Localized anterior arthrofibrosis (Cyclops lesion) with no history of anterior cruciate ligament reconstruction: MRI findings.

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"Cyclops syndrome" was first described by Jackson and Schaefer as a cause of loss of full knee extension after anterior cruciate ligament (ACL) reconstruction. "Cyclops lesion" was defined as a fibrous nodule located in the intercondylar notch anterior to the ACL graft, extending to Hoffa’s fat pad. It was named after its arthroscopic aspect, which appears as a soft-tissue mass with surface vessels resembling the eye of the Cyclops in Greek mythology.

The localized form of anterior arthrofibrosis, the so-called "Cyclops lesion" was hence known to be an arthroscopically treatable complication of ACL reconstructive surgery.

However, it is now admitted that "Cyclops lesion" can also occur in patients with no history of reconstructive ACL surgery even if there are less than 20 cases reported in literature to our knowledge.

The lesion has typical MRI and arthroscopic appearances.

The purpose of this case report is to describe the MR imaging appearance of the "Cyclops lesion" which is typical and to incite any radiologist to keep in mind that it might also be found with no history of ACL reconstructive surgery.
Methods and Materials

Our case report

In this didactic work, we report the case of a 37 year-old patient, regular jogger, presenting with knee pain exaggerated with physical effort and stiffness of the right knee.

The patient had a history of knee trauma 4 years before with documented meniscal lesion for which he underwent an arthroscopic partial meniscectomy. However, he had no history or signs of anterior cruciate ligament repair.

Physical examination confirmed the right knee extension loss and found an audible and palpable "clunk" with terminal extension.

He was addressed to us for further investigation of his loss of knee extension and an MR imaging was performed.

MRI Technique

MR examination of the knee was performed at 3T(MAGNETOM® Verio Siemens Medical Solutions) with a phased-array coil. The field of view was 20-32 cm, and the matrix was 512 × 512.

The following sequences were obtained:

- Sagittal T1-weighted spin-echo images (TR /TE: 530/16)
- Coronal, Sagittal and Axial Proton Density-weighted (PDW) fast-spin-echo images with fat-suppression (TR/TE: 3000/36)
- Sagittal T2*-weighted images in order to rule out a differential diagnosis which is pigmented villonodular synovitis.
- Axial and sagittal T1-weighted images with fat suppression after IV Gadolinium administration

The slice thickness was 3 mm with a 10% gap.
Results

**RESULTS**

**Imaging findings:**

In our patient's MA imaging examination, a soft tissue nodule was found in the intercondylar notch anterior to and attached to the ACL, extending onto the infrapatellar fat pad (Hoffa's fat pad) (Fig. 1 on page 8).

The nodule appeared hypointense on T1W (Fig. 2 on page 8) and with heterogeneous signal on proton density-weighted (PDW) images (Fig. 1 on page 8, Fig. 3 on page 9) with no low-intensity signal on T2*W images (Fig. 4 on page 10).

After IV Gadolinium administration, the nodule has a moderate and heterogeneous enhancement (Fig. 5 on page 11, Fig. 6 on page 12).

In addition to that, the MRI examination showed hyperplastic, thickened, highly-enhanced synovial vili signing synovitis which often associated (Fig. 9 on page 15).

ACL had a normal MR imaging aspect with normal low-intensity signal and uninterrupted fibers (Fig. 7 on page 13, Fig. 8 on page 14).

The lateral meniscus showed signs of partial meniscectomy as mentioned in patient's charts. The medial meniscus appeared normal in shape, configuration and signal intensity. The cartilage lining the tibial, femoral and patellar articular surfaces appeared normal in thickness and signal intensity.

We noticed, besides, a benign chondroma of the distal metaphysis of the femur (Fig. 8 on page 14, Fig. 10 on page 16).

**Arthroscopy:**

Arthroscopy confirmed the diagnosis showing the nodule which was located in the intercondylar notch anterior to the ACL attached to it via a pedicle. It had the typical "head-like" appearance with a focal "eye-like" area of reddish-blue discoloration due to venous vessels.

Arthroscopy allowed also treatment of the "Cyclops lesion" with simple resection of the nodule.

**Pathology:**
Pathology examination of the nodule showed central granulation tissue surrounded by dense fibrous tissue in addition to the presence of fibrocartilage, synovium and fat from the infrapatellar fat pad.

**DISCUSSION**

**Clinical features:**

"Cyclops lesion" often presents with:

- Knee pain (usually 4 to 16 weeks after ACL reconstruction surgery)
- Loss of motion particularly loss of knee extension
- Audible and palpable "Clunk" with terminal extension
- Sometimes hydarthrosis
- Exaggerated symptoms with effort

**Pathophysiology:**

« Cyclops Lesion » was first identified as a natural fibroproliferative process resulting from drilling debris or from broken ACL graft fibers.

Microscopic analysis of « Cyclops nodules » showed dense fibroconnective tissue with newly formed vessels and variable content of cartilage, osseous tissue and necrotic lamellar bone, this histologic composition is consistent with microtrauma pathophysiology.

