APPENDIX E-1

Surgical Technique

Preoperative planning included determining the proposed correction with use of full-length standing radiographs according to the method of Miniaci et al.[18]. The mechanical axis was shifted to a point 62% lateral on the transverse diameter of the tibial plateau according to the criteria of Fujisawa et al.[19]. We subtracted the amount of lateral separation (the joint line convergence angle) from the apparent deformity in the preoperative planning of the correction angle.

The surgical technique used was developed by Staubli and Lobenhoffer[5,6]. The procedure was performed with the patient under general or spinal anesthesia and placed in a supine position on a radiolucent standard operating table with a lateral support. An arthroscopy was performed first to assess the lateral compartment and treat intra-articular lesions. A decision not to perform the osteotomy was made on the basis of the arthroscopic appearance in three patients. We made an oblique incision 6 to 8 cm long, 4 cm distal to the joint line and 1 cm above the pes anserinus, extending from the medial aspect of the tibial tuberosity to the posterior border of the tibial plateau. The long fibers of the medial collateral ligament were mobilized and partially released distally to allow a blunt Hohmann retractor to be placed behind the posteromedial aspect of the tibia. One 2.5-mm threaded Kirschner wire marked the oblique osteotomy 5 cm distal to the joint line, starting proximal to the pes anserinus and extending to the level of the tip of the fibula at the lateral cortex, and one wire referenced the posterior slope of the tibia. We made a v-shaped osteotomy at a slow pace under continuous irrigation with cold fluid to avoid bone necrosis (Fig. E-1). First, the oblique osteotomy was

performed in the posterior two-thirds of the medial part of the tibia distal to the Kirschner wires, parallel to the tibial slope and extending to the tip of the fibula, leaving a 10-mm lateral bone bridge intact. The second osteotomy started in the anterior one-third of the tibia at an angle of 135°, leaving the tibial tuberosity intact. We opened the osteotomy in a stepwise fashion with three stacked osteotomes to avoid intra-articular fracture of the tibial plateau. The starting point of the osteotomy was posterior to the superficial medial collateral ligament (Fig. E-2). Fine-tuning of the mechanical axis was done according to preoperative planning with a calibrated wedge spreader.

Alignment was checked with the cable method[20]. The knee was fully extended and the patella faced anteriorly. With the image intensifier beam strictly vertical, the center of the femoral head was centered on the screen and the femoral head was marked on the patient's skin[20]. In a similar way, the center of the ankle joint was marked[20]. An assistant spanned the electrocautery cable between these two landmarks. When the knee is viewed, the cable should run at a point 62% lateral on the transverse diameter of the tibial plateau according to the Fujisawa criteria[19].

We did not change the tibial slope except in one patient with established posterolateral instability. In this case, we increased the slope 5° and combined this procedure with an iliotibial tract rerouting[21,22] to address the posterolateral instability. Two adjacent strips, each about 8 mm wide, were taken from the iliotibial tract. The anterior strip was longer and was left attached distally to the tubercle of Gerdy, while the second strip remained attached to the tract proximally and was mobilized along with a portion of the tubercle as in the procedure described by Ellison[21,22]. We took care to leave the posterior portion of the tract intact, and we developed an aperture for the

iliotibial tract proximally at the lateral lip of the linea aspera. The strip was carried distally beneath the fibular half of the lateral collateral ligament and was passed back beneath the main part of the tract to its site of origin on the Gerdy tubercle, to which it was reattached with a screw[21]. The second, longer strip was passed back through the arcuate ligament, pulled through the capsule and the gastrocnemius tendon close to the femur, and then brought back forward to the tubercle[21].

The TomoFix was inserted into a subcutaneous tunnel over the soft tissues on the anteromedial tibia with two 5-mm temporary spacer bolts placed anterior to the medial collateral ligament (Fig. E-3). The spacer bolts keep the distance to the bone greater than 5 mm, thus avoiding compression of the medial collateral ligament and the pes anserinus. The next step was proximal bicortical fixation with four self-tapping locking head screws and the insertion of a lag screw distal to the osteotomy. The temporary lag screw caused tension in the plate and compression on the lateral side of the osteotomy (Fig. E-3). Finally, we inserted three monocortical self-drilling locking head screws distally and changed the proximal lag screw to a self-tapping bicortical screw. No bone graft was used.

Fig. E-1
Diagram of the v-shaped osteotomy. First, the oblique osteotomy is performed in the posterior two-thirds distal to the Kirschner wires, parallel to the tibial slope and extending to the tip of the fibula, leaving a 10-mm lateral bone bridge intact. The second osteotomy starts in the anterior one-third of the tibia at an angle of 135°, leaving the tibial tuberosity intact. (Reprinted with permission of Synthes, Inc.)

Fig. E-2
Stepwise opening of the osteotomy with three stacked osteotomes. The starting point of the osteotomy was posterior to the superficial medial collateral ligament.

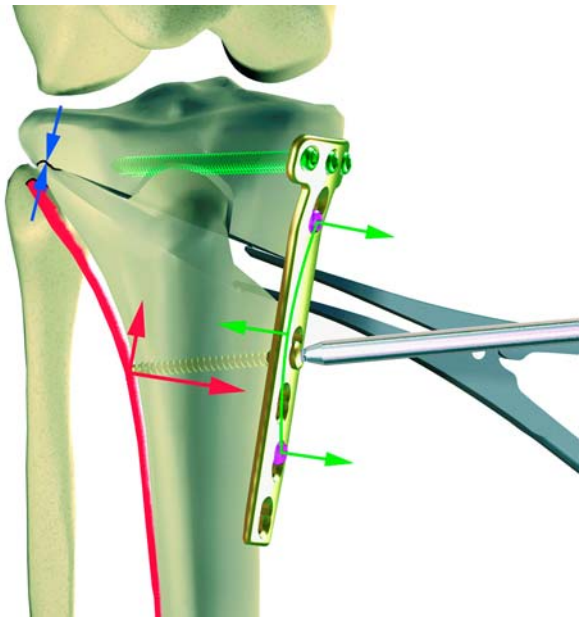

Fig. E-3
The TomoFix was inserted into a subcutaneous tunnel with two 5-mm temporary spacer bolts. The temporary lag screw caused tension in the plate and compression on the lateral side of the osteotomy. (Reprinted with permission of Synthes, Inc.)