

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

Editorial Board Member of *World Journal of Clinical Cases*, Yuan-Liang Yan, MD, PhD, Academic Research, Assistant Professor, Associate Chief Pharmacist, Department of Pharmacy, Xiangya Hospital, Central South University, Changsha 410000, Hunan Province, China. yanyuanliang@csu.edu.cn

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, Reference Citation Analysis, China National Knowledge Infrastructure, China Science and Technology Journal Database, and Superstar Journals Database. The 2023 Edition of Journal Citation Reports® cites the 2022 impact factor (IF) for *WJCC* as 1.1; IF without journal self cites: 1.1; 5-year IF: 1.3; Journal Citation Indicator: 0.26; Ranking: 133 among 167 journals in medicine, general and internal; and Quartile category: Q4.

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

COPYRIGHT

© 2023 Baishideng Publishing Group Inc

INSTRUCTIONS TO AUTHORS

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

GUIDELINES FOR ETHICS DOCUMENTS

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

GUIDELINES FOR NON-NATIVE SPEAKERS OF ENGLISH

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

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>

Case Control Study

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

Yao-Min Hui, Guang Zeng, Pei-Yi Liu, Bin Chai

Specialty type: Medicine, research and experimental**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
Grade D (Fair): 0
Grade E (Poor): 0**P-Reviewer:** Ghimire R, Nepal**Received:** March 30, 2023**Peer-review started:** March 30, 2023**First decision:** July 3, 2023**Revised:** July 5, 2023**Accepted:** August 3, 2023**Article in press:** August 3, 2023**Published online:** September 6, 2023

Yao-Min Hui, Guang Zeng, Pei-Yi Liu, Bin Chai, Department of Orthopedics, Tong Ren Hospital, School of Medicine Shanghai Jiao Tong University, Shanghai 200336, China

Corresponding author: Pei-Yi Liu, MD, PhD, Academic Research, Attending Doctor, Department of Orthopedics, Tong Ren Hospital, School of Medicine Shanghai Jiao Tong University, No. 1111 Xianxia Road, Shanghai 200336, China. liupeiyi_sjtu@163.com

Abstract

BACKGROUND

Closed reduction and internal fixation with intramedullary nails has been widely accepted for treating intertrochanteric fractures.

AIM

To focus on how to avoid displacement of the lesser trochanter in unstable intertrochanteric fractures.

METHODS

We developed a lesser trochanteric reduction fixator for treating intertrochanteric fractures through fixing the lesser trochanter by combining the loop plate through the fixator after reduction by the reducer. Five patients with intertrochanteric fractures treated with the newly developed lesser trochanteric reduction fixator and loop plate combined with intramedullary nails, and 20 patients with intertrochanteric fractures treated with simple intramedullary nails were selected from December 2020 to March 2021.

RESULTS

The postoperative Harris hip score was significantly higher in patients treated with the lesser trochanteric reduction fixator than in patients treated without the lesser trochanteric reduction fixator, which indicated that this lesser trochanteric reduction fixator had a positive impact on rehabilitation of the hip joint after surgery and could significantly improve the quality of life of patients.

CONCLUSION

We fully realize the significance of trochanteric reduction and fixation, namely, reconstruction of structures under pressure, in the treatment of intertrochanteric fractures. As long as the general condition of patients is favorable and they are willing to undergo surgery, fixation of the main fracture end should be performed and the lesser trochanter should be reduced and fixed at the same time.

Key Words: Lesser trochanteric; Intertrochanteric fractures; Reduction fixator; Loop plate; Unstable fractures

©The Author(s) 2023. Published by Baishideng Publishing Group Inc. All rights reserved.

Core Tip: After reliable reduction and fixation, a newly developed lesser trochanteric reduction fixator can be introduced into the loop plate through the customized holes, and the loop plate can pass through the muscle space of the lesser trochanter, which can achieve the reduction and fixation of the lesser trochanter. This fixator can improve the quality of reducing the lesser trochanter, and the loop plate can achieve elastic fixation. There is no risk of nail breakage caused by nail fixation.