In consequence, it was speculated that « Cyclops nodules » that occur in patients after trauma with clinically or radiologically intact ACL are likely also to result from microtrauma to subclinically torn ACL fibers.

**MR imaging appearance is typical:**

*MRI will always be performed in order to:

- Search for the cause of knee stiffness or pain (diagnosis of "Cyclops lesion" or any other Hoffa's fat pad nodule)
- Search for complications of ACL reconstruction surgery if there is such history.

*The MRI aspect is typical:

- A well-circumscribed often with a low-intensity signal peripheral line nodule, attached to the anterior surface of the ACL or ACL-graft, extending onto Hoffa's fat pad.
- Low-intensity or iso-intensity to the muscle signal in T1W sequences.
• Heterogeneous iso-intensity or high-intensity signal in T2W sequences.
• Moderate, heterogeneous enhancement after IV Gadolinium administration.

**Differential diagnosis:**

*In front of a Hoffa's fat pad nodule with no history of ACL reconstruction surgery:*

• **Extrinsic causes:**
- Other articular pathologies:
  + Torn meniscal fragments
  + Meniscal cysts and mucoid cysts (those present with typical high intensity T2W signal)
- Synovial pathologies:
  + Villonodular synovitis (that presents with typical hypointense T2*W signal spots signing hemosiderin deposits)
  + Chronic non-specific synovitis
  + Synovial hemangioma
  + Osteochondromatosis (which is frequently multiple)
- Extracapsular pathologies: lipodystrophy
  
• **Intrinsic causes:**
  - Hoffas's Disease
  - Intracapsular chondroma
  - Focal villonodular synovitis
  - Post-arthroscopic fibrosis

*In front of knee extension loss after ACL reconstruction surgery:*

• Graft impingement, the most frequent post-ACL reconstruction complication which develops due to anterior misplacement of the tibial tunnel
• Suprapatellar or intercondylar adhesions
• Fibrosis of the infrapatellar fat pad
• Entrapment of the patella
• Capsular contracture
Treatment is arthroscopic and functional prognosis is good:

- **Arthroscopic resection of the nodule**, most of times.
- **Arthroscopic debridement**, in diffuse forms.
**Fig. 1:** Sagittal FSE proton-density image with fat-suppression demonstrates a soft-tissue nodule (inside the red circle) in the anterior intercondylar notch, attached to the anterior surface of the tibial insertion of the ACL (yellow arrow), extending to the Hoffa's fat pad (inside the orange line).

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Fig. 2: Cyclops lesion in a 37-year-old-man with 4-year old history of knee trauma and arthroscopic meniscectomy presenting with loss of extension. Sagittal T1W MRI image shows the hypointense nodule (inside the red circle) indistinguishable from the synovial fluid.

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Fig. 3: Axial FSE proton-density image with fat-suppression demonstrates the well-circumscribed, heterogeneous cyclops nodule in the intercondylar notch (inside the red circle).

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Fig. 4: Sagittal T2*W MRI image confirms absence of hemosiderin deposits in the "Cyclops nodule".

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**Fig. 5:** Sagittal T1W after IV Gadolinium injection MRI image shows the hypointense "Cyclops nodule" (inside the red circle) and its moderate, mostly peripheral, heterogeneous enhancement.

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Fig. 6: Sagittal T1W after IV Gadolinium injection and fat-suppression MRI image shows the "Cyclops nodule" (inside the red circle) and its moderate, heterogeneous enhancement. It seems here that the nodule is attached to the anterior surface of the ACL through a pedicle.
**Fig. 7:** Coronal FSE proton-density with fat-suppression image confirms a normal ACL aspect with normal low-intensity signal and uninterrupted fibers.

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Fig. 8: Sagittal FSE proton-density with fat-suppression 3D MRI image depicts a fortuitously discovered chondroma (purple star) of the distal metaphysis of the femur which appears as a lobulated lesion with high-intensity T2W signal. We notice also the absence of any ACL graft (blue arrow).

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**Fig. 9:** Axial T1W after IV Gadolinium administration and fat-suppression MRI image shows thickened highly-enhanced synovial vili signing associated synovitis.

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Fig. 10: Axial FSE proton-density image showing the intramedullary chondroma of the distal metaphysis of the femur (purple star).

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Conclusion

"Cyclops syndrome" should be suspected in any patient in whom a nodule attached to the anterior surface of the ACL is identified at MR imaging, and similarly a "Cyclops nodule" should be considered as a possible cause of loss of extension in any patient who has sustained ACL injury whether there is history of ACL repair surgery or not.

Hence, localized anterior arthrofibrosis (cyclops lesion) is to keep in mind of any radiologist performing an MR imaging in a patient with knee pain and stiffness even if there is only history of arthroscopic knee surgery or just history of knee trauma.

The MR imaging appearance of the lesion is typical and has signal characteristics consistent with fibrovascular tissue, located in the intercondylar notch, anterior to the ACL.

Arthroscopy confirms the diagnosis and treats the lesion often with simple resection.
References


