regain articular and mechanical alignment are the treatment goals to optimize later function[13]. Generally, femoral fractures should be fixed prior to the tibial fracture, except in the case of an open tibial fracture[17]. The choice of implants for fixation includes intramedullary nails, plates, or a combination of the two. Although Rethnam *et al*[18] reported a short fracture union time and positive functional recovery in patients treated with intramedullary nails for extra-articular fractures and plates for intra-articular fractures in FK, each fracture is unique, and treatment should be decided based on a patient's individual circumstances, the fracture pattern, and the extent of the soft tissue injury[17]. The patient in this study had simultaneous bilateral FK, a type I fracture as per Blake *et al*'s and Fraser *et al*'s classification[1,11]; thus, we decided to use plates and screws for the fixation to reduce the cost of the procedure for the patient, avoid the time involved in changing the patient's surgical position in the event of pulmonary complications, and avoid any excess radiative exposure for the patient and medical personnel compared with intramedullary nailing.

Although stabilization of femoral or tibial fracture is considered the gold standard during the first 24 h, a staged approach using damage-control orthopedic (DCO) surgery is also recommended according to the patient's real condition[3]. Patients who sustain major orthopedic trauma, such as FK, must be graded as stable or critical in terms of vital signs, and treatment should follow the evolving DCO approach[3,19]. Life-threatening systemic complications, including head, chest and abdominal injuries with internal bleeding, popliteal artery ruptures, and open fractures, should be treated first, and femoral and tibial fractures should be temporarily immobilized through splinting, skin traction, or external fixation. Immediate definitive internal reduction and fixation are reserved for hemodynamically stable patients[17].

Because FK is a serious long bone fracture accompanied by a combination of other complex bone, ligamentous, and other soft tissue injuries, patients are at high risk of complications[20]. Early complications such as excessive blood loss, superficial and deep wound infection, limb amputation, pneumonia, FES, pulmonary embolism, ARDS and multiple organ failure have been reported. Late complications include joint stiffness, bone malunion, nonunion, chronic osteomyelitis, heterotopic ossification, implant failure, and post-traumatic arthritis[13].

In fat embolism, fat particles enter the circulatory system with vascular occlusion, causing more serious FES. FES is common in patients with long bone fractures. Its incidence is 1%–3% in patients with single long bone fractures and up to 33% in patients with bilateral femoral fractures. The mortality rate is 5%–15%[21,22]. The clinical symptoms of FES usually occur during the first 12–72 h after traumatic injury and include respiratory distress, altered mental status, and skin petechiae[9,23,24]. Pulmonary dysfunction with dyspnea, tachypnea and hypoxemia is the primary symptom, occurring in 75% of cases. Respiratory failure might develop in more than 10% of cases, and 5%–8% of patients might progress to severe ARDS. Approximately 50% of FES patients develop severe hypoxemia and respiratory insufficiency requiring mechanical ventilation[25–27].

The patient in our study had simultaneous bilateral FK with complete femoral, tibial and fibular midshaft fractures in six long bones in both lower limbs; type I fracture in the Blake and McBryde classification. Endotracheal intubation with mechanical ventilation was reapplied because of respiratory insufficiency with dyspnea and hypoxemia 9 h after the initial removal of the endotracheal tube. FES was suspected as the cause. No designated therapy exists for FES; prevention, early diagnosis, and adequate symptomatic treatment are the key responses[26,28]. Rapid supportive treatment of the patient's respiratory system and additional pharmaceutical treatment provide positive clinical outcomes.

Because this patient experienced severe bilateral FK, the soft tissue of his legs was severely swollen during surgery. To avoid blisters and skin necrosis, we applied a Chinese medicine blood-letting method after the wound was sutured. The skin around the wound was punctured with hundreds of small holes using an 18-gauge needle to allow the accumulated blood in the tissue to flow out, and a drainage tube was inserted to reduce the continued swelling of the soft tissue and prevent compartment syndrome and tissue necrosis[29–31]. After the operation, we administered intravenous antibiotics (1.0 g cefazolin every 8 h for 2 d) and oral antibiotics for the subsequent 3 d. Simultaneously, the wound dressing was changed twice a day for the first 3 d after the operation and then once a day.

