ISSN 2218-5836 (online)

World Journal of *Orthopedics*

World J Orthop 2024 October 18; 15(10): 902-1000

Published by Baishideng Publishing Group Inc

World Journal of Orthopedics

Contents

Monthly Volume 15 Number 10 October 18, 2024

World Journal of Orthopedics

Monthly Volume 15 Number 10 October 18, 2024

Contents

ABOUT COVER

Editorial Board Member of *World Journal of Orthopedics*, Kai Cao, MD, PhD, Professor, Department of Orthopaedics, The First Affiliated Hospital of Nanchang University, Nanchang 330002, Jiangxi Province, China.
kaichaw@126.com

AIMS AND SCOPE

The primary aim of *World Journal of Orthopedics* (*WJO*, *World J Orthop*) is to provide scholars and readers from various fields of orthopedics with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJO mainly publishes articles reporting research results and findings obtained in the field of orthopedics and covering a wide range of topics including arthroscopy, bone trauma, bone tumors, hand and foot surgery, joint surgery, orthopedic trauma, osteoarthropathy, osteoporosis, pediatric orthopedics, spinal diseases, spine surgery, and sports medicine.

INDEXING/ABSTRACTING

WJO is now abstracted and indexed in PubMed, PubMed Central, Emerging Sources Citation Index (Web of Science), Scopus, Reference Citation Analysis, China Science and Technology Journal Database, and Superstar Journals Database. The 2024 Edition of Journal Citation Reports® cites the 2023 journal impact factor (JIF) for *WJO* as 2.0; JIF Quartile: Q2. The *WJO*'s CiteScore for 2023 is 3.1.

RESPONSIBLE EDITORS FOR THIS ISSUE

NAME OF JOURNAL
World Journal of Orthopedics

ISSN
ISSN 2218-5836 (online)

LAUNCH DATE
November 18, 2010

FREQUENCY
Monthly

PUBLICATION DATE
October 18, 2024

PUBLISHING PARTNER
The Minimally Invasive Spine Surgery Research Center Of Shanghai Jiaotong University

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

POLICY OF CO-AUTHORS
https://www.wjgnet.com/bpg/GerInfo/310

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

PUBLISHING PARTNER's OFFICIAL WEBSITE
https://www.shtrhospital.com/zkjs/info_29.aspx?itemid=647

World Journal of Orthopedics

Submit a Manuscript: https://www.f6publishing.com

World J Orthop 2024 October 18; 15(10): 997-1000

DOI: 10.5312/wjo.v15.i10.997

ISSN 2218-5836 (online)

LETTER TO THE EDITOR

Conversion hip arthroplasty for failed nailing of intertrochanteric fracture: Reflections on some important aspects

Fu-Chun Yang

Specialty type: Orthopedics

Provenance and peer review: Invited article; Externally peer reviewed.

Peer-review model: Single blind

Peer-review report's classification

Scientific Quality: Grade A, Grade B

Novelty: Grade B, Grade B

Creativity or Innovation: Grade B, Grade B

Scientific Significance: Grade A, Grade B

P-Reviewer: Jiang Q; Li F

Received: May 26, 2024

Revised: September 3, 2024

Accepted: September 12, 2024

Published online: October 18, 2024

Processing time: 137 Days and 15.2 Hours

Fu-Chun Yang, Department of Orthopedic Trauma and Hand Surgery, The First Affiliated Hospital of Guangxi Medical University, Nanning 530021, Guangxi Zhuang Autonomous Region, China

Corresponding author: Fu-Chun Yang, MD, PhD, Chief Doctor, Professor, Department of Orthopedic Trauma and Hand Surgery, The First Affiliated Hospital of Guangxi Medical University, No. 6 Shuangyong Road, Nanning 530021, Guangxi Zhuang Autonomous Region, China. yangfuch89@163.com

Abstract

In this editorial, I present my comments on the article by Solarino *et al*. Conversion hip arthroplasty, which is an optional salvage procedure performed following unsuccessful fixation of intertrochanteric femur fractures in elderly patients, entails more complex processes and higher rates of operative complications than primary arthroplasty. Hence, it is important to consider the appropriateness of the primary treatment choice, as well as the adequacy of nailing fixation for intertrochanteric fractures. This article briefly analyzes the possible factors contributing to the nailing failure of intertrochanteric fractures and attempts to find corresponding countermeasures to prevent fixation failures. It also analyzes the choice of treatment between nailing fixation and primary arthroplasty for intertrochanteric fractures.