Citation: Hui YM, Zeng G, Liu PY, Chai B. Application of lesser trochanteric reduction fixator in the treatment of unstable intertrochanteric fractures. *World J Clin Cases* 2023; 11(25): 5863-5869

URL: <https://www.wjgnet.com/2307-8960/full/v11/i25/5863.htm>

DOI: <https://dx.doi.org/10.12998/wjcc.v11.i25.5863>

INTRODUCTION

As the population ages, an increase in the incidence of low-energy injuries, such as intertrochanteric fractures induced by trauma-related osteoporosis, has been reported. Based on the Evans classification system, an intertrochanteric fracture can be categorized into the following five types[1]: (1) Type I: Syn-intertrochanteric fractures; non-displaced, stable fractures that account for 11.1% of all intertrochanteric fractures; (2) Type II: Lesser trochanteric fractures, showing mild displacement and stable reduction; stable fractures that account for 17.4% of all intertrochanteric fractures; (3) Type III: Lesser trochanteric comminuted fractures, with the absence of stable reduction; unstable fractures that account for 45.1% of all intertrochanteric fractures; (4) Type IV: Type III combined with greater trochanteric fractures; unstable fractures that account for 20.1% of all intertrochanteric fractures; and (5) Type V: Reverse intertrochanteric fractures, showing a tendency for displacement due to traction of the adductor; unstable fractures which account for 6.3% of all intertrochanteric fractures. Closed reduction and internal fixation using intramedullary nails has been widely accepted for treating intertrochanteric fractures with established efficacy in clinical practice. However, there may be a lack of medial support structure in patients with types II and III intertrochanteric fractures combined with lesser trochanteric fractures. Meanwhile, the iliopsoas muscle and psoas major muscle attach to the lesser trochanter. In the short term, an unfixed lesser trochanter will affect the hip flexion function, and in the long term, it can cause coxa vara. A tendency for coxa vara has been reported after intramedullary fixation of the femur. There are clinical case reports of postoperative nail breakage caused by lateral stress concentration and fracture nonunion or delayed union caused by a bone defect in the medial wall. Currently, it is thought that these cases are related to the local defect caused by displacement of lesser trochanteric fracture fragments. Therefore, in this study, we aimed to focus on exploring an approach that can avoid lesser trochanter displacement in unstable intertrochanteric fractures, reduce the lesser trochanter during surgery, support the medial wall of the proximal femur, and avoid the development of complications.

MATERIALS AND METHODS

Newly developed lesser trochanteric reduction fixator

After consulting the relevant literature and conducting explorations in clinical practice, we developed a lesser trochanteric reduction fixator for treating intertrochanteric fractures through fixing the lesser trochanter by combining the loop plate through the fixator after reduction by the reducer (Figure 1A and B).

We have applied for a patent for the lesser trochanteric reduction fixator for intertrochanteric fractures to the China National Intellectual Property Administration (No. 202122899022.4).

General patient data

Five patients with intertrochanteric fractures treated with the newly developed lesser trochanteric reduction fixator and loop plate combined with intramedullary nails, and 20 patients with intertrochanteric fractures treated with simple intramedullary nails were selected from December 2020 to March 2021 for a 6-mo follow-up comparison.

Treatment methods

Preoperative preparation: Before surgery, all patients underwent complete routine auxiliary examinations. Data collection, measurement, and classification of X-ray and computed tomography imaging of the hip joint were performed. Besides, the diagnosis and treatment of patients complicated with internal medicine diseases were also conducted whenever necessary.

