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Early Loosening after Total Knee Arthroplasty with Minimal Incision Surgery: A Report of Two Cases and A Review of the Literature

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Abstract

Advances in surgical techniques and equipment have recently encouraged the use of minimal incision surgery (MIS) in total knee arthroplasty (TKA). However several complications have been reported following MIS, among which, early loosening is one of the most serious issues. We report two cases that experienced early loosening of the tibial component within three months of surgery, and received revision surgery within three years of primary MIS TKA. The cases were compared with 50 other cases which received MIS TKAs by the same technique, and it was hypothesized the failures in the two relatively young patients may have been caused by virus implantation of the tibiae component and a large bony cut in the proximal tibia, possibly as a result of limited working space during surgeries.

Keywords: Minimum incision surgery; Total knee arthroplasty; Early loosening

Introduction

The conventional surgical approach for total knee arthroplasty (TKA) has traditionally involved a relatively long midline incision, a medial parapatellar arthrotomy, patellar eversion, and tibiofemoral dislocation. Although this surgical approach is more extensive, it allows for excellent visualization, component orientation, fixation, and has been associated with remarkable long-term implant survival [1-3]. Numerous short-term results after TKA with minimal incision surgery (MIS) have now appeared in the literature, and most claim a number of advantages of MIS over conventional TKA including reduced blood loss, perioperative pain and narcotic use, a shorter length of hospital stay, and earlier return of function [4-12]. The main focus of most authors supporting MIS TKA has been improved patient satisfaction, whereas certainly many patients expect no increase in the complication rate.

Among complications with the use of MIS technique, early loosening is one of the most serious issues affecting patient satisfaction. Whereas substantial component misalignment may occur using MIS technique because of the limited working space [13-15], early loosening which needs revision surgery is rarely reported. Here, we report two patients who experienced loosening of the tibial component in the early phase after surgery resulting in revision surgery within three years of MISTKA. We also discuss the cause of failure and compare the failure cases with fifty successful MIS-TKAs performed in the same series at our institution.

Case Reports

Case 1

A 71-year-old woman was suffering from severe osteoarthritis of the right knee with varus deformity. Her past medical history was unremarkable. Before operation, range of motion (ROM) was -30 degrees in extension to 95 degrees in flexion. Femorotibial angle (FTA) was 192 degrees (Figure 1a).

TKA with MISquadriceps-sparing (QS) technique using side-cutting instrumentation (NexGen LPS Flex, Zimmer, Warsaw, IN, USA) was performed. Radiographs taken the day after surgery revealed the tibial component was implanted with 4 degrees of varus and 4 degrees of posterior slope (Figure 1b). Three months after the surgery, a radiolucent area below the tibial component was apparent on the follow-up radiograph (Figure 1c), and 8 months after the operation, sinking of the tibial component was obviously confirmed. At that time, FTA was 187 degrees (Figure 1d). Although we observed her clinical

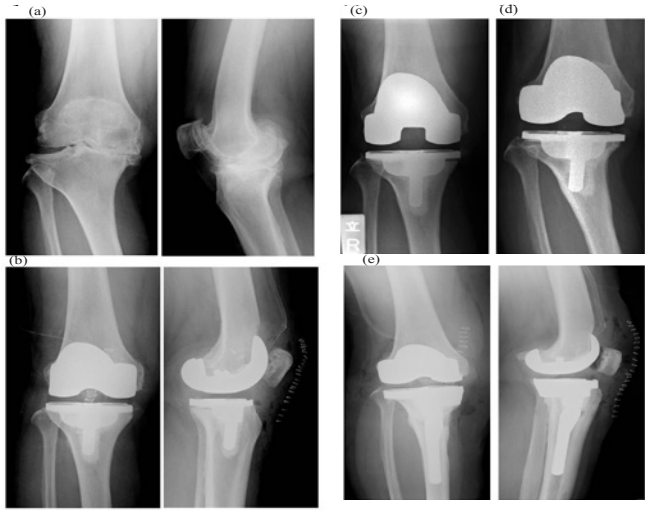

Figure 1 Case 1. (a) Plain radiographs taken prior to primary TKA surgery. (b) Plain radiographs taken after the primary TKA surgery. Tibial component was implanted with 4 degrees of varus and 4 degrees of posterior slope.(c)Three months after primary TKA. Radiolucency below the tibial component was clearly observed. (d) Eight months after primary TKA. A sinking of the tibial component and varus deformity had occurred. (e) Approximately 2.5 years after initial TKA, tibial component revision was

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course for about 2 years, the patient experienced instability and gait pain leading to difficulties walking. Therefore, we performed a revision of the tibial component with the use of a long stem component and metal augmentation (NexGen LCCK, Zimmer, Warsaw, IN, USA) approximately 2 years and 6 months after the initial surgical treatment (Figure 1e). After revision of the tibial component, the patient was able to walk without pain and returned to her daily life.

Case 2

A 62 year-old-woman experienced severe osteoarthritis of the left knee with varus deformity. Her past medical history was unremarkable. Before operation, ROM was -10 in extension to 115 degrees in flexion, and FTA was 187 degrees (Figure 2a). We performed TKA with MIS-QS technique using side-cutting instrumentation (NexGen LPS Flex, Zimmer, Inc,. Warsaw, IN). Radiographs taken the day after the surgery revealed the tibial component was implanted with 2 degrees of varus and 5 degrees of posterior slope (Figure 2b). Three months after surgery, varus sinking of the tibial component was apparent on the radiographs (Figure 2c), and 9 months post operation, increased loosening of the tibial component was observed on radiographs (Figure 2d). One year after the initial surgery, because of gait difficulties, revision of the tibial component was performed with the use of long stem component and metal augmentation (NexGen LCCK, Zimmer, Inc,. Warsaw, IN) (Figure 2e). After the operation, the patient could walk smoothly and return to daily activities.

