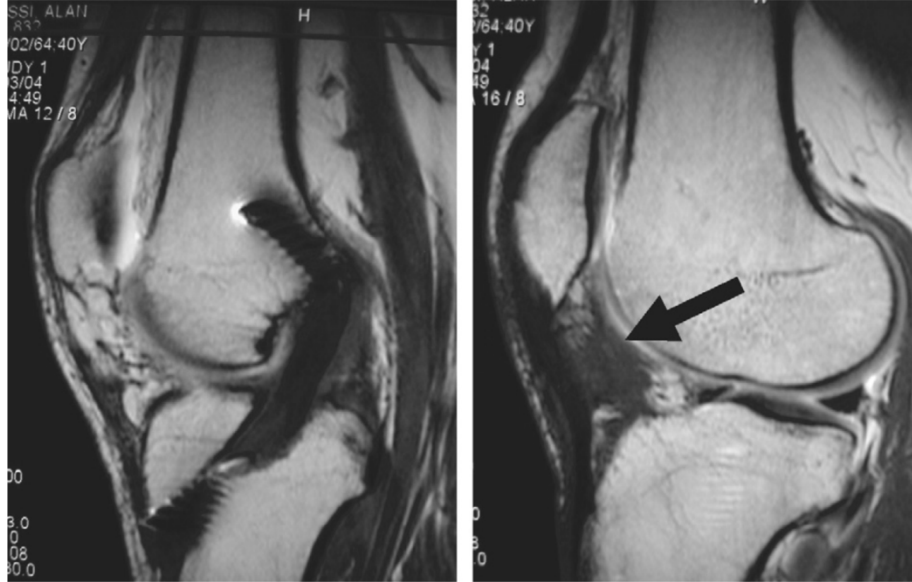


Question 3

History

This patient had post-operative pain on knee extension (Images 5 and 6).

What do the MRI images show?



Images 5 and 6 MRI (sagittal T1).

Answer: Image 6 shows the ACL graft is intact, seen as a taut low signal structure. Fat returns high signal on T1-weighted images and Hoffa's fat pad will therefore normally contain high signal material. Image 6 shows a rounded low signal mass (black arrow) within Hoffa's fat pad which represents post-operative scar tissue; also known as arthrofibrosis or a 'Cyclops' lesion.

Background—approach to **looking at ACL reconstruction** on MRI

1. Graft integrity:

- the graft should be seen as taut intact low signal band,
- there may be signal up to 2-years post-op (periligamentous revascularisation).

2. Position of the **femoral tunnel** and hence graft isometry (tension):

- **AP:** 11 o'clock right knee and 1 o'clock left knee.
- **Lateral:** At intersection of posterior femoral cortex & intercondylar roof.

3. Position of the **tibia tunnel** and hence signs of impingement:

- the tibia tunnel should be posterior and parallel to intercondylar roof,
- if it is too steep, graft will impinge on the femur in extension,
- if it is too flat, graft may be too lax.

4. **Arthrofibrosis:**

- Fibrous tissue seen anterior to the distal graft within notch or Hoffa's fat pad.

5. Infection:

- Donor site, tunnels, joint.

6. Hardware:

- Bone plug failure.

5. Tunnels

Femoral tunnel: 1-2 mm from the posterior intercondylar region at the 11 o'clock in the Right and 1 o'clock for the Left Knee

Tibial tunnel: at the footprint of the native ACL i.e. Ant-med of tibial spine i.e., posteromedial to the original ACL

Femoral tunnel more anterior

Limits flexion and stretches the graft; May cause rupture of the graft

Tibial tunnel more anterior

Limits Extension of the knee [Cyclops lesion also limits extension]

GENERAL PRINCIPLES OF ACL RECONSTRUCTION

1. Accurate tunnel placement: Anatomic tunnel placement = “physiometric” function
2. The edges of the tunnels are rounded off to allow smooth passage of the graft
3. Most chronic ACL ruptures will require a notchplasty.
4. To maximize BTB G : there should be 20 to 25 mm of graft inserted into the femoral and tibial tunnels.
5. Femoral side: The collagen fibers of the graft in a posterior position with a bone-tendon-bone graft.
6. Tension is applied to the tibial bone plug sutures and the knee is cycled several times through a full range of motion to remove any excessive viscoelasticity of the “graft suture construct.”
7. **Prior to fixing the tibial side, the graft can be externally rotated 90**, which orients the cortex of the tibial plug anteriorly. This position mimics the natural fiber orientation of the native ACL and may increase the graft strength.
8. When using hamstring tendons: the knee be cycled a minimum of 60 times prior to tibial fixation.
9. Tibial fixation with the knee flexed 30 degrees
10. Debate exists as to whether 5 lb, 10 lb, or 15 lb force should be applied to the graft construct during tibial fixation. : to prevent proximal migration of the graft during fixation.

Theoretically, the advantage of direct fixation is decreased longitudinal graft-tunnel motion (“bungy” effect) and decreased sagittal graft-tunnel motion (“windshield wiper” effect).. No clinical relevance

Evidence that graft-tunnel motion is unlikely to be the primary etiology of tunnel widening after ACL reconstruction is provided by Clayworthy.

1. EndoButton and staples (elastic fixation).
2. Bone Mulch Screw
3. interference (RCI) screws
4. bioabsorbable interference screws (aperture fixation).

Tunnel widening occurred with all fixation methods.