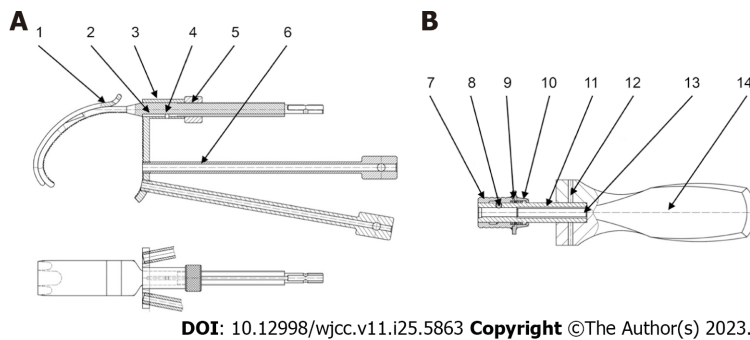


Figure 1 Computer aided design of the newly developed lesser trochanteric reduction fixator. A: Structural schematic diagram of the novel lesser trochanteric reduction fixator for the treatment of intertrochanteric fractures; B: Structural schematic diagram of the handle and connecting rod. 1: Retractor; 2: Grasping rod; 3: Movable pusher; 4: Locating rivet; 5: Movable nut; 6: Drill sleeve; 7: Movable sleeve; 8: Steel ball; 9: Spring; 10: Locking sleeve; 11: Connecting rod; 12: Rivet; 13: Inner core; 14: Handle.

Surgical methods: Surgery was performed under general anesthesia. The patient was placed in a supine position. After being anesthetized, the patient was placed on an orthopedic traction bed. Manual traction reduction was performed, followed by fluoroscopy under a C-arm machine. After at least two qualified doctors confirmed that reduction was achieved, routine disinfection and draping were performed. An opening of about 4-5 cm was made on the proximal femur, and the lesser trochanteric reduction fixator was placed to reduce the lesser trochanter and maintain the fixed state (Figure 2). Proximal femoral nail-anti-rotation Asia II or integrated cephalomedullary nail placement was completed by routine opening at fixed points of the femur. The lesser trochanteric reduction fixator was introduced into the loop plate through a guiding hole. Subsequently, the button end of the loop plate was placed at the apex of the lesser trochanter and was tightened. Then, the newly developed lesser trochanteric reduction fixator was gradually loosened to observe whether there was any displacement of the lesser trochanter. After the position was stable, the loop plate was fixed to complete the surgery.

Postoperative treatment: After surgery, antibiotics were administered as per the requirements, and anticoagulants were administered as appropriate based on venous thromboembolism scores. Physiatrists guided the patients to conduct passive movement 6-8 h after surgery, and to actively move the knee joint and conduct quadriceps femoris function exercise 24 h after surgery. From four weeks after surgery, patients walked with a partial weight-bearing walking aid with the permission of the attending physician, who judged the timing to walk with full weight-bearing according to the postoperative image data.

Statistical analysis

IBM SPSS 26 was used for data analyses. An independent samples *t*-test was used for comparison of means between groups. A *P* value of < 0.05 was considered statistically significant.