The functional outcomes of FK are measured with seven criteria defined by Karlström and Olerud. The Karlström–Olerud criteria include the following: subjective symptoms from thigh or leg; subjective symptoms from knee or ankle joint walking ability return to preinjury work and sports angulation or rotational deformity or both; and shortening and restricted joint mobility of the hip, knee or ankle joint. Scores for each criterion are divided into excellent, good, acceptable and poor[3,32]. Our patient was able to walk independently without external support and was free from bilateral hip, ankle and ankle joints at 4 mo postoperatively. He complained of intermittent mild pain in the left calf, but no pain medication was required. He has returned to most of his preinjury activities, including working 6 mo after surgery. All of his fractures had healed successfully after 13 mo. The patient's bilateral lower limbs

were normal function without shortening, rotation and angulation deformity.

CONCLUSION

We presented a highly unusual case of a young adult with bilateral FK resulting from a severe road traffic accident. The incidence of unilateral FK is rare, and that of simultaneous bilateral FK even more so. FK is a devastating injury with life-threatening complications, and it often results from high-energy trauma. Patients might present in a critical condition with multiple severe injuries. Treatment of FK is challenging and following with DCO protocol. An urgent primary assessment and resuscitation followed by suitable and timely definitive treatment comprising systemic soft tissue and fracture considerations reduces the risk of complications.

FOOTNOTES

Author contributions: Wu CM performed the operation and wrote the manuscript; Lan SJ analysed the clinical data and submitted the manuscript; Liao HE revised the manuscript; All authors approved the final version of this manuscript.

Informed consent statement: All study participants provided informed written consent prior to study enrollment.

Conflict-of-interest statement: All authors, including Chi-Ming Wu and Shou-Jen Lan, all declare that they have no conflict of interest.

CARE Checklist (2016) statement: The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

Open-Access: This article is an open-access article that was selected by an in-house editor and fully peer-reviewed by external reviewers. It is distributed in accordance with the Creative Commons Attribution NonCommercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <https://creativecommons.org/licenses/by-nc/4.0/>

Country/Territory of origin: Taiwan

ORCID number: Chi-Ming Wu 0000-0003-1228-3127; Hung-En Liao 0000-0003-2840-6988; Shou-Jen Lan 0000-0002-8395-2052.

S-Editor: Zhang H

L-Editor: Kerr C

P-Editor: Zhang H

REFERENCES

- 1 **Blake R**, McBryde A Jr. The floating knee: Ipsilateral fractures of the tibia and femur. *South Med J* 1975; **68**: 13-16 [PMID: 807974]
- 2 **Piétu G**, Jacquot F, Féron JM; et les membres du GETRAUM. Le genou flottant: étude rétrospective de 172 cas [The floating knee: a retrospective analysis of 172 cases]. *Rev Chir Orthop Reparatrice Appar Mot* 2007; **93**: 627-634 [PMID: 18065874 DOI: 10.1016/s0035-1040(07)92687-2]
- 3 **Apostolopoulos AP**, Angelis S, Elamin SE, Clewer G. Bilateral Floating Knee Injury-Management of a Complex Injury. *J Long Term Eff Med Implants* 2019; **29**: 1-6 [PMID: 31679195 DOI: 10.1615/JLongTermEffMedImplants.2019030557]
- 4 **Lundy DW**, Johnson KD. "Floating knee" injuries: ipsilateral fractures of the femur and tibia. *J Am Acad Orthop Surg* 2001; **9**: 238-245 [PMID: 11476533 DOI: 10.5435/00124635-200107000-00003]
- 5 **Bertrand ML**, Andrés-Cano P. Management of the Floating Knee in Polytrauma Patients. *Open Orthop J* 2015; **9**: 347-355 [PMID: 26312119 DOI: 10.2174/1874325001509010347]
- 6 **Letts M**, Vincent N, Gouw G. The "floating knee" in children. *J Bone Joint Surg Br* 1986; **68**: 442-446 [PMID: 3733812 DOI: 10.1302/0301-620x.68b3.3733812]
- 7 **Veith RG**, Winkquist RA, Hansen ST Jr. Ipsilateral fractures of the femur and tibia. A report of fifty-seven consecutive cases. *J Bone and Joint Surgery* 1984; **66**: 991-1002 [DOI: 10.2106/00004623-198466070-00004]
- 8 **Philip PJ**, Georgekutty, Stephen M, Sultan AS. Functional outcome of floating knee injuries after fixation: A follow up study. *Int J Orthop Sci* 2020; **6**: 336-339 [DOI: 10.22271/ortho.2020.v6.i2f.2063]
- 9 **Ebina M**, Inoue A, Atsumi T, Ariyoshi K. Concomitant fat embolism syndrome and pulmonary embolism in a patient with a femoral shaft fracture. *Acute Med Surg* 2016; **3**: 135-138 [PMID: 29123766 DOI: 10.1002/ams2.127]