Key Words: Intertrochanteric femur fracture; Femoral nailing fixation; Primary hip arthroplasty; Conversion hip arthroplasty; Failed internal fixation; Treatment reflection

Core Tip: As a complex salvage procedure following the failed nailing of intertrochanteric femur fractures, conversion hip arthroplasty calls for reflections on the primary treatment of these fractures, including the choice of treatment approaches; however, the most important of these considerations are the reasons leading to failed nailing fixation and the measures that can be taken to prevent the failure.

Citation: Yang FC. Conversion hip arthroplasty for failed nailing of intertrochanteric fracture: Reflections on some important aspects. *World J Orthop* 2024; 15(10): 997-1000
URL: https://www.wjgnet.com/2218-5836/full/v15/i10/997.htm
DOI: https://dx.doi.org/10.5312/wjo.v15.i10.997

TO THE EDITOR

As proposed by Solarino *et al*[1], to avoid the increased risk of internal fixation failure, the complexity of revision surgery, and the high rate of complications, primary hip arthroplasty is a preferred treatment option in elderly patients with unstable intertrochanteric femur fractures.

WHY CONVERSION HIP ARTHROPLASTY?

Indeed, as for the surgical procedure, conversion hip arthroplasty following unsuccessful intertrochanteric nailing fixation is much more complex than primary arthroplasty, as evidenced by the complicated processing of hardware removal, operative exposure, fracture nonunion or malunion, bone defect, varus deformity, poor bone stock, and disuse osteopenia[2]. All of these problems, which render the prosthesis implanting particularly challenging and technically demanding, inevitably result in more surgical bleeding, a longer operation time, and a higher rate of procedure-related complications, ultimately affecting the surgical outcome and treatment cost[3]. It is true that for patients with high life expectancy, good bone quality, and remaining bone store, revision fixation is a viable option; however, revision fixation also entails implant removal, deformity correction, and fracture re-fixation, probably requiring simultaneous osteotomy or bone grafting/cement augmentation to improve fixation stability[4,5]. Moreover, this surgical procedure again carries the risk of nonunion and/or loss of fixation, which is a devastating outcome that is unacceptable for frail elderly patients. Therefore, conversion arthroplasty is a safer surgical option, including hemi-arthroplasty and total hip arthroplasty, depending on the physical conditions and functional demand of the patients, as well as whether they have concomitant hip arthritis and damaged articular surface[6].