RESULTS

Patient grouping

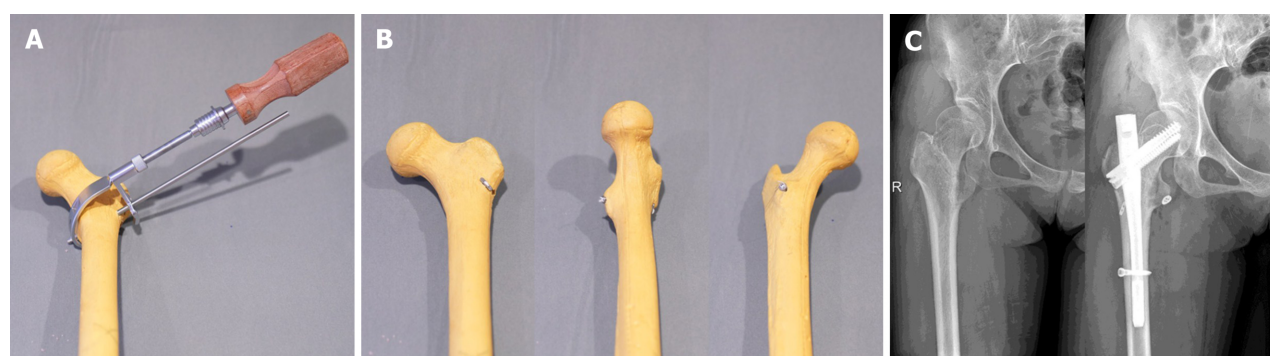
The patients were divided into either an experimental group or a control group. The experimental group comprised five patients (two males and three females; age range, 51-70 years, with an average age of 60.2 years) who experienced intertrochanteric fractures and were treated using the lesser trochanteric reduction fixator, loop plates, and intramedullary nails. These five cases included three cases with the left side affected and two cases with the right side affected.

The control group comprised 20 patients (4 males and 16 females; age range, 51-95 years, with an average age of 83.9 years) who experienced intertrochanteric fractures and were treated using simple intramedullary nails. These 20 cases included 13 cases with the left side affected and 7 cases with the right side affected.

Patient characteristics

Bone mineral density, age, fracture type, preoperative duration, operative duration, intraoperative blood loss, hospital stay, Harris hip score[2], and proximal incision length were compared between patients who were treated with and without the lesser trochanteric reduction fixator.

No significant difference was noted in age, fracture type, bone mineral density, preoperative duration, operative duration, or hospital stay between the two groups ($P > 0.05$). The postoperative Harris hip score in patients who were treated with the lesser trochanteric reduction fixator was significantly higher than that in patients who were treated without the lesser trochanteric reduction fixator ($P < 0.05$), which suggested that the lesser trochanteric reduction fixator had a positive impact on rehabilitation of the hip joint after surgery and could significantly enhance the quality of life of patients. In addition, the proximal incision in patients who were treated with the lesser trochanteric reduction fixator was larger than that in patients who were treated without the lesser trochanteric reduction fixator ($P < 0.05$). However, no



DOI: 10.12998/wjcc.v11.i25.5863 Copyright ©The Author(s) 2023.

Figure 2 Example diagram of the novel lesser trochanteric reduction fixator for treatment of intertrochanteric fractures. A: Simulation of fixed position of a fixator; B: Simulation of a loop plate through the guiding hole; C: Imaging data of surgical internal fixation.

significant difference was noted in the intraoperative blood loss between the two groups ($P > 0.05$) (Table 1).

DISCUSSION

From the perspective of mechanics, the biomechanical structure of the proximal femur is similar to that of a truss, and the calcar femorale receives support from the bony trabeculae in the posterior medial cortex of the upper femur, which is mainly the trochanter. The calcar femorale, the upper part of the femur, and three bundles of bony trabeculae form a reasonable weight-bearing system. From the biomechanical perspective, this system is the most important part to resist buckling and varus stress.

A defect in the lesser trochanter significantly compromises the biomechanical properties of the upper part of the femur. Biomechanical experiments have shown that defects in the lesser trochanter and extensive defects in the femur could induce obvious stress concentration in the upper part of the femur, increase the load strain and load displacement of the femoral head, reduce the stiffness of the femur, and impair the torsional strength and stiffness, which could decrease the mechanical performance of the femur significantly to resist external load and torsion. Severe torsional instability and failure of anti-deformation ability may cause hip instability. Defects in the lesser trochanter and extensive defects in the femur could induce femoral stress concentration. The strength could increase by 31% and 37%, respectively; femoral stiffness could decrease by 29% and 51%, respectively; and torsional strength of the femur could decrease by 33% and 54%, respectively. After fixing the lesser trochanter, stress concentration could decrease by 25% and 28%, respectively; stiffness could increase by 20% and 31%, respectively; and torsional strength could increase by 23% and 29%, respectively. Thus, significant restoration of the mechanical properties could be achieved.

