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The choice of locking plate in the treatment of *peri*-implant femoral fracture eight years after *trans*-trochanteric rotational osteotomy: A case report[☆]

Takeshi Utsunomiya (M.D.)^a, Takuaki Yamamoto (Ph.D.) (M.D.)^{b,*},
Goro Motomura (Ph.D.) (M.D.)^a, Kazuyuki Karasuyama (Ph.D.) (M.D.)^a,
Kazuhiko Sonoda (M.D.)^a, Yusuke Kubo (M.D.)^a, Hiroyuki Hatanaka (M.D.)^a,
Yukihide Iwamoto (Ph.D.) (M.D.)^c

^a Department of Orthopaedics Surgery, Graduate School of Medical Sciences, Kyushu University, 3-1-1 Maidashi, Higashi-ku, Fukuoka 812-8582, Japan

^b Department of Orthopaedic Surgery, Faculty of Medicine, Fukuoka University, 7-45-1 Nanakuma, Jonan-ku, Fukuoka 814-0180, Japan

^c Department of Orthopaedic Surgery, Kyushu Rosai Hospital, 1-1 Sonekita-machi, Kokuraminami-ku, Kitakyushu 800-0296, Japan

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ABSTRACT

INTRODUCTION: Transtrochanteric anterior rotational osteotomy of the femoral head (TRO) was developed as a joint preserving surgery for osteonecrosis of the femoral head. To the best of our knowledge, *peri*-implant fractures after femoral osteotomy have rarely been reported.

PRESENTATION OF CASE: We report a 58-year-old female who suffered a *peri*-implant femoral shaft fracture following a fall from a stepladder eight years after TRO. Fracture union was achieved six months after a preferred proximal femoral locking plate.

DISCUSSION: The entry point of the ante-grade femoral nail would have been very close to the new position of the nutrient artery of the femoral head occasioned by the TRO and to avoid injury, we chose proximal femoral locking plate.

CONCLUSION: It is important to consider the new position of the nutrient artery of the femoral head in the surgical planning of *peri*-implant fracture after TRO.

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1. Introduction

Transtrochanteric rotational osteotomy of the femoral head (TRO) was developed by Sugioka in 1978 as a joint preserving procedure for osteonecrosis of the femoral head (ONFH) [1]. In the Sugioka's original technique, the osteotomized site was fixed with large cancellous screws [1]. To obtain more rigid fixation, we started using the plate system in 2002, which enabled starting partial weight-bearing two weeks earlier after TRO compared to the original procedure as well as shortening the periods of hospitalization without major complications [2].

The removal of the plate system after bone union is not routinely performed unless the patients have symptoms in our institution. More than half of 150 TRO cases have been followed with remain-

ing the plate and the other underwent removal surgery because of discomfort around the hip plate. To the best of our knowledge, *peri*-implant fractures after femoral osteotomy have rarely been reported. We herein report a rare case that experienced a *peri*-implant femoral shaft fracture occurred with trauma eight years after TRO.

2. Presentation of case

A 51-year-old female (height: 153 cm, weight: 52 kg, body mass index: 22.2 kg/m²) has been on corticosteroids (maximum dose of 60 mg/day) for systemic lupus erythematosus since the age of 30. The oral administration of alendronate and active vit D3 for corticosteroid induced osteoporosis was started when she was 50 years old. She underwent TRO based on the diagnosis with stage-3A ONFH at the age of 51 [3]. TRO was conventionally performed using K-MAX Adjustable Angle Hip Screw system (K-MAX AA Hip Screw; Japan Medical Materials, Osaka, Japan), which consists of an 8.5 mm lag screw and a lateral plate [2]. She had an uncomplicated postoperative course, and was performing normal daily activities

[☆] Investigation performed at the Department of Orthopaedics Surgery, Graduate School of Medical Sciences, Kyushu University, 3-1-1 Maidashi Higashi-ku, Fukuoka 812-8582, Japan.

* Corresponding author.

