



## Case report

## The cyclops lesion after bicruciate-retaining total knee replacement

Mark A. Klaassen, MD, FACS <sup>a,\*</sup>, Jerry L. Aikins, BS <sup>b</sup><sup>a</sup> Department of Orthopedic Surgery, Orthopedic and Sports Medicine Center, Elkhart, IN, USA<sup>b</sup> Clinical Affairs, Zimmer Biomet, Warsaw, IN, USA

## ARTICLE INFO

## Article history:

Received 29 March 2017

Received in revised form

6 June 2017

Accepted 10 June 2017

Available online 10 July 2017

## Keywords:

Cyclops lesion

Bicruciate-retaining

Total knee arthroplasty

Extension deficit

## ABSTRACT

The cyclops lesion is a localized anterior arthrofibrosis most commonly seen following anterior cruciate ligament reconstruction. The lesion forms at the anterior cruciate ligament insertion creating a painful extension block between femoral intercondylar notch and tibial plateau. We present 2 cases (3 knees) in which cyclops lesions appeared atypically following bicruciate-retaining total knee replacement. Two lesions occurred in a single patient following bilateral knee replacement. One lesion occurred in an active sportswoman. All 3 resolved following arthroscopic debridement. We describe the presentation of this unusual complication and suggest keys to its diagnosis, treatment, and prevention.

© 2017 The Authors. Published by Elsevier Inc. on behalf of The American Association of Hip and Knee Surgeons. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

The cyclops lesion first described by Jackson and Schaefer [1] was a complication following arthroscopically assisted anterior cruciate ligament (ACL) reconstruction. The arthrofibrotic nodule, arising from the base of the ACL graft, grew to impinge the femoral intercondylar notch causing loss of full extension in about 5% of patients. Arthroscopic excision was effective and the lesions typically did not reoccur.

Posttraumatic cyclops lesions have since been reported following ACL injury without surgical intervention [2–4]. These lesions resemble the “classic” cyclops in location and histology but are nonsurgical in etiology, suggesting that nodule genesis may lie in ACL fiber injury.

In this case report, we describe 3 cyclops lesions in 2 patients (1 bilateral) following bicruciate-retaining total knee arthroplasty (TKA). The absence of suspected ACL injury and the presence of a TKA prosthesis present unique diagnostic challenges. The case

reports are followed by a discussion of diagnostic and treatment options and tips for prevention.

## Case histories

## Case 1

A 61-year-old secretary was first seen for bilateral knee pain. Examination revealed both knees in neutral alignment with identical range of motion (ROM) 0° extension to 120° flexion. There was no significant laxity in either knee, and her history was negative for injury and prior surgery. The clinical Knee Society Score (KSS) was 59.

The 165-cm (5'–5")-tall, body mass index 24 nonsmoker consented to left TKA in June 2014. At surgery, tricompartmental degenerative disease and intact cruciate ligaments were confirmed. She received a cemented, bicruciate-retaining total knee (Vanguard XP, Zimmer Biomet, Warsaw, IN, Fig. 1). Femoral rotation was established off posterior condyles with transepicondylar axis check; tibial rotation by second metatarsal alignment with patellar tracking and flexion-extension axis confirmations. Care was taken to shield the cruciates and to prevent fracture of the tibial bone island. Trial reduction confirmed full ROM and no impingement of the ACL. Recovery and rehab were uneventful. At 5-week follow-up, examination revealed ROM 5°–110° and KSS 91.

Encouraged by early results, the patient consented to right total knee replacement in October 2014. Preoperative ROM was 0°–120°

One or more of the authors of this paper have disclosed potential or pertinent conflicts of interest, which may include receipt of payment, either direct or indirect, institutional support, or association with an entity in the biomedical field which may be perceived to have potential conflict of interest with this work. For full disclosure statements refer to <http://dx.doi.org/10.1016/j.artd.2017.06.002>.

\* Corresponding author. 2310 California Road, Elkhart, IN 46514, USA. Tel.: +1 574 264 0791.

E-mail address: [mklaassen@osmc.com](mailto:mklaassen@osmc.com)

<http://dx.doi.org/10.1016/j.artd.2017.06.002>

2352-3441/© 2017 The Authors. Published by Elsevier Inc. on behalf of The American Association of Hip and Knee Surgeons. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).