Chen *et al*[3] conducted a mechanical analysis and test of type III fractures. The results showed that the average maximum load on the upper part of the femur was increased by 57% after anatomical reduction and fixation of a larger posterior medial bone block; however, the increase in the average maximum load on the upper part of the femur was 17% after anatomical reduction and fixation of a smaller posterior medial bone block. Therefore, reduction and fixation of the lesser trochanter is the key to mechanical stability of fractures. Domingo *et al*[4] simulated the femoral head under vertical compression by performing relevant experimental analysis. Besides, they measured the change in the force on the medial side of the lesser trochanter. Results showed that tensile stress on the medial side of the femoral head was obviously increased, and it reached 60% after the lesser trochanter was obviously displaced or defective. Therefore, they stated that displacement of the lesser trochanter could have a significant impact on surgical efficacy. Liu *et al*[5] suggested that the lesser trochanter is located under the calcar femorale, which is the medial cortex extending downwards from the femoral neck to the lesser trochanter. Its main function comprised ensuring that the local composition could bear a higher pressure and could transmit the force evenly to the medial femur. If the fracture affected the lesser trochanter or calcar femorale, displacement of local fracture blocks could occur, which may cause disruption of the normal physiological structure of the medial side, thus inducing coxa vara after surgery. Park *et al*[6] believed that if there was a defect in the lesser trochanter, the contralateral tension could significantly increase. In case of type II intertrochanteric fractures with lesser trochanteric defects, the contralateral tension could increase by 60%, and in case of type IV intertrochanteric fractures with lesser trochanteric defects, the contralateral tension could increase by 370%. Therefore, there may be an increase in the risk of fracture displacement, internal fixation loosening, rupture, femoral head cutting, and coxa vara as a result of only using internal fixation materials to maintain the weight load.

Reduction of the lesser trochanter is one of the most important key factors affecting fracture healing. Currently, many scholars believe that performing reduction of the lesser trochanter and restoring its anatomical function and shape are an optimal option.

Reduction of the lesser trochanter and reconstruction of calcar femorale are important for the treatment of intertrochanteric fractures. If reduction of the lesser trochanter is achieved by extensive soft tissue stripping, there will be disruption of the local blood supply to a certain extent, which would increase the fracture healing time. Although damage to the local blood supply will be reduced if the intertrochanteric fracture is fixed with a steel wire, the steel wire will

Table 1 Comparison of characteristics of patients treated with and without the lesser trochanteric reduction fixator

	Simple intramedullary nails	Lesser trochanteric reduction fixators	P value
Sex			
Male	4	3	
Female	16	2	
Age (yr)	83.95 ± 9.539	60.2 ± 7.463	0.066
Fracture location			
Left	13	3	
Right	7	2	
Bone mineral density	-1.635 ± 1.214	-1.6 ± 1.474	0.956
Preoperative duration (d)	3.6 ± 2.414	2.6 ± 0.894	0.378
Operation method			
interTAN	6	5	
PFNA	14	0	
Operative duration (min)	43.95 ± 17.251	69.4 ± 37.031	0.202
Intraoperative blood loss (mL)	81.5 ± 81.517	160 ± 54.772	0.055
Hospital stay (d)	12.85 ± 7.050	11.2 ± 3.768	0.622
Harris hip score	86.865 ± 5.653	91.94 ± 2.639	0.011
Proximal incision length (cm)	4.925 ± 0.293	6 ± 0.3536	0.000

interTAN: Integrated cephalomedullary nail; PFNA: Proximal femoral nail-anti-rotation Asia.

affect the growth of the callus and the stability will not be favorable[7-8]. If the intertrochanteric fracture is fixed with the newly developed lesser trochanteric reduction fixator combined with loop plates, damage to the blood supply will be avoided and reliable fixation will also be achieved, which will not hamper the growth of the callus and can provide certain biological tension for elastic fixation.