E-mail address: yamataku@ortho.med.kyushu-u.ac.jp (T. Yamamoto).

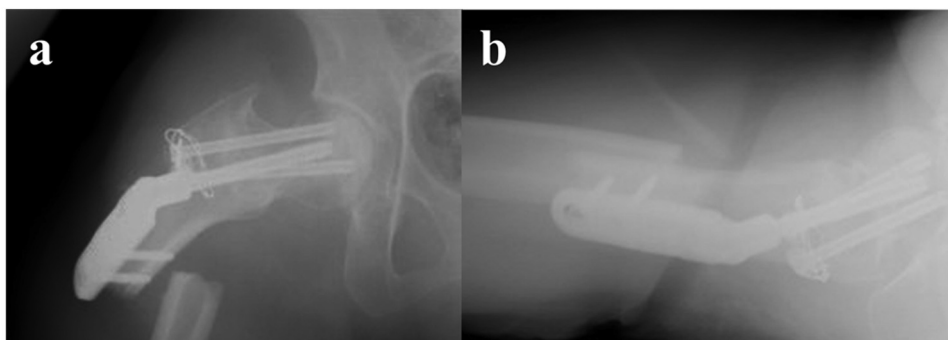


Fig. 1. (a, b) Radiograph at the time of the *peri*-implant femoral fracture with trauma. (a) A radiograph showed the transverse fracture originated from the most distal screw. (b) The lateral view.