REFLECTION ON PRIOR TREATMENT

As a complex salvage procedure following the failure of intertrochanteric fixation, conversion arthroplasty poses great challenges to both the orthopedic surgeon and the affected patient. Hence, it is important to consider the appropriateness of the previous treatment strategy and the adequacy of surgical fixation. The outcome of surgical fixation for an intertrochanteric fracture is affected by a number of factors, including patient-related factors such as the fracture pattern and bone quality, surgery-related factors such as reduction quality of the fracture, placement and selection of fixation devices, and postoperative management[7,8] (Table 1). First, the fracture pattern and bone quality determine the selection of surgical methods for intertrochanteric fractures. If the current conditions make it impossible to securely fix an intertrochanteric fracture, the only way out will be primary arthroplasty. Of course, a detailed assessment of the fracture is extremely important to determine the suitability of internal fixation. For example, the study of bone mineral density in cadaveric femora, as a measure of osteoporosis, has shown that there is a high risk of a screw cutout after osteosynthesis for pertrochanteric fractures if the mineral density of bones is less than 250 mg/cm^3[9]. Furthermore, if the fracture pattern and comminution do not meet the basic requirements for reduction and fixation, primary arthroplasty is the likely choice of treatment. Second, the appropriateness of surgical fixation is a prerequisite for achieving a fracture union, which requires high-quality reduction of the fracture and correct placement of the fixation nail[10]. The failure modalities of trochanteric nailing fixation include cutout (50.65%), non-union (17.56%), peri-implant fracture (16.20%), cut-through (10.80%), and femoral head avascular necrosis (2.70%)[1]. These complications may be more or less related to defective surgical treatment, such as unsatisfactory fracture reduction, inappropriate choices, and/or suboptimal placements of fixation devices. Although there is currently no general consensus on the quality criteria for reducing unstable intertrochanteric fractures, considerable attention has been paid to well-reduced posteromedial cortical calcar and the restoration of the neck- shaft angle, which are very important for the stability of the fracture fixation[8,10]. Recently, Chang *et al*[11] have proposed modified quality criteria for reducing unstable pertrochanteric fractures, emphasizing the importance of an positive anteromedial cortical support which is conducive to fracture reduction and resistance to the loss of neck-shaft angle. Today, given its biomechanical advantage over extramedullary fixation devices such as a sliding hip screw, the cephalomedullary nail is the predominant fixation device of choice for unstable intertrochanteric fractures. However, different cephalomedullary nails with characteristic designs have shown varying degrees of risk of certain complications such as cutout and nail breakage[12]. Importantly, the correct placement of the blade or screw, combined with high-quality reduction, is crucial for minimizing the risk of cutout[12]. Third, postoperative management, including protective hip joint functional rehabilitation and anti-osteoporosis treatment, is also of great significance to prevent bone loss and loosening of nail fixation[13].

Table 1 Factors affecting the outcome of surgical fixation of an intertrochanteric fracture

Factors	Specific content
Patient-related factors	Age, sex, comorbidities, fracture pattern and comminution, intactness of lateral wall, bone quality, osteoporosis
Surgery-related factors	Reduction quality of the fracture, placement and selection of fixation devices, tip-apex distance
Postoperative management	Protective hip joint functional rehabilitation and anti-osteoporosis treatment

Table 2 Advantages and disadvantages of nailing fixation *vs* primary arthroplasty for an intertrochanteric fracture

	Operative time	Blood loss	Postoperative bedridden time	Re-operative rate	Long-term effect	Applicability preference
Nailing fixation	Shorter	Less	Longer	Comparable	Comparable or superior	Younger patients with lower-grade fracture pattern, good bone quality, fewer comorbidities, higher functional demands, and longer life expectancy
Primary arthroplasty	Longer	More	Shorter	Comparable	Comparable	Elderly patients with higher-grade fracture pattern, poor bone quality, more comorbidities, lower functional demands, and shorter life expectancy

NAILING FIXATION *VS* PRIMARY ARTHROPLASTY

In fact, most unstable intertrochanteric fractures can achieve good to excellent outcomes, provided that the three aspects mentioned above are well executed. The overall rate of complications for re-operation associated with nailing fixation is 2%-10%[14], which is almost similar to 2%-15% with primary arthroplasty for unstable intertrochanteric fractures[14]. Even a systematic review and meta-analysis revealed that PFN fixation yields better functional outcomes (based on the Harris hip score) after fracture healing than primary arthroplasty does over a long follow-up period[15]. Indeed, as two optional procedures for unstable intertrochanteric fractures, nailing fixation and primary arthroplasty have their respective advantages and disadvantages (Table 2), and the differences consist mainly in the duration of the operation and the duration of being bedridden, with nailing fixation prevailing in shorter operative time and primary arthroplasty prevailing in earlier full weight-bearing and mobilization[16]. Therefore, nailing fixation is still the current mainstream treatment option for intertrochanteric fractures[17]. After determining the surgical procedure by considering the patient's age, fracture pattern, bone quality, comorbidities, functional demands, life expectancy, and the necessary surgical conditions, detailed preoperative planning should be made, which is critical to ensuring surgical success and technical excellence.

