

Interference of Union after the Use of Beta-Tricalcium Phosphate Block in High Tibial Osteotomy

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High tibial osteotomy (HTO) is a commonly used treatment for genu varum and medial compartment osteoarthritis. Recently open wedge HTO has been the preferred method due to its facilitated technique, fewer neurovascular and joint injuries, etc. In open wedge HTO materials such as autogenous, allogeneous bone graft and tricalcium phosphate (TCP) are used to help with bone union and have a role in filling in the empty space. However the authors of this study report on two cases of nonunion 1 year after HTO using TCP block.

Key words: high tibial osteotomy, tricalcium phosphate, nonunion

For many years patients with medial compartment osteoarthritis and varus deformity have been successfully treated with high tibial osteotomy (HTO).¹⁾ Recently, opening-wedge osteotomy has been mentioned to be more advantageous than closing wedge technique.²⁾ Open wedge HTO has been more popular and with good results due to the development of locking plate.³⁾

However the disadvantage of open wedge HTO is the empty space on the proximal tibia which is needed to be filled in with a spacer to gain union (autograft, allograft, etc.).⁴⁾ Recently, hydroxyapatite (HAp) and beta-tricalcium phosphate (TCP) blocks are being used to fill the vacant space and through studies, TCP ceramics were shown to have superior absorption rate and osteoconductivity.¹⁾

The authors report two patients who had a non-union at the osteotomy site after the HTO using a TCP block.

The patient received arthroscopic partial meniscectomy for medial meniscus posterior root tear, and arthroscopic chondroplasty for medial femoral condyle chondral lesion. Correction of 11° was made in order to move weight bearing line to 62% lateral of the proximal tibia. To achieve 11° correction, 13 mm is required, which is the osteotomy site length (6.2 cm) multiplied by the tangent 11°. Opening-wedge HTO with TOMOFIX (Synthes, Oberdorf, Switzerland), and 13 mm TCP block (Synthes) insertion was performed (Fig. 1).

For the initial 6 weeks, partial weight bearing with crutch was

CASE REPORT

1. Case 1

A 53-year-old woman was admitted due to left knee pain. The range of knee motion was 0° to 115° and medial joint line tenderness was positive.



Figure 1. Open wedge high tibial osteotomy performed using a 13 mm tricalcium phosphate block with locking plate.

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permitted and range of motion exercise was performed. After 6 weeks, tolerable weight bearing was allowed and muscle strengthening exercise was done.

At 12 months after surgery, on the plain radiograph, nonunion of the wedge was seen (Fig. 2). Implant removal was performed. Most of the TCP blocks were nonabsorbed. Remaining TCP was removed, and then a 3×2 cm vacant space was observed intraoperatively (Fig. 3). The space due to nonunion was untouched because the good union state of the other portions.

At 3 months after implant removal and anteroposterior radiograph also showed a radiolucent space with a well maintained cor-

rection angle (Fig. 4).

2. Case 2

A 55-year-old woman was admitted due to right knee pain. The range of knee motion was 14° to 98° and medial joint line tenderness was positive. The patient had a varus angle of 8.1° and Kellgren–Lawrence grade 2 OA change.

The patient received arthroscopic partial meniscectomy for medial meniscus tear, arthroscopic microfracture for medial femoral condyle chondral lesion, and HTO with TOMOFIX (Synthes), TCP block (10 mm) for genu varum (Fig. 5).



Figure 2. Nonunion around the edges of the tricalcium phosphate block after 1 year was shown in a simple radiograph.



Figure 4. An anteroposterior radiograph at 3 months after implant removal was checked and the well maintained space was observed.



Figure 3. An intraoperative image of the nonunion shown in the wedge space.



Figure 5. An anteroposterior radiograph at 3 months after implant removal was checked and the well maintained space was observed.



Figure 6. An anteroposterior radiograph before implant removal was performed.

At 12 months, radiolucency was seen around the spacer on the plain radiograph (Fig. 6). Implant removal was done and TCP from the nonunion site was removed. The space due to nonunion was untouched because the good union state of the other portions.

At 3 months after implant removal, standing anteroposterior radiograph also showed a radiolucent space and a well maintained angle (Fig. 7).

DISCUSSION

HTO is a procedure which is performed in patients with medial compartment degenerative disease, osteoarthritis, and varus deformity which delay the time until TKA is needed. Many studies have shown good results of HTO due to the development of TOMOFIX (Synthes).^{2,4-6} Open wedge HTO showed better results than closed wedge HTO.²

The advantages of open wedge HTO includes less risk of peroneal nerve injury and less instability of lateral knee ligament, facilitated technique, maintenance of bone stock, and better correction achievement.¹ It has brought satisfactory clinical results for patients with medial unicompartmental osteoarthritis.⁷

The disadvantages include the need for filling in the free space after osteotomy (autogenous bone graft causing donor site pain), delayed union and nonunion.^{2,8,9} TCP and HAp grafts are used to help with the union process and many studies have shown the efficacy of them both with TCP being a better choice.⁶ Onodera et al.⁶ reported that TCP had a higher osteoconductivity and greater absorbability than HAp spacer.



Figure 7. At 3 months after implant removal, a standing anteroposterior radiograph also showed a radiolucent space and well maintained angle.

Saragaglia et al.¹⁰ reported the outcome of opening wedge HTO augmented with a Biosorb® (TCP) wedge in 124 patients with a mean of 10 years follow-up. There were only 7 knees with delayed union which required deferring weight-bearing. They reported the Biosorb® wedge to be completely integrated in all cases.

Present study demonstrated the 2 cases out of 38 cases (5.2%) from March 2012 to March 2014 of nonunion with the use of TCP block. Both patients are nonsmokers, and did not have a history of steroid use. Other complications, excluding nonunion of two cases, did not occur.

In both cases, correction angle was maintained at 3 months after implant removal. The reason why the angle was well maintained was because the area without TCP block showed good union.

The authors of this study reports that the use of TCP block in HTO procedure may interfere with the process of union. Therefore caution is thought to be needed when choosing the spacers when performing HTO.

CONFLICTS OF INTEREST

The authors have nothing to disclose.

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근위 경골 절골술 시에 인산삼석회 불력을 사용 후 발생한 불유합

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부산부민병원 정형외과

근위 경골 절골술은 최근 내반슬과 내측 구획 골관절염 치료에 흔히 시행되고 있는 치료 방법이다. 특히 열린 뼈기 근위 경골 절골술은 수술 술기가 쉽고, 신경과 혈관 손상이 적으며, 관절의 손상이 적어 자주 시행되고 있다. 열린 뼈기 근위 경골 절골술의 시행에 있어 골유합과 빈공간을 채우기 위하여 자가골 이식, 동종골 이식, 인산삼석회 같은 물질이 종종 쓰인다. 하지만 이 논문의 저자들은 인산삼석회 불력을 이용한 근위경 골 절골술을 시행한 1년 후 발생한 불유합 2예를 경험하였기에 이를 문헌 고찰과 함께 보고하는 바이다.

색인단어: 근위 경골 절골술, 인산삼석회, 불유합

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