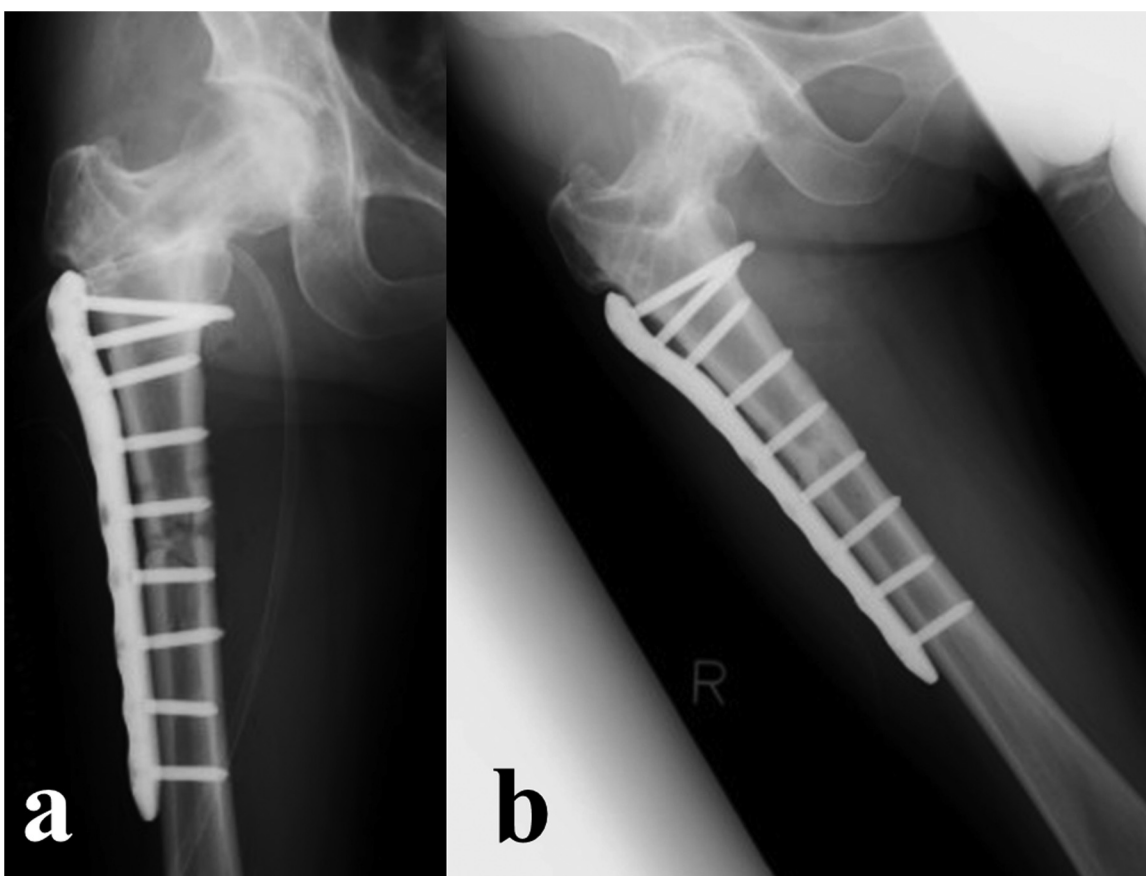


Fig. 2. (a, b) Anteroposterior radiograph after the osteosynthesis. (a) An immediate postoperative radiograph after osteosynthesis. (b) A radiograph taken about one year of follow-up shows that the bone union was achieved with preservation of the hip joint.

nine months after the operation. Because she had no trouble with the implant, the K-MAX AA Hip Screw was not removed. On the follow-up radiographs, bone union at the site of transtrochanteric osteotomy was seen with remodeling of the hip joint. The lumbar bone mineral density (BMD) was 0.520 g/cm^2 (67% of the young adult mean) when she was 57 years old.

When the patient was 58 years old, she fell down from five steps up on a stepladder, which was over 50 centimeters high from the ground, and experienced severe hip pain. On the radiographs after the injury, a transverse fracture of the femoral shaft was found around the distal screw of the K-MAX AA Hip Screw (Fig. 1). Based on the diagnosis of a *peri*-implant femoral shaft fracture, she underwent osteosynthesis using a locking plate (Fig. 2a). She was allowed partial weight-bearing at five weeks after the operation. On the

radiographs obtained at six months after the operation, bone union at the site of fracture was confirmed (Fig. 2b). In the last follow-up at one year, she was performing her normal activities of daily living.

3. Discussion

Peri-implant fractures after osteosynthesis for proximal femoral fracture have been well-documented. Robinson et al. reported that the incidence of *peri*-implant fractures following the insertion of a compression hip screw for proximal femoral fractures was 4.46 per 1000 persons-years [4]. In that study, about 50% of the fractures occurred around the distal end of the lateral plate [4]. Parker et al. also showed that a secondary fracture around the plate system occurred 1.9% of patients with an intracapsular fracture of the hip

[5]. On the other hand, to the best of our knowledge, *peri*-implant fractures after femoral osteotomy have rarely been reported.

According to previous reports demonstrating the vasculature of the proximal femur after TRO using the angiography [6–8], the nutrient artery of the femoral head is located at the trochanteric fossa, which is generally very close to the entry point of ante-grade femoral nail [9,10]. Therefore, we preferred a locking plate osteosynthesis to ante-grade nailing so that damage to the nutrient artery could be avoided.

Regarding the other osteosynthesis implants for the treatment of femoral fracture after TRO, a retro-grade nail can be an optimal device by reason of preserving the nutrient artery as well as the locking plate. A retro-grade nail has an advantage of preventing a secondary fracture after osteosynthesis, since it is not necessary to remove the old implant with the exception of the two screws of the side plate.

In conclusion, it is important to consider the new position of the nutrient artery of the femoral head in the surgical planning of *peri*-implant fracture after TRO.

Conflict of interest

None.

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Ethical approval

The present case report was approved by our institutional review board.

Consent

Written informed consent was obtained the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Author contribution

Dr. Utsunomiya and Dr. Motomura, and collected data of this patient. Dr. Karasuyama, Dr. Kubo and Dr. Hatanaka analysed the data. Dr. Yamamoto and Dr. Iwamoto supervised the writing.

Dr. Utsunomiya and Dr. Sonoda were contributors in writing the manuscript. All authors read and approved the final manuscript.

Guarantor

Dr. Yamamoto.

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