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MACI with High Tibial Osteotomy — Pre-Operative Information

About Your Injury

Cartilage has no blood supply and cannot heal on its own. Unlike bone, which can break, bleed, and knit back together, damaged cartilage is stuck in a permanent "pothole." The best way to address this is **cartilage restoration** — a surgical option most effective in younger, active patients who want to restore function and avoid a joint replacement years later.

Your imaging shows **a cartilage defect on the femoral condyle along with lower limb malalignment**. When the leg is bow-legged (varus), the weight-bearing line passes directly through the damaged area, loading it with every step. Without correcting this alignment, cartilage surgery has a much higher chance of failing. **A high tibial osteotomy (HTO)** corrects this by cutting and repositioning the tibia to shift weight away from the damaged area, giving the graft the protected environment it needs to heal.

Two separate structures must heal simultaneously: the **MACI cartilage graft** (12–18 months for full maturation) and **the tibial osteotomy bone cut** (typically confirmed by 6-week X-ray).

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About Your Surgery

MACI (Matrix-Assisted Chondrocyte Implantation) is an FDA-approved, two-stage procedure:

Stage 1 (Biopsy): A small biopsy of healthy cartilage from an area of your knee that doesn't bear weight is taken during an arthroscopic procedure.

Stage 2 (Implantation): Over 4–6 weeks, your biopsy cells are expanded in the laboratory to create millions of cells. In the second surgery (your upcoming procedure), the cultured cells are implanted into your cartilage defect using fibrin glue.
The second stage of the operation is generally done open, but can occasionally be done arthroscopically.

This is a very meticulous surgery that requires significant precision and treatment and placement of the new cartilage cells into the cartilage defect. over time, the knee is protected and the cartilage is allowed to grow into the bone. Since this is your own cells, the goal is to recreate the normal cartilage that was in your knee before the injury

Healing Occurs in Four Stages:

Week 1–2: Integration of the graft.

Week 2–12: Cell differentiation and matrix formation.

Month 3–12: Tissue maturation and integration.

Month 12+: Ongoing maturation and remodeling (up to 24 months).

85% of MACI implants are still intact at 5 years, making this one of the most successful cartilage restoration procedures available.

The distal femoral osteotomy (DFO) is performed at the same time as the MACI implantation. Dr Merritt used CT scan + NewClip 3D-printed custom cutting guide allow us to plan the exact amount of bone to remove and angle of correction. This maximizes precision and reduces operative time.

Surgery typically takes about 2 hours. This is an outpatient surgery generally performed at Valley Medical Center. You will go home the same day.

Risks: infection, blood clots, numbness, stiffness, delayed bone healing or non-union (especially in smokers), overcorrection/undercorrection, hardware irritation, continued pain. Smoking significantly impairs bone healing — **you must stop smoking at least two weeks before surgery.**

What happens on the day of surgery: A couple of days before surgery, the nursing staff will call you to confirm your check-in time and when to stop eating and drinking. On the day of surgery, check in at the front desk at your assigned time. You will go to the pre-op area with your family where our nurses will help you get changed, start an IV, and review your health history. You will meet with me to review the plan, and the anesthesia team will explain their approach. When the operating room is ready, you will walk back with a nurse. After anesthesia is given, you will not remember anything until the recovery room.

While you are in surgery, your family can pick up your post-operative medications at the pharmacy next to the surgery center. If you are under 18, one family member must stay at the surgery center during the entire surgery. In the recovery room, you will be monitored until you are awake, have some crackers and juice, and be made comfortable. Once ready, you will change into your clothes and be wheeled to your car. **You will need someone to drive you home and stay with you for the first 24 hours.**

After Surgery — What to Expect

After surgery, pain, swelling, and limited motion are expected. You will be in a **hinged knee brace locked straight** and **on crutches**. The brace is locked at 0° for all mobilization activity and sleep for 4 weeks.

Two structures are healing at the same time: the **MACI graft** and **the osteotomy bone cut**. The osteotomy drives the early weight-bearing restrictions. **Weight bearing is not advanced until a 6-week X-ray confirms the bone is healing.**

Physical therapy should start within the first week, 2 times per week. ROM is progressed more aggressively than isolated MACI to prevent stiffness (arthrofibrosis). Targets: **90° by Week 1, 105° by Week 2, 115° by Week 3, 125° by Week 4.**

An unloading knee brace is introduced at Weeks 6–8 to protect the graft compartment as weight bearing increases. Orthotics, arch supports, or medial heel wedges may be prescribed to manage alignment.

Week 0–1	Non-weight bearing (NWB). Brace locked at 0° for weight bearing and sleep. Aggressive ROM targets (90° by Week 1). NMES, quad sets, straight-leg raises, heel slides, ankle pumps, patellar mobilization from Day 1.
Weeks 1–5	Toe-touch weight bearing (TTWB) through Week 5 — the osteotomy must heal before weight can advance. ROM targets: 105° by Week 2, 115° by Week 3,

	125° by Week 4. Active knee extension exercises (90° to 40° arc, no resistance).
Week 6	Six-week X-ray determines if the osteotomy bone has healed. If confirmed: begin weight bearing as tolerated. If not confirmed: continue TTWB until follow-up imaging clears advancement.
Weeks 6–9	Transition to full weight bearing: bilateral crutches → single crutch → no crutch by Weeks 8–9 (after X-ray clearance). Unloading knee brace introduced. Recumbent bike and pool therapy begin.
Months 3–5	Progressive strengthening. Low-impact conditioning. No loaded deep flexion past 90° until Month 5.
Months 9–12	Walk-jog running program. Plyometrics at Month 12. Sport-specific training.
Months 12–18	Return to cutting/pivoting/impact sports after meeting all criteria AND surgeon clearance. MRI at 12 months. HTO hardware reviewed.

Driving: Right leg 6–8 weeks, left leg 4–6 weeks, and you must be off narcotics.

Preparing for Surgery

Pre-surgical physical therapy (prehab): The stronger you come into surgery, the stronger you come out of surgery. Good quad strength and ROM of the knee ensures an easier recovery.

Nutrition: A good diet with increased protein and collagen supplementation helps speed your recovery and prevent muscle weakness after surgery. Vitamin C can help with inflammation and stiffness. Start these before surgery and continue through your recovery.

Ice Machine — My #1 Recovery Recommendation

I highly recommend purchasing an ice machine to help your recovery. An ice machine is the single best investment you can make — it allows for continuous icing without the risk of frostbite and is far easier than using ice bags or gel pads. Our clinic staff can fit you for one before surgery and show you how to get the most out of it. Stock up on bags of ice — the machine can go through a bag a day when used regularly.

Prepare your home: Remove throw rugs or obstacles that might catch a crutch and cause a fall. Make sure you have clean sheets and comfortable clothes ready. Stock the refrigerator with healthy food and buy bags of ice for the ice machine.

Handicap placard: You will be given a handicap parking pass application at your clinic visit. Get this at a DMV office before your surgery so you do not have to deal with it while recovering.

Day-of-Surgery Checklist

- ☐ Verify your check-in time and follow instructions on when to stop eating and drinking
- ☐ Schedule Physical Therapy for 5–7 days after surgery (do this before surgery)
- ☐ Bring your brace — you will be fitted at your pre-operative visit
- ☐ Wear comfortable clothes that fit over a brace (sweatpants work well)
- ☐ No perfume or lotion on your skin
- ☐ Remove or leave jewelry at home

☐ Have the ice machine and bags of ice ready at home for when you return

Contact Information

Questions about your surgery:	(425) 656-5060
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