Risk factors for symptomatic cyclops after primary ACLR

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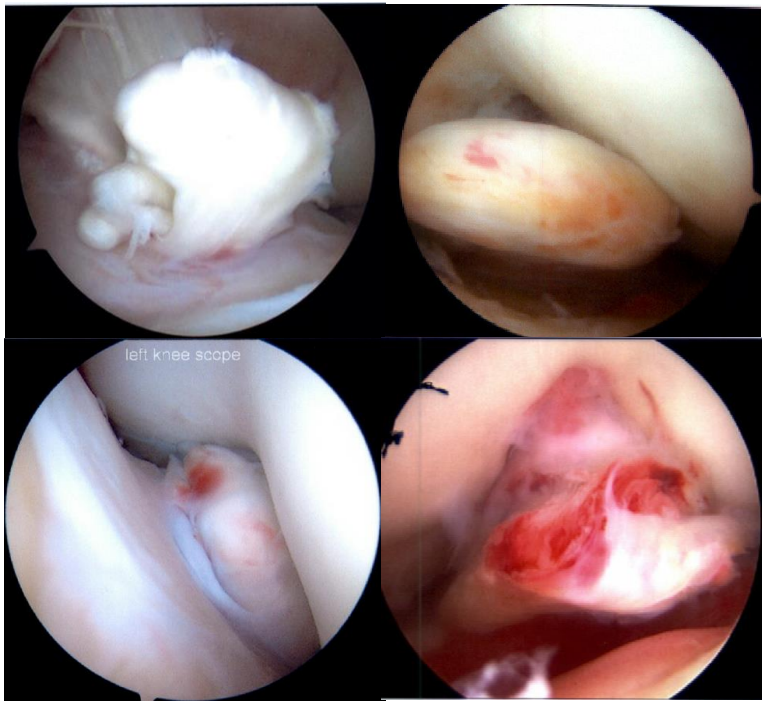
Disclosures

No relevant disclosures

Background

Cyclops lesions are a **common cause of extension loss** after ACLR.

MRI incidence within 1 year of ACLR up to **47%**



Kambhampati, OJSM 2020

Gohil, KSSTA 2014

Cyclops lesion vs syndrome

1 in 9 cyclops lesions are symptomatic…

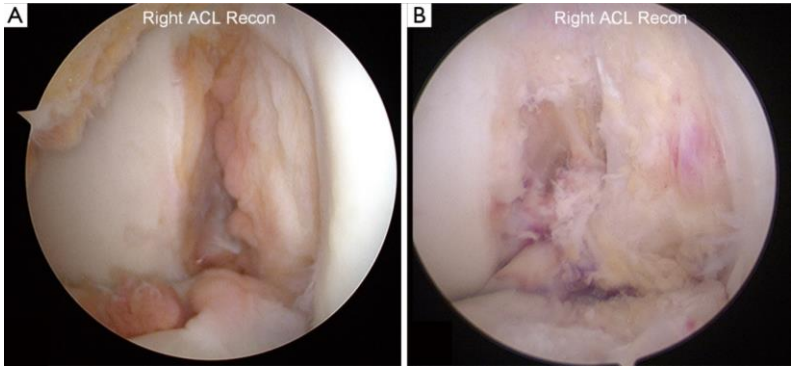
So it's important to distinguish:

Cyclops lesion = excessive notch fibrovascular tissue

Cyclops syndrome = cyclops lesion + clinical **block to extension**

Cyclops risk factors

Literature: female sex, narrow notch, large grafts, meniscus repair



Burnham, Fu, AOJ 2017

However:

- **Graft type** → no data
- "**Over-stuffing**" → no data
- **Slope** → no data

Kambhampati, OJSM 2020

Haley, Xerogeanes, Arthroscopy, 2023

Study questions

1. Does **graft type** matter? → quads are big grafts!
2. Is it **overstuffing**? → graft diameter, graft-notch ratio, remnant?
3. What about **slope**? → dynamic impingement, graft pistoning

