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CASE REPORT

Ryota Takatori · Daisaku Tokunaga · Tatsuya Hojo
Kazuya Ikoma · Koji Nagasawa · Toshikazu Kubo

Utility of grommets for implant arthroplasty of the great toe in a patient with rheumatoid arthritis: a case report

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Abstract We report a case of rheumatoid arthritis treated by bilateral flexible hinge toe implant arthroplasty, using grommets only on one side, which resulted in bilateral fractures requiring removal of the implants 6.5 years after the surgery. Both implants were completely fractured at the bottom of the distal stems. Macroscopically, synovitis was present around both fractured stems, although the severity of synovitis and fragmentation of the fractured implant was relatively mild on the right side in which grommets were used. The shape of the body of the fractured implant was relatively preserved on the right side in which grommets were used. There was no damage or fracture of the grommets. The grommet might have acted to prevent pressures and scratches that would cause synovitis and deformity of the body of the implant, but might not completely prevent fractures of implants.

Key words Flexible hinge toe implant · Grommet · Rheumatoid arthritis

Introduction

Flexible hinge toe implants, introduced by Swanson,[1] have been utilized for arthroplasty of the great toe in patients with rheumatoid arthritis. Press-fit titanium grommets have been added as an option for implant arthroplasty in order to prevent complications, including fracture of the implant and silicone synovitis. However, only a few reports have been published describing the outcome of the operation using grommets. This report describes a case of rheumatoid arthritis treated by replacement of bilateral flexible hinge implant, with grommets only on one side, resulting in bilateral fracture and removal of the implants 6.5 years after the surgery.

R. Takatori · D. Tokunaga (✉) · T. Hojo · K. Ikoma · K. Nagasawa · T. Kubo
Department of Orthopaedics, Graduate School of Medical Science, Kyoto Prefectural University of Medicine, 465 Kajii-cho, Kawaramachi-Hirokoji, Kamigyo-ku, Kyoto 602-8566, Japan
Tel. +81-75-251-5549; Fax +81-75-251-5841
e-mail: dai@koto.kpu-m.ac.jp

Case report

A 70-year-old Japanese woman who had rheumatoid arthritis since 1985 was treated with low doses of oral corticosteroids and methotrexate. She had been diagnosed as fulfilling the 1987 American College of Rheumatology (formerly, the American Rheumatism Association) criteria and was Stage 4 and Class II on the Steinbrocker classification. Despite good control of the disease activity, valgus deformities and triangular toe deformities of the bilateral toes progressed. Figure 1 shows preoperative radiographs (non-weight bearing). The hallux valgus angles (HVA) were 36° on the right and 41° on the left. The first intermetatarsal angles (IMA) were 15° on the right and 19° on the left. Implant arthroplasty (without grommets) combined with resection arthroplasty of the metatarsophalangeal (MTP) joints of the lesser toes was performed on the left great toe on April 1, 1996. One month later, the same procedure was performed using grommets, which had become available in Japan at that time, for the right great toe. Postoperative radiographs (non-weight bearing, 3 months after surgery on the left side, 2 months after that on the right side) are shown in Fig. 2. HVA were 26° on the right and 23° on the left, IMA were 13° on the right and 13° on the left. Pain disappeared and the patient was satisfied with the result. In October 2001, valgus deformities of the bilateral great toes appeared without any precipitating incident and a radiograph showed fractures of both implants. Since the patient did not complain of severe pain, insole plasters were applied, but valgus deformities and pain worsened over time (Fig. 3). Removal of the implants and resection arthroplasty for the MTP joints of the bilateral great toes were performed on November 9, 2002. Both implants were completely fractured at the bottom of the distal stems and were easily removed. No damage or fracture of the grommets were found (Figs. 4 and 5). Around the stems and bodies of the implants, mild syno-

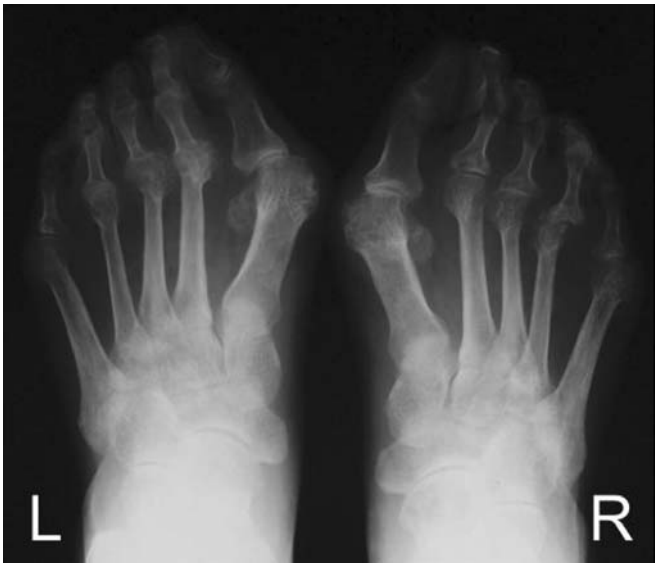

Fig. 1. Preoperative radiographs (non-weight bearing). Hallux valgus angles (HVA) were 36° on right and 41° on left, intermetatarsal angles (IMA) were 15° on right and 19° on left. The Larsen score of both first metatarsophalangeal joints were grade 3

