



# Treatment of varus knee combined with extra-articular deformity with medial condyle sliding osteotomy during total knee arthroplasty: a case report

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**Abstract:** A 65-year-old female complained of progressive right knee pain, limited range of motion and obvious varus deformity of the right knee. She had a trauma history 20 years ago on femur side and treated by non-operative procedure. Preoperative radiographs showed severe osteoarthritis on medial side and patellofemoral joint. She had supracondylar malunion old fracture and varus deformity. So a total knee arthroplasty (TKA) was ordered. To balance the extension gap, medial condyle sliding osteotomy (MCSO) was made during the TKA. The bone block cut from the medial condyle was pulled distally until extension gap was balanced and then marked. Prosthetic components were implanted and then medial bone block was reduced into the medial prosthetic condyle after extra bone margin was removed. At 1 year follow-up, the knee was painless, stable, with satisfactory range of motion and improved function without any infection or aseptic lysis.

**Keywords:** Varus knee; total knee arthroplasty (TKA); extra-articular deformity; medial condyle sliding osteotomy (MCSO)

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## Introduction

Varus alignment is a common deformity of the knee during total knee arthroplasty (TKA) (1-3), and releasing medial soft tissue structure is a commonly used method to achieve balanced gap and corrected alignment. But for patient with extra-articular varus deformity, medial soft tissue releasing alone may lead to over releasing and medial instability (2,3). And medial condyle sliding osteotomy (MCSO) may be considered as a smart and appropriate solution (4). We report a typical varus knee combined with extra-articular varus deformity treated with MCSO.

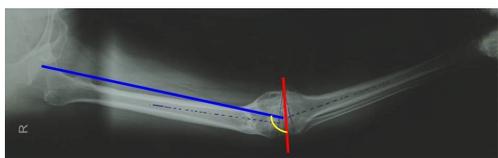
## Case presentation

A 65-year-old woman presented to us with 20 years history of right knee pain of insidious onset. Pain was initially but not gradually increased in severity over few months

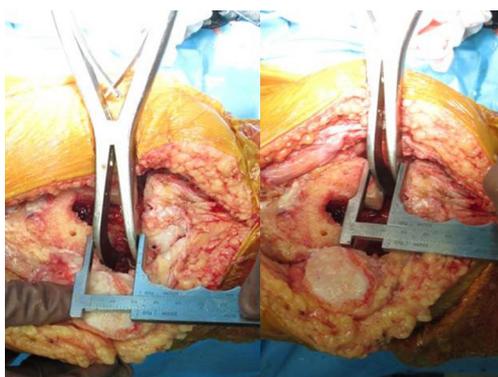
and worse on movements without any trauma. Medical treatment with non-steroidal anti-inflammatory analgesics did not relief her pain.

The patient had moderate to severe pain, obvious varus knee, antalgic gait and restriction extension and flexion of the right knee due to pain. Initial standard pelvis and lumbosacral spine radiographs were normal. But the full lower limbs X-ray showed severe osteoarthritis in knee that suggested a TKA was appropriate. And CT scan with 3D reconstruction is helpful for the preoperative plan.

Considering her age and the degree of medial arthritis, a TKA was ordered (*Figure 1*). The surgery was performed by one experienced surgeon, with LPS knee prosthesis (NexGen® high-flex fixed bearing knee; Zimmer Inc.). Firstly the tibial proximal cut was made 90° to the mechanical axis on coronal plane and 7° posterior slope on sagittal plane. A 9 mm resection below the highest