Hypothesis: High graft diameter-notch ratio, quad graft, large remnants, and high tibial slope are risk factors for **cyclops syndrome**

Methods

Retrospective cohort study

- Primary ACLR, min. 6mo f/u

Evaluate:

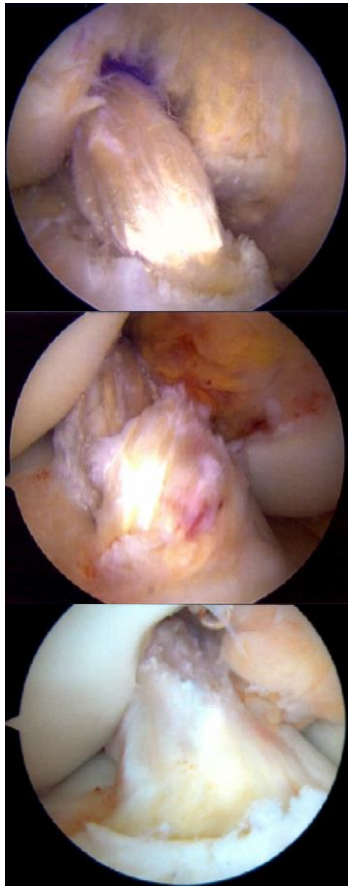
- Graft type + diameter → Op note
- Notch size → MRI
- Remnant preservation → Arthroscopy photos
- Slope → Post-op XR
- Tunnel position → Post-op XR (Quadrants method)

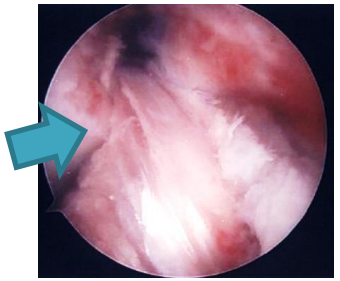
Methods – Remnant Grading

What constitutes a "**remnant**"?

We **graded** them:

1. Remnant grade:
   - 1 = below spine (or no tissue)
   - 2 = above spine
   - 3 = above condylar margin
2. Anterior tissue coverage
   - → yes/no
3. Lateral condyle impingement
   - → yes/no





Methods – Primary Outcome

Rate of **cyclops syndrome** **WITH return to OR for cyclops debridement <24 months** (excludes late occurrence)

Results

N = 1163 consecutive primary ACLs in 1134 patients

age 24.9 ± 10.5 years, 48% female, f/u 1.9 years (0.6-8.6 years)

- 234 Hamstring
- 341 Quad
- 334 BTB
- 254 Allograft

Overall rate of **cyclops syndrome 5.5% (n=64)**

Univariate: demographics not significant

Variable	Cyclops	No Cyclops	*p*
Age, mean (SD)	23.7 (9.1)	25.0 (10.5)	0.35
Sex (female), n (%)	35 (55%)	522 (47%)	0.26
BMI, mean (SD)	28.0 (6.5)	26.2 (5.3)	0.06

Univariate: graft type not significant

	Cyclops (n)	No Cyclops (n)	Cyclops Rate	*p*
Graft Type				0.79
Hamstring (n=234)	14	220	6.0 %	
Quad (n=341)	21	320	6.2 %	
BTB (n=334)	15	319	4.5 %	
Allograft (n=254)	14	240	5.5 %	

Univariate: meniscus repair not significant

	Cyclops (n)	No Cyclops (n)	Cyclops Rate	*p*
Meniscus Repair				0.07
Neither	32	646	4.7%	
Medial meniscus only	12	231	4.9%	
Lateral meniscus only	10	145	6.5%	
Both meniscus	10	77	11.5%	

Univariate: remnant grade not significant

	Cyclops (n)	No Cyclops (n)	Cyclops Rate	*p*
Remnant Preservation				0.49
Grade 1: below spine	46	716	6.0%	
Grade 2: above spine	8	197	3.9%	
Grade 3: above condyle	3	56	5.1%	
Anterior Graft Coverage	17	243	6.5%	0.46
LFC Contact	13	201	6.1%	0.68