**Figure 1.** Anteroposterior (AP) (a) and lateral (b) radiographs of patients 1 at presentation and early postoperatively (c and d) following bicruciate retaining total knee arthroplasty (TKA).

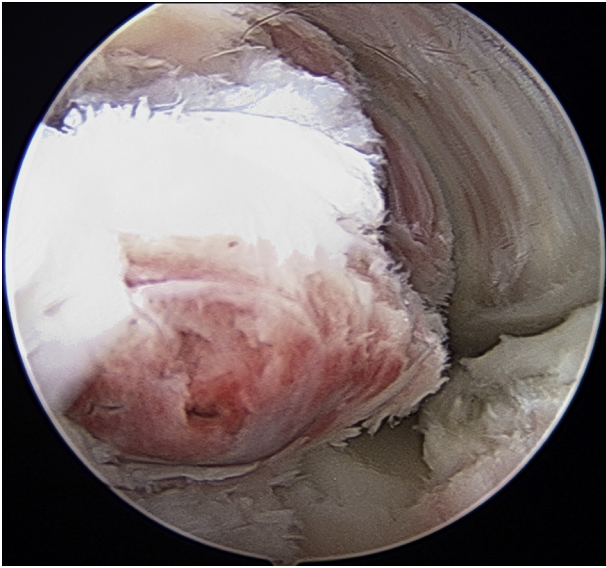
and the KSS was 59. Right knee surgery and recovery proceeded as described for the left knee.

The patient returned at 3 months (right) and 7 months (left) postoperatively with bilateral failure to achieve full knee extension. Physical examination revealed stable knees and good flexion; however, both knees exhibited a painful, hard stop at 5°–10° of extension deficit. Radiographs revealed properly aligned and well-fixed prostheses. Physical therapy targeted at achieving full extension was unsuccessful, so arthroscopy was scheduled for the worse (right) knee for suspected arthrofibrosis. With patient anesthetized, the extension deficit remained. Findings included a cyclops lesion blocking full extension (Fig. 2). The nodule was about 1.5 cm in height and width and extended anteriorly about 1 cm. Its attachment spanned the distal third of the ACL and its tibial insertion. Surgery included excision of the cyclops and

tricompartmental synovectomy. Full extension was regained immediately passively. Four weeks later swelling persisted, but pain and ROM had improved.

The patient eagerly consented to arthroscopy of the left knee, now 12 months post-TKA. The left knee's surgery and findings were similar to those of the first. Debridement of the second knee included careful excision of some anterior ACL fibers to eliminate impingement with the femoral prosthesis in extension. Full extension was obtained, passively and actively. Two months later, the left knee was asymptomatic with ROM 0°–120° and KSS 99.

The right knee was improved but remains problematic 7 months after debridement (14 months post-TKA). There is discomfort and a stubborn 5° flexion contracture not believed to be recurrence of the cyclops lesion. The right-side KSS is 93 and the patient's Knee Society functional score is 80.



**Figure 2.** The cyclops lesion of patient 1, right knee, lies within the polished prosthetic intercondylar notch.

**Case 2**

An active 69-year-old retiree was first seen in 2014 for pain in both knees. An avid bowler and golfer, her knee pain interfered with activity. Both knees were in neutral alignment with identical 5°–110° ROM and KSS 56. There was no significant laxity in either knee, and her history was negative for injury and prior surgery.

The 170-cm (5'-7")-tall, body mass index 30 nonsmoker consented to right TKA. Bicruciate-retaining knee replacement proceeded as described previously (Fig. 3). Recovery and rehab were uneventful.