There are some advantages of the newly developed lesser trochanteric reduction fixator: (1) After reliable reduction and fixation, the fixator can be introduced into the loop plate through customized holes, and the loop plate can pass through the muscle space of the lesser trochanter, which can achieve reduction and fixation of the lesser trochanter; (2) This fixator can improve the quality of reduction of the lesser trochanter, and the loop plate can achieve elastic fixation; and (3) The risk of nail breakage caused by nail fixation is minimized.

CONCLUSION

We fully realize the significance of trochanteric reduction and fixation, namely, reconstruction of structures under pressure, in the treatment of intertrochanteric fractures. As long as the general condition of patients is favorable and they are willing to undergo surgery, fixation should be carried out at the main fracture end and the lesser trochanter should be reduced and fixed at the same time. Some foreign scholars have proposed another method for performing nail fixation through a medial incision. However, as a medial incision causes greater trauma, we advocate that the lateral intra-medullary nail incision should be appropriately lengthened and the soft tissue should be properly stripped from the anterior and posterior aspects of the greater trochanter, followed by placement of the newly developed lesser trochanteric reduction fixator.

ARTICLE HIGHLIGHTS

Research background

We invented a new device for better treatment of femoral intertrochanteric fractures. During the treatment of intertrochanteric fractures, we fully realize the significance of trochanteric reduction and fixation, namely, reconstruction of structures under pressure.

Research motivation

As long as the general condition of patients is suitable and they are willing to undergo surgery, fixation should be carried out at the main fracture end and the lesser trochanter should be reduced and fixed at the same time. Some foreign scholars have proposed another method for performing nail fixation through a medial incision. However, as a medial incision causes larger trauma, we advocate that the lateral intramedullary nail incision shall be appropriately lengthened and the soft tissue shall be properly stripped from the anterior and posterior aspects of the greater trochanter, followed by placement of the newly developed lesser trochanteric reduction fixator.

Research objectives

We aimed to focus on how to avoid displacement of the lesser trochanter in unstable intertrochanteric fractures.

Research methods

IBM SPSS 26 was used for data analyses. An independent samples *t*-test was used for comparison of means between groups. A *P* value of < 0.05 was considered statistically significant.

Research results

The postoperative Harris hip score in patients who were treated with the lesser trochanteric reduction fixator was significantly higher than that in patients who were treated without the lesser trochanteric reduction fixator (*P* < 0.05), which indicated that the lesser trochanteric reduction fixator had a positive impact on rehabilitation of the hip joint after surgery and could significantly improve the quality of life of patients. In addition, the proximal incision in patients who were treated with the lesser trochanteric reduction fixator was larger than that in patients who were treated without the lesser trochanteric reduction fixator (*P* < 0.05).

Research conclusions

We fully realize the significance of trochanteric reduction and fixation, namely, reconstruction of structures under pressure, in the treatment of intertrochanteric fractures. As long as the general condition of patients is favorable and they are willing to undergo surgery, fixation should be carried out at the main fracture end and the lesser trochanter should be reduced and fixed at the same time. Some foreign scholars have proposed another method for performing nail fixation through a medial incision. However, as a medial incision causes greater trauma, we advocate that the lateral intramedullary nail incision should be appropriately lengthened and the soft tissue should be properly stripped from the anterior and posterior aspects of the greater trochanter, followed by placement of the newly developed lesser trochanteric reduction fixator.

Research perspectives

This newly developed lesser trochanteric reduction fixator has some advantages: (1) After reliable reduction and fixation, this fixator can be introduced into the loop plate through the customized holes, and the loop plate can pass through the muscle space of the lesser trochanter, which can achieve reduction and fixation of the lesser trochanter; and (2) This fixator can improve the quality of reduction of the lesser trochanter, and the loop plate can achieve elastic fixation. There is no risk of nail breakage caused by nail fixation.