Univariate: overstuffing not significant

	Cyclops (n)	No Cyclops (n)	Cyclops Rate	*p*
Graft diameter ≥10mm	33	553	5.6%	0.88
Notch width ≤15mm	13	134	8.8%	0.11
Graft diameter : notch width ratio >0.66	8	88	8.3%	0.30

Univariate: slope predicts cyclops

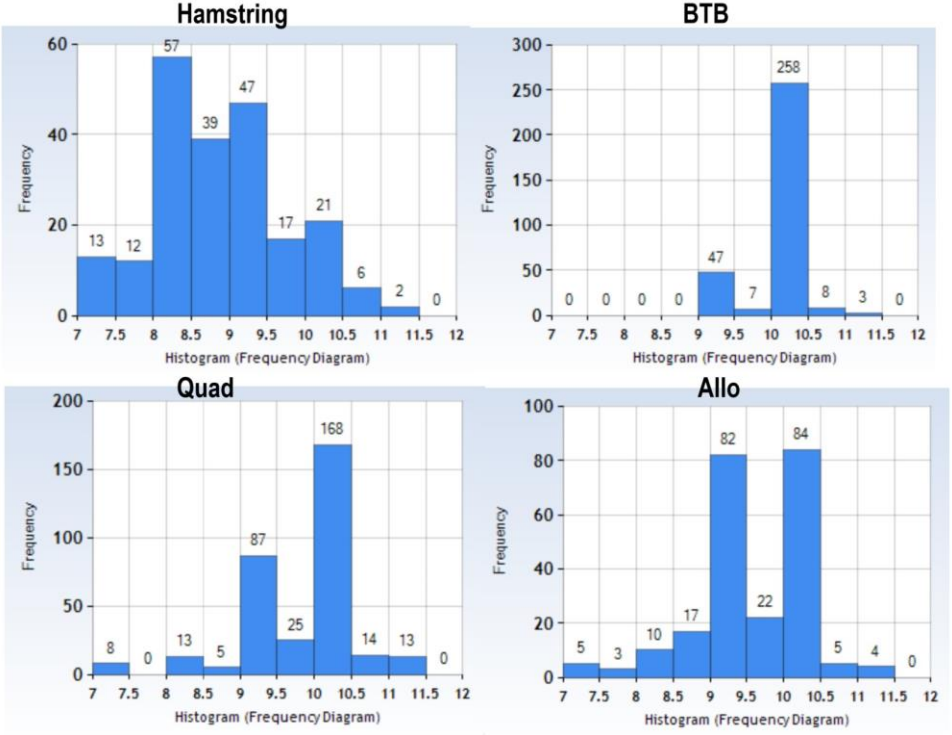
	Cyclops (n)	No Cyclops (n)	Cyclops Rate	*p*
Femoral Tunnel, Anterior Quartile	13	180	6.7%	0.52
Femoral Tunnel, Proximal-Distal				0.35
Proximal Quartile	9	171	5.0%	
Anatomic	29	359	7.5%	
Distal Quartile	6	126	4.5%	
Tibial Tunnel, Anterior Quartile	10	178	5.3%	0.52
Posterior Tibial Slope >12°	**15**	**100**	**13.0%**	**0.004**

Multiple regression: slope independently predicts cyclops

Variable	OR Estimate	95% Wald Confidence Limits		*p*
High BMI	1.04	0.985	1.098	0.153
Posterior tibial slope >12º	**2.58**	**1.260**	**5.276**	**0.010**

Sample size for multiple regression (stepwise) after removing missing data: **538 patients**, of which 38 had symptomatic cyclops with return to OR.

Post-hoc: does graft type interact with size?



All except hamstring are bimodal.

Can't treat diameter as a continuous variable

Summary: **High tibial slope** independently predicts clinically-significant cyclops

- This is a stringent cohort with conservative statistics.
- Adjusting for covariates in a multiple logistic regression: graft type, remnant, notch and graft dimensions, BMI, and meniscus repair were not significant predictors.
- Why does slope predispose cyclops? Dynamic graft motion? Impingment?

Thank you!