FUTURE PERSPECTIVES

Complications following surgical treatment of intertrochanteric femur fractures are associated not only with the surgical methods but also with the characteristics of the implants[18]. Surgical implants are constantly being improved and new implants are being developed continuously, which will lead to improvements in surgical techniques and outcomes accordingly. Complications after nailing fixation are frustrating but are by no means insoluble. The key is to identify the causes and recognize the related risk factors, and take preventive measures to prevent the occurrence of these complications; otherwise, if it is in any way unavoidable, turning directly to primary arthroplasty is justified. There is still much to be explored and understood about the treatment of intertrochanteric fractures, especially reduction and fixation. We hope that in the future a well-established protocol of detailed quantitative evaluations of patients with intertrochanteric fractures will be of great benefit to the precise selection of suitable surgical methods, so that intertrochanteric fractures can be treated with the best strategy and a standardized procedure to achieve optimal surgical outcomes.

CONCLUSION

As a complex salvage procedure following unsuccessful intertrochanteric fixation, conversion arthroplasty requires deep reflections on the appropriateness of the primary treatment choice, and the most important of these considerations is the analysis of the causes that led to the failed nailing and the search for countermeasures to prevent failure.

FOOTNOTES

Author contributions: There is only one author.

Conflict-of-interest statement: The author declares that there is no conflict of interest.

Country of origin: China

ORCID number: Fu-Chun Yang 0000-0003-3245-2426.

