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Non-union after correction of femoral deformity combined with total knee arthroplasty

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ABSTRACT

In knee arthritis with extra-articular deformity of the femur, total knee arthroplasty becomes more challenging. Simultaneous femoral deformity correction and TKA can be a complex procedure. We present a case in which TKA and femoral osteotomy for varus femoral deformity were performed simultaneously. Non-union in the osteotomy portion occurred after the operation. Teriparatide therapy and low intensity pulsed ultrasound therapy was administered after a diagnosis of non-union. Bony union was partially obtained at 29 months after surgery.

Keywords:

Total Knee Arthroplasty, extra-articular deformity, osteotomy, nonunion

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Introduction

Complications after femoral fracture include fracture nonunion or malunion and limb shortening. Complication can cause osteoarthritis (OA) of the hip, knee or ankle. In severe knee OA, we may perform total knee arthroplasty (TKA) in many cases. Although many TKA cases can be aligned with soft tissue balancing, a severe femoral deformity may preclude this procedure. TKA becomes more challenging when OA is associated with an extra-articular deformity of the femur. Simultaneous femoral deformity correction and TKA can be a difficult procedure [6,7,8,10]. We present a case in which TKA and femoral osteotomy for varus femoral deformity were

performed simultaneously.

Case report

A 63-year-old man presented with severe pain in the right knee and gait disturbance. The patient had had a femoral fracture from a traffic accident, and undergone conservative therapy (skeletal traction) 47 years previously. After the treatment, he had 15° varus deformity, but there had been no symptoms. He had worked as a fisherman. He had had faint pain in the right knee five years previously. The pain was increasing. He was diagnosed with OA at a nearby hospital and received conservative treatment but no improvement was observed. Therefore, he was referred to our department for surgery.



Figure 1 Radiograph of long lower limb

As for physical findings, the right lower limb alignment deformity was 15° varus and more 15° more external rotation than the left side. Swelling and tenderness were observed in the right knee. The range of motion was limited from 15 to 105°. The patellofemoral joint had no problem. Muscle

weakness of the lower limb was not significant. He had a leg length discrepancy, with a spica-malleolar disturbance of 3 cm shorter in the right side than in the left side. The knee-rating scale of the Hospital for Special Surgery (HSS) was 66.



Figure 2 Postoperative radiograph of the right knee showing femoral osteotomy combined with TKA.



Figure 3 Postoperative radiograph of the right knee showing non-union in the osteotomy portion.

A hip-to-ankle standing x-ray image 3 (Figure 1). The anatomical lateral distal demonstrated a severe varus deformity in the left femoral angle (FTA) was 191°. The right leg was distal femur with a Kellgren-Lawrence OA grade 26.4 mm shorter than the left.



Figure 4 Postoperative CT scan showing non-union in the osteotomy portion at 9 months after the surgery

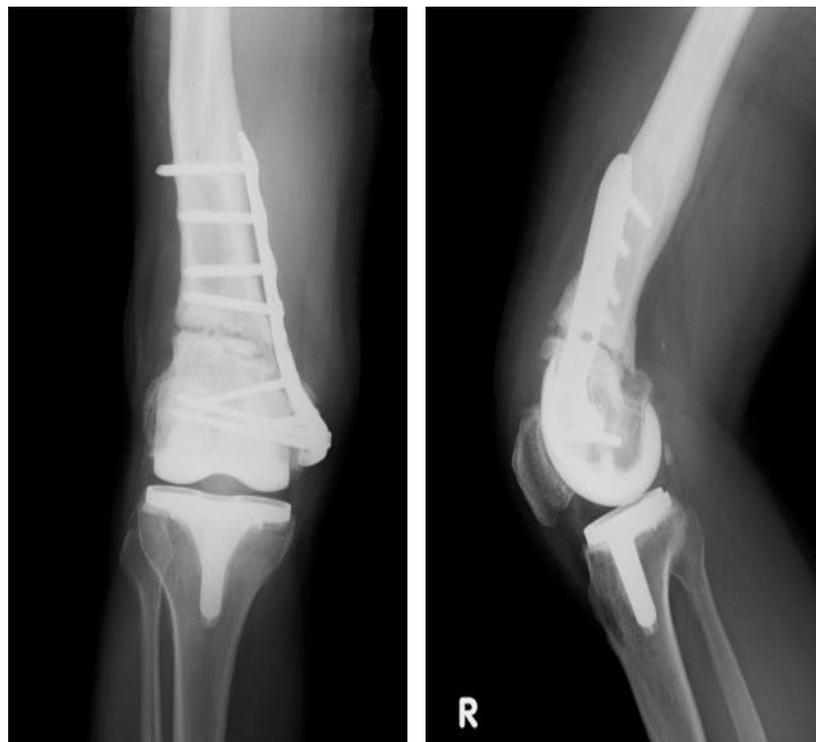


Figure 5 Postoperative radiograph at 24 months after the surgery

TKA was performed using Physio Knee CS type (Kyocera Co., Japan) with cement. The patella was not replaced. After TKA, a medial opened wedge osteotomy was performed as an oblique osteotomy at 3 cm above the supracondylar ridge. The osteotomy gap site was filled with artificial (β -TCP) and autologous bone graft and fixed with a locking plate (Zimmer NCB) (Figure 2).

After the operation, a knee brace was put on the right leg for 2 weeks. ROM exercise and partial weight bearing was started with a long leg brace. However, the ROM of the right knee was limited to 0-80° with no swelling or tenderness.