ACKNOWLEDGEMENTS

We thank Medjaden Inc. for scientific editing of this manuscript.

FOOTNOTES

Author contributions: Liu PY designed the study, wrote the main manuscript text, and prepared the figures; Hui YM prepared the utility model patents tool for surgery; Zeng G prepared the surgery; Chai B collected the data and performed the statistical analysis; all authors have read and approved the final manuscript.

Institutional review board statement: The Institutional Review Board of the TongRen Hospital, School of Medicine Shanghai Jiao Tong University approved this study, and it was conducted in accordance with the Declaration of Helsinki. All participants provided written informed consent before their data were stored in our hospital database and used for study purposes.

Informed consent statement: All participants provided written informed consent before their data were stored in our hospital database and used for study purposes.

Conflict-of-interest statement: The authors declare no competing interests for this article.

Data sharing statement: The generated and analysed datasets are available from the corresponding author upon reasonable request.

STROBE statement: The authors have read the STROBE Statement—checklist of items, and the manuscript was prepared and revised

according to the STROBE Statement—checklist of items.

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: China

ORCID number: Yao-Min Hui 0000-0002-1815-875X; Pei-Yi Liu 0000-0003-1072-3889.

S-Editor: Lin C

L-Editor: Wang TQ

P-Editor: Zhang YL

REFERENCES

- 1 **Evans EM.** The treatment of trochanteric fractures of the femur. *J Bone Joint Surg Br* 1949; **31B**: 190-203 [PMID: 18150534]
- 2 **Harris WH.** Traumatic arthritis of the hip after dislocation and acetabular fractures: treatment by mold arthroplasty. An end-result study using a new method of result evaluation. *J Bone Joint Surg Am* 1969; **51**: 737-755 [PMID: 5783851]
- 3 **Chen WH, Guo WX, Gao SH, Wei QS, Li ZQ, He W.** Arthroplasty vs proximal femoral nails for unstable intertrochanteric femoral fractures in elderly patients: A systematic review and meta-analysis. *World J Clin Cases* 2021; **9**: 9878-9888 [PMID: 34877326 DOI: 10.12998/wjcc.v9.i32.9878]
- 4 **Domingo LJ, Cecilia D, Herrera A, Resines C.** Trochanteric fractures treated with a proximal femoral nail. *Int Orthop* 2001; **25**: 298-301 [PMID: 11794263 DOI: 10.1007/s002640100275]
- 5 **Liu X, Liu Y, Pan S, Cao H, Yu D.** Does integrity of the lesser trochanter influence the surgical outcome of intertrochanteric fracture in elderly patients? *BMC Musculoskelet Disord* 2015; **16**: 47 [PMID: 25879412 DOI: 10.1186/s12891-015-0492-7]
- 6 **Park SY, Yang KH, Yoo JH, Yoon HK, Park HW.** The treatment of reverse obliquity intertrochanteric fractures with the intramedullary hip nail. *J Trauma* 2008; **65**: 852-857 [PMID: 18849802 DOI: 10.1097/TA.0b013e31802b9559]
- 7 **Kim GM, Nam KW, Seo KB, Lim C, Kim J, Park YG.** Wiring technique for lesser trochanter fixation in proximal IM nailing of unstable intertrochanteric fractures: A modified candy-package wiring technique. *Injury* 2017; **48**: 406-413 [PMID: 27887702 DOI: 10.1016/j.injury.2016.11.016]
- 8 **Cho SH, Lee SH, Cho HL, Ku JH, Choi JH, Lee AJ.** Additional fixations for sliding hip screws in treating unstable pertrochanteric femoral fractures (AO Type 31-A2): short-term clinical results. *Clin Orthop Surg* 2011; **3**: 107-113 [PMID: 21629470 DOI: 10.4055/cios.2011.3.2.107]



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>

