PATHOLOGY
Chondral defects with prior medial and lateral meniscectomy and varus alignment

TREATMENT
Staged high tibial osteotomy followed by single-stage autologous chondrocyte implantation and medial and lateral meniscus allograft transplantation

SUBMITTED BY
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CHIEF COMPLAINT AND HISTORY OF PRESENT ILLNESS
The patient is a 38-year-old medical salesperson who presented with progressive bilateral tibiofemoral joint line pain and activity-related swelling of his right knee. He had a history of medial and lateral meniscectomies performed at the time of anterior cruciate ligament (ACL) reconstruction approximately 8 years earlier. He had no functional instability and initially maintained an active lifestyle including running and basketball, until the gradual onset of medial greater than lateral joint line pain occurred. He has eliminated impact activities and changed to biking and swimming.

PHYSICAL EXAMINATION
Height, 5’10’, weight, 146 lb. Gait of right limb is stiff and mildly antalgic. Clinical alignment is varus with excellent muscle bulk and tone. The knee has a trace effusion. Range of motion is from 5 to 135 degrees of flexion. He has medial and lateral joint line tenderness without patellofemoral findings. His ligament examination is normal. His patellar tracking is normal.

RADIOGRAPHIC EVALUATION
Radiographs demonstrate prior ACL reconstruction with isolated joint space narrowing of the right knee medial compartment (Figure C38.1). Standing hip-to-ankle alignment films show 6 degrees of varus.

SURGICAL INTERVENTION
At staging arthroscopy, focal grade III to IV chondral lesions of the trochlea (1.5 cm by 2.3 cm) and medial femoral condyle (1.5 cm by 2.5 cm) were identified. Both menisci were essentially absent. The ACL graft was intact. In light of the varus alignment and medial pathology greater than lateral, the limb was treated at the time of staging arthroscopy with high tibial valgus-producing osteotomy using an opening-wedge hemicallotasis technique with an external fixator. The goal was to correct alignment such that the weight-bearing line would just enter the lateral compartment (Figure C38.2). Cartilage restoration was performed after the osteotomy had healed. Autologous chondrocyte implantation (ACI) was performed on the trochlea and medial femoral condyle defects.

FOLLOW UP
Postoperative platelet derived growth factor (PDGF) was used to promote healing of the meniscal defect. ACI had near normal meniscal healing 1 year post surgery. The area was minimally antalgic with no limp. Initial postoperative x-rays showed excellent healing of the osteotomy. The patient was allowed to begin weight bearing with no restrictions 3 months following surgery. Range of motion was to 120 degrees of flexion in the knee. The patient returned to running and playing basketball with no symptoms. He has maintained his earlier lifestyle and activity levels.

Figure C38.1: (A) weight-bearing anteroposterior (B) views of the right knee with valgus alignment of the medial joint line

(Figure C38.2) Transplantation of osteotomy. Hemi-osteotomy was performed with (A) nonweight-bearing anteroposterior weight-bearing anteroposterior.
Figure C38.1. Preoperative 45-degree flexion weight-bearing posteroanterior (A) and Merchant (B) views demonstrate prior evidence of anterior cruciate ligament (ACL) reconstruction and minimal medial joint space narrowing.

(Figure C38.3). The medial and lateral meniscal transplants were performed through the same arthrotomy as the ACI, using tibial tubercle osteotomy for exposure and not for realignment (Figure C38.4).

Postoperatively, the patient was made nonweight bearing for 4 weeks and used immediate continuous passive motion during that time for 6h/day. After 4 weeks, the patient was allowed to progress to weight bearing as tolerated with crutches. Once the patient lost his antalgic gait, the crutches were no longer used.

FOLLOW-UP

Postoperatively, his range of motion reached a plateau of 5 to 115 degrees of flexion. Ten months later, he developed recurrence of his medial pain and underwent arthroscopy. The ACI had largely incorporated, the lateral meniscal transplant had healed and appeared near normal (Figure C38.5), whereas the medial meniscus was torn at the posterior horn attachment. Debridement of the torn meniscus fragment and scar tissue allowed increased flexion to 125 degrees while maintaining extension. The area of incomplete filling by ACI was treated with microfracture. Thereafter, his pain was minimized to significantly less than his initial preoperative condition.

Figure C38.2. Postoperative radiograph with external fixator in place, and complete healing of the valgus-producing hemicalloysis high tibial osteotomy (HTO). Note that the weight-bearing line falls into the medial third of the lateral compartment.
Figure C38.3. (A) Intraoperative views of the central trochlear and medial femoral condyle lesions (note intact ACL graft). (B) Autologous chondrocyte implantation (ACI) periosteal patch in place following preparation of the medial femoral condyle lesion.

Figure C38.4. Postoperative anteroposterior (A) and lateral (B) films show evidence of medial and lateral bone bridge in slot meniscal transplants and fixation of the tibial tubercle.
FIGURE C38.5. Ten-month postoperative second-look arthroscopy. (A) Treatment of 5 mm by 10 mm area of failed ACI of the medial femoral condyle with microfracture. (B) Trochlea shows filling with hyaline-like cartilage. (C) Completely healed lateral meniscus allograft.

DEcision-Making Factors

1. Young, active patient with progressive symptoms largely in the medial compartment, but also in the lateral compartment.
2. Staged osteotomy without efforts to over-correct varus deformity due to bicompartamental nature of the patient’s symptoms and disease.
3. Single-stage cartilage restoration procedure to treat both the chondral surfaces and meniscal deficiency such that each procedure provides relative protection against respective graft failure.
4. Minor complaints of anterior knee pain led to a decision to avoid a significant anteromedialization of the tibial tubercle with the tubercle osteotomy performed primarily for surgical exposure.
5. Indications for second look due to pain and motion loss led to management of incomplete ACI fill with microfracture and meniscal tearing with partial meniscectomy.