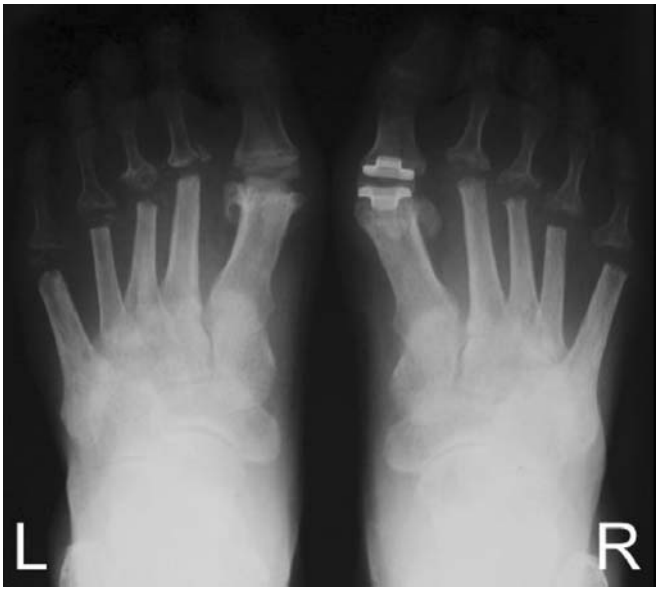

Fig. 2. Postoperative radiographs (non-weight bearing). Hallux valgus angles were 26° on right and 23° on left, IMA were 13° on right and 13° on left

vitis with brown discoloration was found. Tissue specimens around the fractured stems were stained with hematoxylin–eosin. Microscopic examination demonstrated inflammatory cell infiltration, with giant cells that encapsulated foreign body particles that are assumed to be fragments of the implant being detected. Severity of synovitis and fragmentation of the fractured implant were relatively mild on the right side in which grommets were used (Fig. 6).

At the recent follow-up (2 years after the revision surgeries), the patient complained of mild pain around osteophytes of the resected first metatarsus while walking, but is able to walk for more than 500 m.

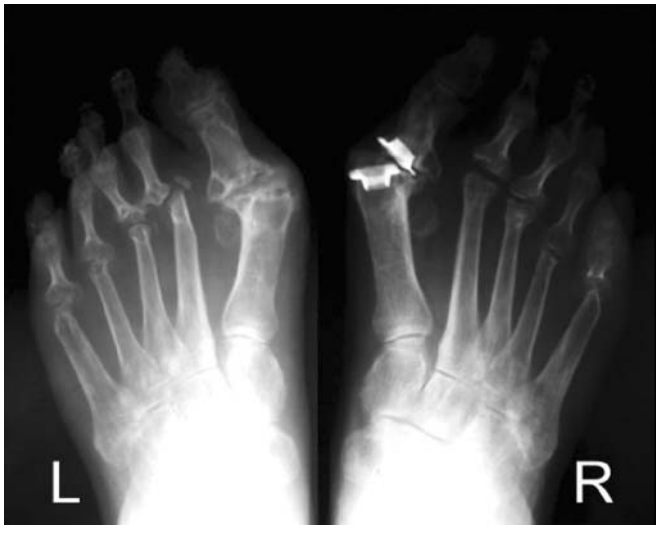

Fig. 3. Radiographs before revision surgeries. Hallux valgus angles were 34° on right and 40° on left, IMA were 16° on right and 15° on left

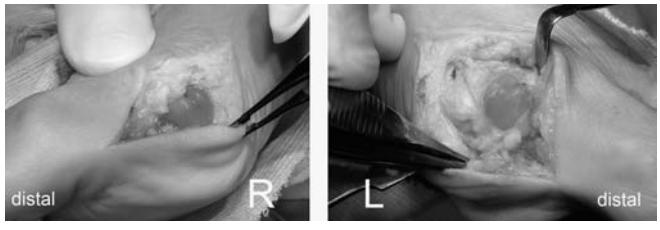

Fig. 4. Findings during revision surgeries. **Left** Right toe implant with grommets. **Right** Left toe without grommets