**Figure 1** Preoperative X-ray film.

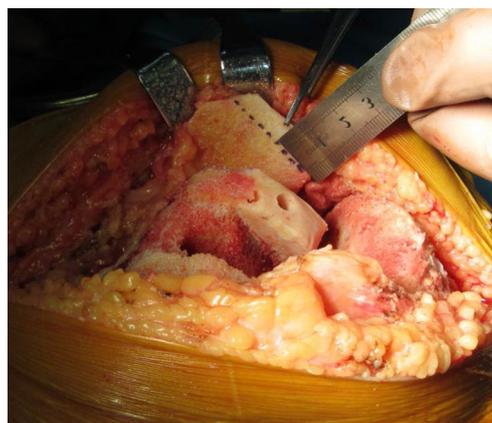


**Figure 2** Imbalanced extension gap.

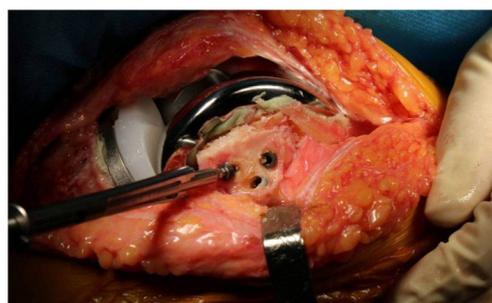


**Figure 3** Medial condyle sliding osteotomy (MCSO).

point of the lateral plateau was made. Then 9 mm distal femoral cut was made vertical to the mechanical line [hip knee stem (HKS) 5 degrees]. Four in one femoral cutting block was applied and dependant femoral rotational cut was made according to tibial proximal cut. There was about 10 mm less extension gap on medial side than lateral side in extension (*Figure 2*). To balance the extension gap, MCSO was made. 1 cm thick bone block was cut from the medial side of medial condyle (*Figure 3*). The bone block was pulled distally until extension gap was balanced and then marked (*Figure 4*). Prosthetic components were implanted and then medial bone block was reduced into the medial prosthetic condyle after extra bone margin was removed to fit the outline of medial prosthetic condyle. Bone block was



**Figure 4** The distance of sliding.



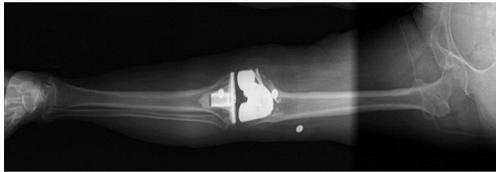
**Figure 5** Internal fixation with screws.

fixed with three screws (*Figure 5*). The patient had obvious pain relief and alignment correction at the time of follow-up. Range of motion was 0 to 125 degree and no infection, thrombolism and malunion of bone block was found.

After the surgery, the patient's pain completely resolved. She remained symptom-free at 1 year of follow-up. She underwent physiotherapy to improve the range of motion of the knee. Her VAS score improved from 7.4 to 2.2. The KSS pain score improved from 55.7 to 90.2. The KSS function score improved from 58.4 to 91.3. The preoperative mechanical lateral distal femoral angle (mLDFA) was 110° and the postoperative mLFDA was 95°. The preoperative hip knee ankle (HKA) angle was 163° and the postoperative HKA angle was 178° (*Figure 6*).

## Discussion

Varus knee is a common deformity of the knee during TKA (1-3). During TKA, releasing of the soft tissue on concave side of the joint to fit the convex side is a common method to achieve gap balancing and alignment correction. But in



**Figure 6** Postoperative X-ray film.

some cases, especially in south China, developmental varus knee accompanied by curved femur which leads to extra-articular deformity is also a very common situation (1). Posttraumatic knee arthritis combined with femoral varus is the other important reason (5). For these cases, traditional release may lead to over release in TKA. And correction of femoral varus by osteotomy may not be acceptable for some patients because of the trauma and expenses. In order to achieve the gap balancing and corrected alignment (6), HKA angle and HKS angle of each case should be precisely measured (7). Recent reports had suggested undercorrected varus deformity is also a method to get balanced gap without medial over releasing (8). Short-term follow-up reports have showed excellent prosthesis survival rate, but the mid-term follow-up reports are different from literatures (9-11). And residual deformity of the knee is also unacceptable for the gait of the patients (5).

MCSO should be recommended for these patients to achieve gap balancing and corrected alignment (6). To be qualified for the indications for MCSO, full lower limbs X-ray and the CT scan with 3D reconstruction should be done to analyze the deformity of the lower limbs. That is why mL DFA, HKS angle and HKA angle of all patients must be measured to investigate the deformity (7,8).

In normal population, usually the mL DFA is  $90^{\circ}$ – $93^{\circ}$ . For this patient, there was  $110^{\circ}$  mL DFA which means there was over  $15^{\circ}$  of extra-articular varus deformity should be corrected inside the joint. Obvious increased mL DFA qualified the patient for MCSO. MCSO may decrease mL DFA and correct the rotational axis of femoral condyles to better position which is more vertical to mechanical line than preoperative one. At the same time, by distally sliding the medial condyle bone block, the medial extension gap was made even to lateral one. This technique has limited trauma and is easy to fix the block. And the follow-up has showed the excellent result (12).

MCSO is not suitable for all the severe varus knees. Sliding osteotomy may change the rotational axis of femoral condyles to a wrong position if it is normal preoperatively.

Although it could get the same effect like thorough medial structure releasing. And it is still controversial if sliding backward of the medial condyle block could be used to balance flexion gap. Theoretically it may achieve the balancing of the flexion gap but since it also changes the through condyle line in sagittal position so that may potentially consequence the patellofemoral alignment and the axis of femur rotation.

## Conclusions

It is effective to correct extra-articular varus deformity by MCSO during TKA (4,5). And it could avoid over release of medial structure, and make it easy to balance of extension gap without causing patellofemoral malalignment (6,7).

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## Footnote

*Conflicts of Interest:* All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/aoj.2016.09.03>). The authors have no conflicts of interest to declare.

*Ethical Statement:* The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Helsinki Declaration (as revised in 2013). Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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