

## High Tibial Osteotomy, Over-the-Top Revision ACL Reconstruction plus Extra-Articular Tenodesis for ACL-Deficient Varus Knees in Middle Aged Patients

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### Summary:

Lateral closing wedge HTO in addition to hamstrings ACL revision (Over-the-Top plus extra-articular tenodesis) showed 82% satisfactory results (normal aligned and stable knee) in the treatment of chronic ACL-deficient varus knees.

### Abstract:

#### Introduction:

High tibial osteotomy (HTO) is a widely accepted treatment for symptomatic medial osteoarthritis with lower extremity varus alignment. In young active patients this pattern could be caused by unoperated anterior cruciate ligament (ACL) rupture or ACL reconstruction failure. ACL-deficiency is also responsible of the high frequency of medial meniscal lesion requiring meniscectomy, that are proven to worsen the chondral wearing of medial compartment. Combined ACL reconstruction and HTO represents a feasible salvage procedure in such complex patients. The purpose of this work is to investigate the clinical and radiographic outcomes of varus knees with failed anterior cruciate ligament (ACL) reconstruction treated with valgus high tibial osteotomy combined to an Over-the-Top revision ACL reconstruction plus extra-articular tenodesis.

#### Methods:

In a consecutive series we treated 36 young patients (age at surgery  $40.1 \pm 8.1$  years old) who had chronic ACL deficiency and lower limb varus angulation. The surgery was performed at a mean of  $9.8 \pm 3.6$  years later the first ACL reconstruction. A 90% follow-up was obtained at a mean of  $6.5 \pm 2.7$  year after surgery. Fifty-three percent of these patients (N=17) had a partial lost of the medial meniscus and 70 % (N=22) had marked articular cartilage damage (Outerbridge grade 3 or 4) in the medial compartment at the time of the surgery. All patients were treated with arthroscopic OVER-THE-TOP single-bundle ACL reconstruction plus extra-articular lateral tenodesis with autologous hamstrings [1] and lateral closing wedge high tibial osteotomy [2].

#### Results:

At follow-up, a reduction in pain was found in 94 % (N=30) of knees, with a mean VAS for pain score improvement from  $73.2 \pm 12.0$  to  $42.1 \pm 25.0$ . The other mean subjective scores greatly improved at follow-up: EQ5D from  $0.62 \pm 0.23$  to  $0.89 \pm 0.13$  ( $p=0.0001$ ); Tegner activity from 3 (range 2-4) to 5 (range 4-5) ( $P=0.0012$ ); subjective IKDC from  $58.0 \pm 12.2$  to  $72.0 \pm 16.5$  ( $p=0.0001$ ). Objective IKDC improved from 1B, 13C, 18D, to 15A, 14B, 3D. The mean objective ligament laxity (as measured by KT-1000 side-to-side difference) resulted  $2.7 \pm 1.0$  mm at final FU, with only three

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patients reporting a value >5 mm (9%, all of them presented a varus alignment). The femoral-tibial angle (FTA) changed from  $178.5^{\circ} \pm 1.5^{\circ}$  to  $172.9 \pm 6.13^{\circ}$  ( $p=0.0014$ ) and the hip-knee-ankle angle (HKA) changed from  $186.2^{\circ} \pm 2.7^{\circ}$  to  $179.6^{\circ} \pm 5.7^{\circ}$  ( $p=0.0015$ ). The posterior tibial slope (PTS) decreased of  $1.2^{\circ}$ . Six patients (18%) presented varus alignment at final FU. Significant changes of radiographic IKDC score were reported only for medial compartment ( $p=0.0230$ ), changing from 1A, 12B, 19C to 10B, 14C, 8D. Positive correlation was found between KT-1000 side-to-side difference and PTS ( $p= .0441$ ;  $r= .64$ )

### Conclusion:

Lateral closing wedge HTO in addition to hamstrings ACL revision (OVER-THE-TOP plus extra-articular tenodesis) showed 82% satisfactory results (normal aligned and stable knee) in the treatment of chronic ACL-deficient varus knees. The findings of this study are comparable to the literature [3]. In conclusion we recommend this combined procedure to manage varus angulated knees with combined chronic ACL deficiency.

### References:

1. Marcacci M, et al. Am J Sports Med. 2009;37(4):707-14.
2. Marcacci M, et al. Oper Tech Orthop. 2006;17:22-28.
3. Noyes FR, et al. Am J Sports Med. 2000;28(3):282-96.