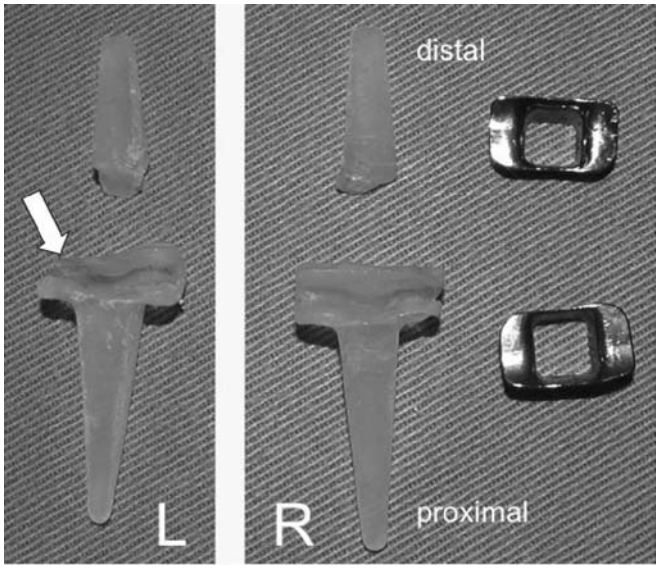

Fig. 5. Removed implants and grommets. *Arrow* indicates severe deformity at the body of implant, in which side grommets were not utilized

Discussion

For valgus deformities of the first metatarsophalangeal joint in patients with rheumatoid arthritis, arthrodesis of the

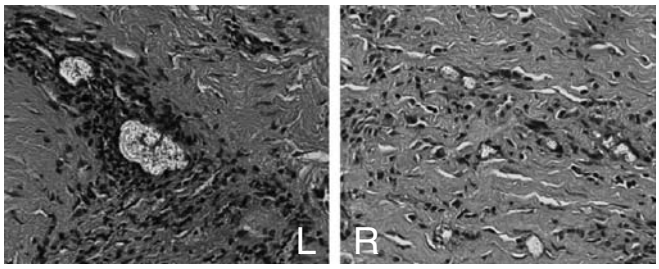

Fig. 6. Microscopic findings stained with hematoxylin–eosin. **Left** Left side without grommets. **Right** Right side with grommets. There was inflammatory cell infiltration with giant cells in tissue specimens around the fractured stems, which was relatively reduced on the right side, in which grommets were used

MTP joint, resection arthroplasty, and implant arthroplasty are considered. Implant arthroplasty has the merit of correcting deformity and preserving mobility of the MTP joint, which enables the step-off motion of the great toe. However, complications of the implants such as fracture of the implants and silicone synovitis have been reported in the long-term results.[2–7] To resolve these problems, press-fit titanium grommets have been utilized since 1985 to cover the bone edge of the bone to prevent damage of the implant.[8–11] These grommets have been available since 1996 in Japan and we have started applying this device to the patients with rheumatoid arthritis.

We performed arthroplasty of the first MTP joint for 30 feet of 18 patients with rheumatoid arthritis (all women) using a flexible hinged toe implant with grommets between 1996 and 2003. The average age of patients at the time of surgery was 61 (range 33–77) years. At the average follow-up period of 3 years (range 6 months to 7 years 6 months), 29 implants with grommet (97%) survived, while one implant (present case) required removal. In the case we report, preoperative radiographs show 36° (right side) and 41° (left side) HVA and 15° (right side) and 19° (left side) IMA under non-weight-bearing conditions. These angles would be larger under weight-bearing conditions. In some cases showing large HVA and IMA even after adequate release of the adductor tendon and capsular repair, recurrence of the valgus deformity occurs over the long term. In those cases, continuous shearing force onto the distal stem of the implant may eventually cause implant fracture. For those cases, additional surgical procedures to decrease IMA such as metatarsal osteotomy might be considered.

Regarding the utility of grommets, Swanson et al.[8,9] described 90 cases undergoing surgery using grommets with an average follow-up of 2.4 years, and reported good results with no implant fractures. Ishikawa et al.[10] described postmortem findings in a rheumatoid arthritis patient 2.5 years after MTP joint arthroplasty with flexible hinge toe implants, one side with grommets and the other side without grommet. They examined bone/implant interfaces microscopically and found silicone particles within the fibrous tissue, and a tear and significant scuffing of the implant surface in the joint without grommets, but such changes were not detected in the joint with grommets. They concluded that such findings suggested that grommets improve implant durability and prevent silicone synovitis.

In the present case we reported that fracture of the implants was found radiologically 5 years postoperatively, and recurrence and worsening of valgus deformities resulted in osteophyte formations around the first proximal interphalangeal bone and metatarsal bone, requiring removal of the implants. Implants were fractured bilaterally at the bottom for distal stem and the grommet did not prevent fracture of the stem. The reasons for the fractures of the implants in the present case might include the preoperative severity of valgus deformity and the relatively high activity level of the patient following successful control of the disease activity.

The grommet might not completely prevent implant fractures because it could not reduce continuous shearing force on the stem of the implant. However, the shape of the body of the implant was relatively preserved on the side in which the grommets were used. Microscopically, there was synovitis in tissue specimens around both fractured stems, whose severity was relatively reduced on the right side in which grommets were used. The grommet might have acted to prevent pressure and scratches that would cause synovitis and deformity of the body of the implant.

Several reports of positive clinical outcomes following arthroplasty with grommets have been published.[8,9,11] However, the number of cases that require removal or replacement of the implant is likely to increase over the long term. Further long-term follow-up studies for the surgery using grommets are needed.

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