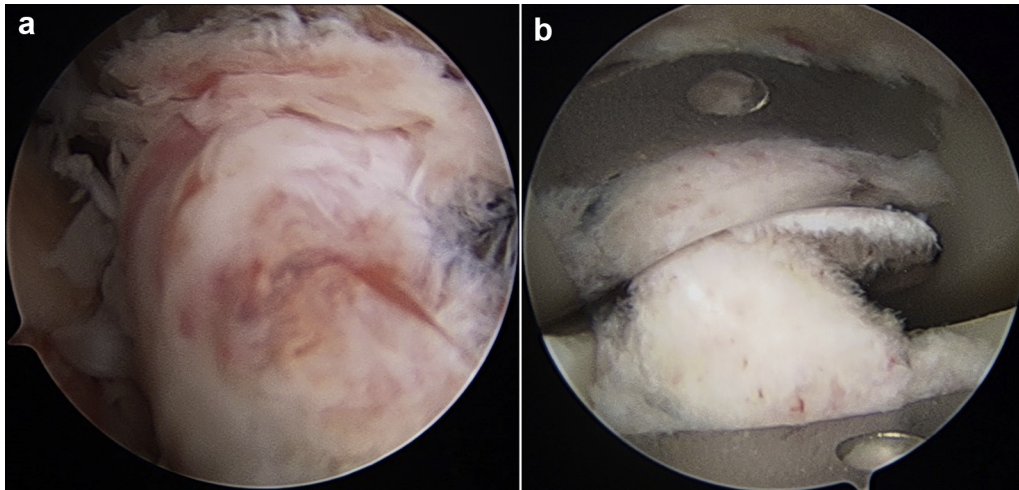
At 6 weeks, this motivated patient's ROM was 0°–110° and she reported having returned to bowling. She was encouraged to follow prescribed activity modification and to return for 1 year follow-up. She returned twice more by 6 months postoperatively complaining of swelling and stiffness interfering with bowling and golf. Each examination revealed a stable knee with mild edema; ROM was 0°–120° and KSS 69.

Symptoms worsened until at 7-month follow-up the pain hampered stair climbing and prevented recreational sports. She had developed a painful 5° extension deficit and her KSS was 50. The patient consented to arthroscopy including excision of a large cyclops lesion, after which the knee extended fully (Fig. 4). Two



**Figure 3.** AP (a) and lateral (b) radiographs of patient 2 at presentation and early postoperatively (c and d) following bicruciate retaining TKA.





**Figure 4.** The cyclops lesion (a) of patient 2. After debridement (b), with the knee fully extended, the ACL is free of impingement. The tibial baseplate's intercondylar bridge can be seen below and its reflection in the polished femoral prosthesis is visible above.

months following debridement, her ROM was 0°–120° and KSS was 94. She is functioning satisfactorily and is considering contralateral knee replacement.

## Discussion

Arthrofibrosis is a serious complication following surgery of the knee. The associated loss of motion is poorly tolerated, especially in extension, and especially in the younger, more active patient [5]. Cosgarea et al. [6] defined arthrofibrosis as flexion or extension loss relative to the contralateral knee and described 2 intra-articular variants: the global variant and the localized anterior variant of which cyclops is one.

Surgical intervention and nonsurgical knee injuries have spawned localized anterior lesions with now-familiar names. An early example, the patellar clunk syndrome, was described by Hozack et al. [7] in the late 1980s. The “suprapatellar fibrous nodule” that arose following posterior-stabilized TKA was stretched anteriorly with knee extension until it escaped the intercondylar notch abruptly with a palpable “clunk.”

The classic cyclops lesion of Jackson and Schaefer [1] followed ACL reconstruction. The fibrous nodule attached just anterolateral to the tibial insertion of the ACL graft. Symptoms included loss of full extension despite intensive physical therapy and a palpable clunk with terminal extension. Histology of resected lesions revealed a core of granulation tissue like that seen in healing scar, but with peripheral cartilaginous and bony tissue. The authors hypothesized that bone tunnel drilling seeded the patellar tendon autograft with autogenous cartilage and bone cells that spawned the lesion. Subsequent studies suggested the initiator was ACL graft injury—either intraoperative or secondary to improperly placed bone tunnels [5,8,9]. Cyclops lesions following both partial and complete ACL disruptions without surgical intervention appear to confirm that nodule genesis lies in ACL fiber injury [2–4].

We present now what we believe to be the first report of cyclops lesions following TKA. The bicruciate-retaining procedure was uncomplicated in all 3 knees and early rehabilitation progressed as expected. Between 3 and 6 months postoperatively, the telltale failure to achieve full extension either remained (1 knee) or developed anew (2 knees) and defied diligent physical therapy. Physical examination revealed significant, guarded pain on extension and a hard extension stop. Radiographs were negative for abnormalities.