- 10 **Demirtas A**, Azboy I, Alemdar C, Gem M, Ozkul E, Bulut M, Uzel K. Functional outcomes and quality of life in adult ipsilateral femur and tibia fractures. *J Orthop Translat* 2019; **16**: 53-61 [PMID: [30723681](#) DOI: [10.1016/j.jot.2018.08.002](#)]
- 11 **Fraser RD**, Hunter GA, Waddell JP. Ipsilateral fracture of the femur and tibia. *J Bone Joint Surg Br* 1978; **60-B**: 510-515 [PMID: [711798](#) DOI: [10.1302/0301-620X.60B4.711798](#)]
- 12 **Kontakis GM**, Tossounidis T, Weiss K, Pape HC, Giannoudis PV. Fat embolism: special situations bilateral femoral fractures and pathologic femoral fractures. *Injury* 2006; **37** Suppl 4: S19-S24 [PMID: [16990057](#) DOI: [10.1016/j.injury.2006.08.037](#)]
- 13 **Vallier HA**, Manzano GW. Management of the Floating Knee: Ipsilateral Fractures of the Femur and Tibia. *J Am Acad Orthop Surg* 2020; **28**: e47-e54 [PMID: [31305352](#) DOI: [10.5435/JAAOS-D-18-00740](#)]
- 14 **Mohamadean A**, Beeh HA. Floating knee injuries: treatment with a single approach. *Egypt Orthop J* 2017; **52**: 6 [DOI: [10.4103/eoj.eoj_8_17](#)]
- 15 **Oh CW**, Oh JK, Min WK, Jeon IH, Kyung HS, Ahn HS, Park BC, Kim PT. Management of ipsilateral femoral and tibial fractures. *Int Orthop* 2005; **29**: 245-250 [PMID: [15928912](#) DOI: [10.1007/s00264-005-0661-7](#)]
- 16 **Yadav U**, Dhupper V, Das J, Lamba A, Gaurav, Behera KC, Devgan A, Kumar N. Bilateral floating knee: a rare case report with review of literature. *Int J Res Orthop* 2020; **6**: 851 [DOI: [10.18203/issn.2455-4510.IntJResOrthop20202035](#)]
- 17 **Muñoz Vives J**, Bel JC, Capel Agundez A, Chana Rodríguez F, Palomo Traver J, Schultz-Larsen M, Tosounidis T. The floating knee: a review on ipsilateral femoral and tibial fractures. *EFORT Open Rev* 2016; **1**: 375-382 [PMID: [28461916](#) DOI: [10.1302/2058-5241.1.000042](#)]
- 18 **Rethnam U**, Yesupalan RS, Nair R. Impact of associated injuries in the floating knee: a retrospective study. *BMC Musculoskelet Disord* 2009; **10**: 7 [PMID: [19144197](#) DOI: [10.1186/1471-2474-10-7](#)]
- 19 **Roberts CS**, Pape HC, Jones AL, Malkani AL, Rodriguez JL, Giannoudis PV. Damage control orthopaedics: evolving concepts in the treatment of patients who have sustained orthopaedic trauma. *Instr Course Lect* 2005; **54**: 447-462 [PMID: [15948472](#)]
- 20 **Chen AT**, Vallier HA. Noncontiguous and open fractures of the lower extremity: Epidemiology, complications, and unplanned procedures. *Injury* 2016; **47**: 742-747 [PMID: [26776462](#) DOI: [10.1016/j.injury.2015.12.013](#)]