He had no pain in his knee joint 9 months after the surgery. However, bridging callus had not filled the osteotomy gap on x-ray and CT (Figure 3, 4). It was considered that non-union in the osteotomy portion had occurred. The patient was reluctant to reoperate and consented to teriparatide therapy (20 μ g subcutaneous injection daily) and low intensity pulsed ultrasound (LIPUS) therapy (20 min/d). LIPUS therapy was performed for 1 year. After then, only teriparatide therapy was continued. Bony union was partially obtained on x-ray at 29 months after surgery (Figure 5). He had no pain in his knee joint, and HSS score was 92.

Discussion

In most TKA for severe osteoarthritis with intra-articular deformity, alignment and ligamentous balancing can be achieved with appropriate

bone cuts and soft tissue releases. TKA for severe osteoarthritis associated with severe extra-articular deformity has been reported to be technically difficult [6,7,8,10]. Correction of alignment of the lower extremity can be accomplished by osteotomy of either the distal part of the femur or the proximal part of the tibia. However, it is impossible to accomplish treatment for severe osteoarthritis with extra-articular deformity solely by osteotomy. For severe OA and correction of femoral deformity, femoral osteotomy and TKA have to be performed. The options for this procedure are two methods. One is simultaneous femoral osteotomy and TKA, the other is correction of the femur followed by staged TKA. In this case, simultaneous femoral osteotomy and TKA was chosen. Lonner reported that this procedure was a technically difficult but effective treatment, and recommended that the femoral osteotomy site be secured with a plate or a locked intramedullary nail [1,4]. Also, a case of non-union in a femoral diaphyseal osteotomy was reported. Papadopoulos demonstrated that patients with malunited femoral fractures had a high complication rate for subsequent TKA. The non-union of the osteotomy site is a risk [2]. Associating femoral osteotomy combined with TKA, the non-union of distal femoral osteotomy is explained by a deficiency in the osteotomy fixation. There are 2 methods of distal femoral osteotomy: closed wedge and open wedge. In

this case, the open wedge method was chosen. The patient had a leg length discrepancy. Had closed wedge osteotomy been performed, the contact area between the bone extremities would have been good, but the leg length discrepancy would have increased. In this case, distal femoral open wedge osteotomy combined with TKA was performed. The leg length discrepancy and malrotation improved. Lonner recommended that the femoral osteotomy site be secured with a plate or a locked intramedullary nail [1]. In distal femoral open wedge osteotomy, an intramedullary nail cannot be used and a locking plate must be used. An appropriate locking plate is not available, so we used an inverted tibial locking plate. The gap in the open-wedge osteotomy part was filled with artificial bone (β -TCP) + autogenous bone. However, non-union in the osteotomy portion occurred as a complication. Lee and Naruse reported that teriparatide could be an alternative to surgical intervention in non-union of the femur [3,5]. Nozaka reported combined therapy with teriparatide and LIPUS may become a useful option in the treatment of elderly patients with lower limb fractures [9]. Teriparatide therapy and LIPUS therapy was administered for 12 months after a diagnosis of nonunion. Finally, bone union was obtained 29 months after the operation. Combined therapy with teriparatide and LIPUS could be an alternative to surgical intervention in non-union or delayed union of the

femur.

Conclusion

Simultaneous femoral deformity correction and TKA can be a difficult procedure. We performed the correction of the femoral deformity combined with total knee arthroplasty simultaneously. Non-union in the osteotomy portion occurred. Teriparatide therapy and LIPUS therapy were administered, and bone union was obtained 29 months after the operation. The nonunion of the osteotomy site is a risk. Combined therapy with teriparatide and LIPUS may become a useful option in non-union or delayed union of the femur.

Disclosure

Conflict of interest

Takatomo Mine	None
Ryutaro Kozuma	None
Koichiro Ihara	None
Hiroyuki Kawamura	None
Ryutaro Kuriyama	None
Yasunari Tominaga	None

References

1. Lonner JH, Siliski JM, Lotke PA. Simultaneous femoral osteotomy and total knee arthroplasty for treatment of osteoarthritis associated with severe extra-articular deformity. *J Bone Joint Surg Am* 2000;82:342-348
2. Papadopoulos EC, Parvizi J, Lai CH, Lewallen DG. Total knee arthroplasty following prior femoral fracture. *Knee* 2002;9:267-274

3. Y.-K. Lee, Y.-C. Ha, K.-H. Koo. Teriparatide, a nonsurgical solution for femoral nonunion? A report of three cases. *Osteoporos Int* 2012;23:2897-2900
4. Stephen J. Incavo, Carl Kapadia, Robert Torney. Use of an intramedullary Nail for Correction of Femoral Deformities Combined with Total Knee Arthroplasty A Technical Tip. *J Arthroplasty* 2007;22:133-135
5. Naruse K, Uchino M, Hirakawa N, Toyama M, et al. The Low-intensity Pulsed Ultrasound (LIPUS) Mechanism and the Effect of Teriparatide on Fracture healing. *J Orthop Trauma* 2016;30 S3
6. Wang JW, Wang CL. Total knee arthroplasty for arthritis of the knee with extra-articular deformity. *J Bone Joint Surg* 2002;84:1769-1774.
7. Mann JW 3rd, Insall JN, Scuderi GR. Total knee arthroplasty in patients with associated extra-articular deformity. *Orthop Trans* 1997;21:59
8. Wolff AM, Hungerford DS, et al. The effect of extraarticular varus and valgus deformity on total knee arthroplasty. *Clin Orthop* 1991;272:35
9. Nozaka K, Shimada K, Miyakoshi N, Yamada S, et al. Can combined therapy with teriparatide and low-intensity pulsed ultrasound (LIPUS) accelerate fracture healing? *J Orthop Trauma*. 2016;30:S2
10. Bottros J, Klika AK, Lee HH, et al. The use of navigation in total knee arthroplasty for patients with extra-articular deformity. *J Arthroplasty* 2008;23:74

