1. Opening Wedge High Tibial Osteotomy

The radiographs of all pelvic limb to evaluate the alignment of the pelvic limb in 1970 were so difficult and their accuracy also became a problem. At that time, the tibiofemoral angle just by the anterior/posterior radiographs of the knee was tried to correct and the concept of 7°+ was set up. After the effective pressures on the medial/lateral and anterior/posterior of the knee were measured accurately during the weight-loading to consider the alignment of all pelvic limb, one of the orthopedist's wishes was to get the information of the reasonable osteotomy to consider the dynamic pressure change during walking, that was to decrease the pressure at the clinical change part when real-walking and to prevent the transfer of the excessive pressure to the opposite part. In the case of High Tibial Osteotomy (HTO), after the merit and the weakness of both Opening Wedge Osteotomy (OWO) and Closed Wedge Osteotomy (CWO) were co-existed, OWO becomes the current trend. Moreover, the treatment of the medial collateral ligament during HTO was not solved yet. The patients number of HTO, which was the real operation of the translated knee ailment, is being decreased by the clinical change part when real-walking and to prevent the transfer of the excessive pressure to the opposite part. In the case of High Tibial Osteotomy (HTO), after the merit and the weakness of both Opening Wedge Osteotomy (OWO) and Closed Wedge Osteotomy (CWO) were co-existed, OWO becomes the current trend. Moreover, the treatment of the medial collateral ligament during HTO was not solved yet. The patients number of HTO, which was the real operation of the translated knee ailment, is being decreased by the artificial transplant of the knee such as Total Knee Arthroplasty (TKA). During TKA, Anterior Cruciate Ligament (ACL) is greatly increased during the sports activity. The operation of Upper Tibial Open Wedge Osteotomy (UTOWO) increases the anterior oblique angle during the re-alignment of the anatomical axis and it also increases the posterior slope. Since it results in the increase of the ACL tension, the rupture possibility of ACL is greatly increased during the sports activity. Frank et al. studied the effect of the oblique angle and the wedge angle on the posterior slope angle by the clinical approach but it was restricted in the 90° of the hinge angle. Nowadays, the posterolateral hinge angle osteotomy, where the hinge angle was 45°, becomes the standard so Frank's study has the limitation to apply UTOWO. Moreover, the results were verified by the computation aided virtual osteotomy. The parameters to affect the increase of the posterior slope angle, were not only the hinge angle, the gap angle but also the oblique angle and the wedge angle. For this reason, it the co-relationship of the above 4 angles were defined, it is believed that the bio-mechanical approach to the osteotomy is even clearer.

2. Development of X-type Fixation Plate

The operation of Upper Tibial Open Wedge Osteotomy (UTOWO) to cure the malalignment and the degenerate arthritis, is easier than that of Upper Tibial Closed Wedge Osteotomy (UTCWO).

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Key words : High Tibial Osteotomy (HTO), Femur, Posterior Slope, Hinge Axis Angle, Computed Tomography (CT) Scan Reconstruction
genu varum deviation or the genu valgum deviation is severely
when the supporting axis proceeds over 15mm from the
the mechanical axis is deviated medially from about 4±2mm. If the mechanical axis is deviated medially
the line is located inside the center of the knee joint and is deviated
and uniformly distributes the stress, which is transferred from the
the deformation of the upper tibia, the shortness of the lower limb
to keep PSA normal during UTOWO to correct the genu varum.
which is caused by the deformation of the anatomical axis after
the osteotomy, is also very important. At this time, the metal plate is
is deformed and applied for the high tibia osteotomy. Our suggested model is the X-type fixation plate for the osteotomy, the new metal plate for the osteotomy was designed in this study.
the inhalation of nicotine happens, about 25weeks is required. Based
bone graft to make the perfect synostosis of the upper and lower
takes it possible to avoid the fibular excision, the open of the
to keep PSA normal during UTOWO to correct the genu varum.

References

Fig. 3 Stress distributions at the point "A", "B", "C", and "D", respectively in X type fixation plate

Fig. 4 Stress value of five different plate angles at the check point A, B, C, D and max. stress, respectively

In addition to this advantage, since the UTOWO did not cause the intraoperating damage of the proximal tibiofibula. It is the effective surgery technique to keep the peroneal nerve. To minimize the deformation of the upper tibia, the shortness of the lower limb can also be prevented. UTOWO is one of the surgery techniques to transfer the overload of the medial meniscus by the genu varum to the lateral meniscus by the translation of the anatomical axis and uniformly distributes the stress, which is transferred from the trunk to the tibia along the axial direction of the femur, to the mediolateral meniscus. Considering the mechanical view, the supporting axis of the lower limb is the line to connect the center of the hip joint with the center of the tibial-talar joint. The connecting line is located inside the center of the knee joint and is deviated from about 4±2mm. If the mechanical axis is deviated medially or laterally, the genu varum deviation or the genu valgum deviation can be happened. If the supporting axis proceeds over 15mm from the centre of the knee joint medially or over 10mm laterally, the genu varum deviation or the genu valgum deviation is severely appeared. To view from the lateral surface, tibia plateau is a little bit moved to the back rather than the axis of the femur and about 10° of articular surface in the tibia is angled down. This angle is called the Posterior Slope Angle (PSA) and it is the most important to keep PSA normal during UTOWO to correct the genu varum. However, the angle of the open wedge aperture by the cut of the proximal tibia after the osteotomy, can be changed by the walking/acting of the postoperated patient. After it results in the change of the PSA and the tibial spine deformation of the anatomical axis, the second malalignment and the unstable ligaments can be caused (See Fig.2). Comparing with the exact angle of UTOWO, the maintenance of the open wedge aperture in the proximal upper tibia,