- 21 **Makarewich CA**, Dwyer KW, Cantu RV. Severe neurologic manifestations of fat embolism syndrome in a polytrauma patient. *Am J Orthop* 2015; **44**: E25-8 [PMID: [25566561](#)]
- 22 **Al Shareef K**, Asadullah M, Helal M. Fat Embolism Syndrome Due to Fracture Right Femur: A Case Report. *Egypt J Hosp Med* 2017; **68**: 923-928 [DOI: [10.12816/0038192](#)]
- 23 **Mellor A**, Soni N. Fat embolism. *Anaesthesia* 2001; **56**: 145-154 [PMID: [11167474](#) DOI: [10.1046/j.1365-2044.2001.01724.x](#)]
- 24 **Gurd AR**. Fat embolism: an aid to diagnosis. *J Bone Joint Surg Br* 1970; **52**: 732-737 [PMID: [5487573](#) DOI: [10.1302/0301-620X.52B4.732](#)]
- 25 **Carlson DS**, Pfadt E. Fat embolism syndrome. *Nursing* 2011; **41**: 72 [PMID: [21403514](#) DOI: [10.1097/01.NURSE.0000395312.91409.7f](#)]
- 26 **Fowler AA**, Hamman RF, Good JT, Benson KN, Baird M, Eberle DJ, Petty TL, Hyers TM. Adult respiratory distress syndrome: risk with common predispositions. *Ann Intern Med* 1983; **98**: 593-597 [PMID: [6846973](#) DOI: [10.7326/0003-4819-98-5-593](#)]
- 27 **King MB**, Harmon KR. Usual forms of Pulmonary embolism. *Clin chest Med* 1994; **15**: 561-580 [DOI: [10.1016/s0272-5231\(21\)00949-7](#)]
- 28 **Porpodis K**, Karanikas M, Zarogoulidis P, Konoglou M, Domvri K, Mitrakas A, Boglou P, Bakali S, Iordanidis A, Zervas V, Courcousakis N, Katsikogiannis N, Zarogoulidis K. Fat embolism due to bilateral femoral fracture: a case report. *Int J Gen Med* 2012; **5**: 59-63 [PMID: [22287848](#) DOI: [10.2147/IJGM.S28455](#)]
- 29 **Chen PD**, Chen GZ, Xu YX. Study strategies for bloodletting therapy in treatment of acute soft tissue injuries. *Zhong Xi Yi Jie He Xue Bao* 2011; **9**: 237-241 [PMID: [21419074](#) DOI: [10.3736/jcim20110302](#)]
- 30 **Erqing D**, Haiying L, Zhankao Z. One hundred and eighty-nine cases of acute articular soft tissue injury treated by blood-letting puncture with plum-blossom needle and cupping. *J Tradit Chin Med* 2005; **25**: 104-105 [PMID: [16136937](#)]
- 31 **Zhou W**, Niu X, Ma J. [Blood-letting therapy combined with acupuncture for 50 cases of ankle joint sprain]. *Zhongguo Zhen Jiu* 2015; **35**: 43 [PMID: [25906566](#)]
- 32 **Karlström G**, Olerud S. Ipsilateral fracture of the femur and tibia. *J Bone Joint Surg Am* 1977; **59**: 240-243 [PMID: [845210](#) DOI: [10.2106/00004623-197759020-00018](#)]



Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA

Telephone: +1-925-3991568

E-mail: bpgoffice@wjgnet.com

Help Desk: <https://www.f6publishing.com/helpdesk>

<https://www.wjgnet.com>