The first of the 3 lesions was a surprise during arthroscopic debridement. Subsequently, with the cyclops a recognized possibility, the betraying painful extension deficit was highly predictive. This is fortunate because the metal prosthesis precludes the magnetic resonance imaging commonly used to diagnose a cyclops after ACL reconstruction. Specialized imaging techniques, such as ultrasonography and metal artifact reduction sequence magnetic resonance imaging, may be useful in these cases but have not been explored.

Arthroscopic excision of the cyclops eliminated symptoms in 2 of the presented knees and improved the third significantly. Excision requires good visibility for discrimination of the nodule's granulomatous tissue from the ACL fibers. Occasionally, a few anterior ACL fibers may require excision for clearance, as was true in one of the reported cases. Rounding the edges of the tibial bone island and aggressive femoral notchplasty are recommended to avoid impingement.

Prevention of the cyclops has become a key goal in the surgeon-author's (MAK) bicruciate-retaining total knees. Instruments are used to greatest advantage to avoid injuring the ACL during bone resections and notchplasty. Kinematically sound implant alignment may prevent undue strain on the ACL and the tibial bone island. Effort is made to preserve the ACL footprint in its entirety; however, ACL fibers occasionally blend so far anteriorly that some can and should be carefully released. The notchplasty should be revisited during trial reduction and after cementing the prosthesis to reassure ACL clearance. Nonsteroidal anti-inflammatory drugs may be of benefit and decreasing doses of steroids might be considered.

Cautious advancement of activity level following bicruciate-retaining knee replacement is recommended. The second patient in particular was doing amazingly well initially with a very high activity level, and then developed the cyclops about 6 weeks postoperatively. Physical therapists should be educated that a cyclops blocking extension defies therapeutic treatment.

## Summary

Retention of the patient's native ACL has opened the door for the cyclops to enter the total knee theater. This lesion should be suspected following bicruciate-retaining TKA when full extension cannot be achieved despite diligent physical therapy, especially if full extension was achieved initially then lost.

## References

- [1] Jackson DW, Schaefer RK. Cyclops syndrome: loss of extension following intra-articular anterior cruciate ligament reconstruction. *Arthroscopy* 1990;6(3):171.
- [2] McMahon PJ, Dettling JR, Yocum LA, Glousman RE. The cyclops lesion: a cause of diminished knee extension after rupture of the anterior cruciate ligament. *Arthroscopy* 1999;15(7):757.
- [3] Nakagawa T, Hiraoka H, Fukuda A, et al. Symptomatic cyclops lesion after rupture of the anteromedial bundle of the anterior cruciate ligament. *J Orthop Sci* 2006;11(5):537.
- [4] Runyan BR, Bancroft LW, Peterson JJ, et al. Cyclops lesions that occur in the absence of prior anterior ligament reconstruction. *Radiographics* 2007;27(6):e26.
- [5] Marzo JM, Bowen MK, Warren RF, Wickiewicz TL, Altchek DW. Intraarticular fibrous nodule as a cause of loss of extension following anterior cruciate ligament reconstruction. *Arthroscopy* 1992;8(1):10.
- [6] Cosgarea AJ, DeHaven KE, Lovelock JE. The surgical treatment of arthrofibrosis of the knee. *Am J Sports Med* 1994;22(2):184.
- [7] Hozack WJ, Rothman RH, Booth Jr RE, Balderston RA. The patellar clunk syndrome. A complication of posterior stabilized total knee arthroplasty. *Clin Orthop Relat Res* 1989;(241):203.
- [8] Gillespie MJ, Friedland J, Dehaven KE. Arthrofibrosis: etiology, classification, histopathology, and treatment. *Oper Tech Sports Med* 1998;6(2):102.
- [9] Noyes FR, Berrios-Torres S, Barber-Westin SD, Heckmann TP. Prevention of permanent arthrofibrosis after anterior cruciate ligament reconstruction alone or combined with associated procedures: a prospective study in 443 knees. *Knee Surg Sports Traumatol Arthrosc* 2000;8(4):196.