S-Editor: Liu JH
L-Editor: A
P-Editor: Zhao YQ

REFERENCES

1 **Solarino G**, Bizzoca D, Dramisino P, Vicenti G, Moretti L, Moretti B, Piazzolla A. Total hip arthroplasty following the failure of intertrochanteric nailing: First implant or salvage surgery? *World J Orthop* 2023; **14**: 763-770 [PMID: 37970621 DOI: 10.5312/wjo.v14.i10.763]
2 **Liu P**, Jin D, Zhang C, Gao Y. Revision surgery due to failed internal fixation of intertrochanteric femoral fracture: current state-of-the-art. *BMC Musculoskelet Disord* 2020; **21**: 573 [PMID: 32828132 DOI: 10.1186/s12891-020-03593-8]
3 **Douglas SJ**, Remily EA, Sax OC, Pervaiz SS, Delanois RE, Johnson AJ. How Does Conversion Total Hip Arthroplasty Compare to Primary? *J Arthroplasty* 2021; **36**: S155-S159 [PMID: 33422393 DOI: 10.1016/j.arth.2020.12.023]
4 **Haidukewych GJ**, Berry DJ. Salvage of failed internal fixation of intertrochanteric hip fractures. *Clin Orthop Relat Res* 2003; 184-188 [PMID: 12838070 DOI: 10.1097/01.blo.0000071753.41516.27]
5 **Lionel L**, Guido C, Rodrigo B, Danilo T, Jorge B, Carlos S. Salvage procedure for cut-through after surgical fixation of trochanteric fractures with TFN. *Eur J Orthop Surg Traumatol* 2022; **32**: 611-618 [PMID: 34052921 DOI: 10.1007/s00590-021-03021-0]
6 **Luthringer TA**, Elbuluk AM, Behery OA, Cizmic Z, Deshmukh AJ. Salvage of failed internal fixation of intertrochanteric hip fractures: clinical and functional outcomes of total hip arthroplasty versus hemiarthroplasty. *Arthroplast Today* 2018; **4**: 383-391 [PMID: 30186926 DOI: 10.1016/j.artd.2018.06.002]
7 **Lähdesmäki M**, Ylitalo AA, Karjalainen L, Uimonen M, Mattila VM, Repo JP. Intramedullary Nailing of Intertrochanteric Femoral Fractures in a Level I Trauma Center in Finland: What Complications Can be Expected? *Clin Orthop Relat Res* 2024; **482**: 278-288 [PMID: 37582281 DOI: 10.1097/CORR.0000000000002792]
8 **Zhang W**, Antony Xavier RP, Decruz J, Chen YD, Park DH. Risk factors for mechanical failure of intertrochanteric fractures after fixation with proximal femoral nail antirotation (PFNA II): a study in a Southeast Asian population. *Arch Orthop Trauma Surg* 2021; **141**: 569-575 [PMID: 32296964 DOI: 10.1007/s00402-020-03399-2]
9 **Konstantinidis L**, Papaioannou C, Blanke P, Hirschmüller A, Südkamp NP, Helwig P. Failure after osteosynthesis of trochanteric fractures. Where is the limit of osteoporosis? *Osteoporos Int* 2013; **24**: 2701-2706 [PMID: 23702701 DOI: 10.1007/s00198-013-2392-8]
10 **Baumgaertner MR**, Curtin SL, Lindskog DM. Intramedullary versus extramedullary fixation for the treatment of intertrochanteric hip fractures. *Clin Orthop Relat Res* 1998; 87-94 [PMID: 9553538]
11 **Chang SM**, Zhang YQ, Ma Z, Li Q, Dargel J, Eysel P. Fracture reduction with positive medial cortical support: a key element in stability reconstruction for the unstable pertrochanteric hip fractures. *Arch Orthop Trauma Surg* 2015; **135**: 811-818 [PMID: 25840887 DOI: 10.1007/s00402-015-2206-x]
12 **Murena L**, Moretti A, Meo F, Saggioro E, Barbati G, Ratti C, Canton G. Predictors of cut-out after cephalomedullary nail fixation of pertrochanteric fractures: a retrospective study of 813 patients. *Arch Orthop Trauma Surg* 2018; **138**: 351-359 [PMID: 29273922 DOI: 10.1007/s00402-017-2863-z]
13 **Chen X**, Hu Y, Geng Z, Su J. The "Three in One" Bone Repair Strategy for Osteoporotic Fractures. *Front Endocrinol (Lausanne)* 2022; **13**: 910602 [PMID: 35757437 DOI: 10.3389/fendo.2022.910602]
14 **Palm H**. Hip Fracture: The Choice of Surgery. 2020 Aug 21. In: Orthogeriatrics: The Management of Older Patients with Fragility Fractures [Internet]. Cham (CH): Springer; 2021 [PMID: 33347220]
15 **Kumar P**, Rajnish RK, Sharma S, Dhillon MS. Proximal femoral nailing is superior to hemiarthroplasty in AO/OTA A2 and A3 intertrochanteric femur fractures in the elderly: a systematic literature review and meta-analysis. *Int Orthop* 2020; **44**: 623-633 [PMID: 31201487 DOI: 10.1007/s00264-019-04351-9]
16 **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]
17 **Nie B**, Wu D, Yang Z, Liu Q. Comparison of intramedullary fixation and arthroplasty for the treatment of intertrochanteric hip fractures in the elderly: A meta-analysis. *Medicine (Baltimore)* 2017; **96**: e7446 [PMID: 28682912 DOI: 10.1097/MD.0000000000007446]
18 **Chapman T**, Zmistowski B, Krieg J, Stake S, Jones CM, Levicoff E. Helical Blade Versus Screw Fixation in the Treatment of Hip Fractures With Cephalomedullary Devices: Incidence of Failure and Atypical "Medial Cutout". *J Orthop Trauma* 2018; **32**: 397-402 [PMID: 30035756 DOI: 10.1097/BOT.0000000000001193]

Published by **Baishideng Publishing Group Inc**
7041 Koll Center Parkway, Suite 160, Pleasanton, CA 94566, USA
Telephone: +1-925-3991568
E-mail: office@baishideng.com
Help Desk: https://www.f6publishing.com/helpdesk
https://www.wjgnet.com