Discussion

While there is evidence of some short-term benefits after MIS-TKA when conducted by experienced surgeons, there is concern that about a possible increase in complications as use of the MIS technique becomes more wide spread [13,14,16-19]. Serious early complications have occurred even for leading surgeons, including vascular injury, patellar tendon injury, condyle fracture, and wound necrosis [14,20]. Early loosening after MIS-TKA is one of the most serious complications. The MIS technique has been reported to increase the rate of component malalignment [13], however, there have been few reports regarding the actual rate of revision. Added to that, the rate of complications may vary among different MIS techniques such as midvastus, subvastus, limited parapatellar, and QS approach.

Foran et al. reported that 1.5% of primary TKA-MIS were revised for early aseptic loosening of the tibial component, and the mean time to revision was 17 months in their series [21]. In the current researchers' facilities, between December 2006 and July 2007 50 consecutive TKAs were performed with the side-cutting device (NexGen LPS-flex, Zimmer) using a MIS QS approach. Two patient's experienced tibial loosening in less than 3 months without any other causes of component loosening such as infection, and both cases required revision surgery within three years. Barrack et al. reported that time to failure was dramatically different between MIS (14 months) and surgery performed through a standard incision (80 months) [15]. It has been argued that previously published MIS TKA studies may have presented best-case scenarios of what can be achieved in selected cases by experienced surgeons [13-15,17-19]. In such successful series, early failure or revision has been reported in less than 1% of cases.

It has been previously reported that patients who received MIS TKA resulting in early loosening were younger than successful cases [15]. In our current cases, early failure also occurred in patients at the comparatively younger end of the age spectrum (Figure 3). Dalury and Dennis also attribute this early loosening to greater than 3 degrees of tibialvarus [13]. They reported greater than 3 degrees of tibialvarus in four of 30 MIS TKAs and warned of the potential for compromising long-term results [13]. Substantial tibialvarus has been shown to correlate with increased polyethylene wear and tibial component loosening [13]. In our cases, we performed varus implantation of the tibial component in one of the early failed cases matching Dalury and Dennis' findings. However, in the other case, varusalignment of the tibial component was less than 3 degrees thus the reason for early loosening could not be explained only by varus alignment.

At our institution we always measure the amount of bony cut of the proximal tibia. In our early failed cases, the amounts were comparatively larger than those of the non-failed cases (Figure 4). In our recent study, using an offset type tensor which could preserve a more physiological post-operative condition of the knee with the patella-femoral joint

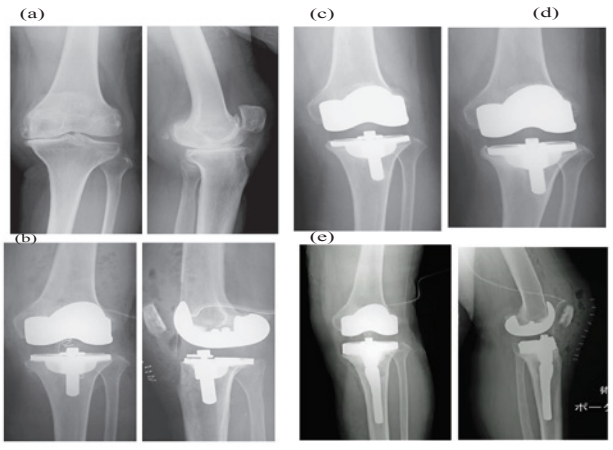

Figure 2 Case 2. (a) Before primary TKA surgery. (b) After primary TKA surgery. Tibial component was implanted with2 degrees of varus and 5 degrees of posterior slope. (c)Three months after the primary TKA. A radiolucent area below the tibial component was clearly observed. (d) 9 months after the primary TKA. A sinking of the tibial component and varus deformity had occurred. (e) A year after initial TKA tibial component revision was performed.

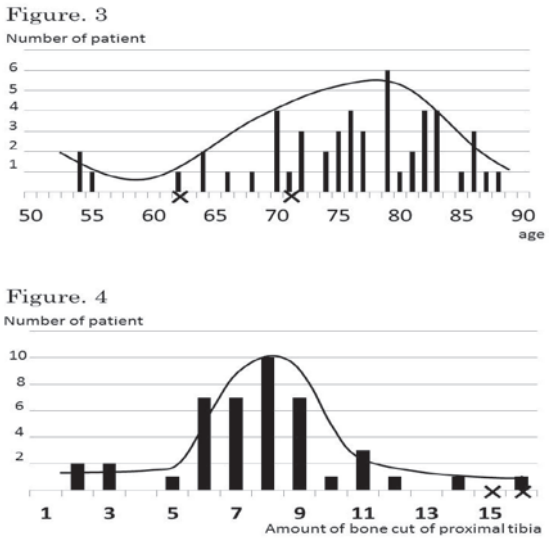

Figure 3 Age of Patient population in our series. The two cases with very early failure were within the younger age band (cross marks).

reduced and the femoral component in place [22-24], the intra-operative kinematic pattern of soft tissue balance observed for MIS QS showed more varus imbalance compared with conventional TKA [25]. It is hypothesized that the limited working space in MIS QS TKA may compel surgeons to avoid a larger femoral component, and select larger bony cuts, which leads to difficulties in acquiring appropriate soft tissue balancing. Considering these features, our cases with early loosening may be partly related to the large amount of tibial bony cut and varus imbalance due to the limited working space available in MIS QS TKA.

Conclusion

We experienced two (4.0%) cases with early tibial loosening after MISQS TKA in a one year period. Our series suggests that varus implantation of the tibia and a large bony cut of the proximal tibia in comparatively younger patients may lead to early loosening of the tibial component.

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