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Occurrence Rate of Cyclops Lesion after Double-Bundle ACL Reconstruction: Comparison between Remnant Tissue Preservation and Resection Methods

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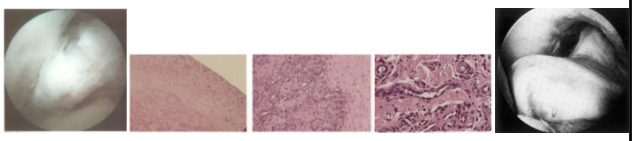
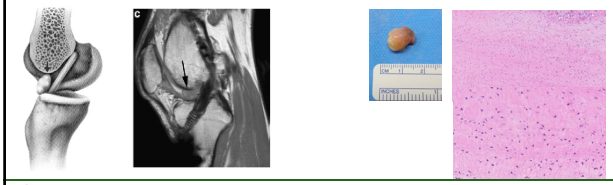
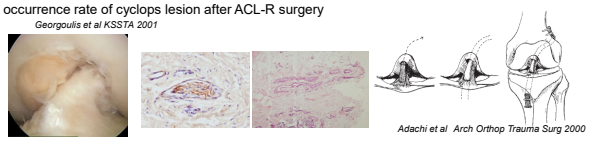
- Cyclops syndrome and lesions were first described in 1990
  Jackson and Schaefer Arthroscopy 1990
  - ✓ Patients w/ the inability to regain full extension had characteristic arthroscopic findings, including a fibrous nodule w/ granulation tissue anterolateral to the tibial tunnel



- The incidence of cyclops syndrome has been reported to be between 1 and 10% of ACL-R
  Marzo et al Arthroscopy 1992, Ahn et al KSSTA 2007, Kondo et al AJSM 2015
- MRI studies have found an incidence of 25 to 47% for cyclops lesions
  Ahn et al Arthroscopy 2011, Facchetti et al Eur Radiol 2017
  - ✓ These lesions are characterized by the development of fibrovascular tissue anterior to the ACL graft
    George et al AJSM 2006, Cha et al Skeletal Radiol 2012

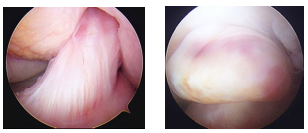


- Preservation of the ACL remnant has remained a topic of interest
- Remnant preservation has been expected to have several potential advantages to improve knee stability
  - ✓ Enhanced graft coverage with fibrous tissues
  - ✓ Accelerated cell repopulation and revascularization
  - ✓ Reduction of tunnel enlargement
    Adachi et al Arch Orthop Trauma Surg 2000, Ochi et al Arthroscopy 2006, 2009, Dhillon et al Int Orthop 2010
    Lee et al Arthroscopy 2008, Masuda et al OJSM 2018, Webster et al OJSM 2021
- However, there has been some apprehension that remnant preservation may increase the occurrence rate of cyclops lesion after ACL-R surgery
  Georgoulis et al KSSTA 2001



Adachi et al Arch Orthop Trauma Surg 2000

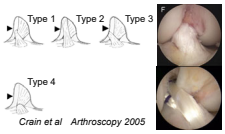
- In this study, we compared the occurrence rate of cyclops lesion between the remnant-preserving and -resecting procedures after DB-R



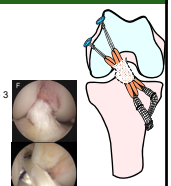
Methods 6

Study design

- Retrospective study
- 177 patients: Unilateral DB ACL-R using hamstring grafts (2014-2018)
  - ✓ Crain classification
    - R group: 98 patients w/ remnant tissue
      - the remnant-preserving procedure
    - NR group: 79 patients w/ remnant type IV
      - the remnant-resecting procedure



Crain et al Arthroscopy 2005



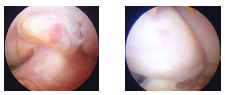
- Patients were evaluated arthroscopic and clinical results @ 15 (8) months after surgery
- Statistical comparisons
  - ✓ The paired Student t test, chi-square test, and Fisher exact test

Methods 7

2nd look arthroscopy

- Cyclops lesion as a nodule of fibrous tissue around the ACL graft
  - ✓ Whose size was >5 mm in long diameter
    - *Jackson et al Arthroscopy 1990*
    - *McMahon et al Arthroscopy 1999*
    - *Kambhampati et al OJSM 2020*

- Cyclops syndrome as the presence of cyclops lesion and concomitant loss of over 5 deg of knee extension



Results 8

- The incidence of cyclops lesions and cyclops syndrome

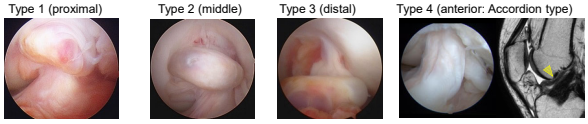
Occurrence rate of Cyclops Lesion and Cyclops Syndrome

	R group (n=98) Remnant	NR group (n=79) Non-Remnant	*P value*
Cyclops lesions	13 patients (13.3%)	23 patients (29.1%)	*0.0139*
Cyclops syndrome	4 patients (4.1%)	3 patients (3.8%)	*NS*

Results 9

- Cyclops lesions were divided into 4 locations

Type 1 (proximal) Type 2 (middle) Type 3 (distal) Type 4 (anterior: Accordion type)



Kambhampati et al OJSM 2020

	R group (n=98) Remnant	NR group (n=79) Non-Remnant	*P value*
Type 1 (proximal)	5 pts (5.1%)	2 pts (2.5%)	*NS*
Type 2 (middle)	4 pts (4.1%)	3 pts (3.8%)	*NS*
Type 3 (distal)	3 pts (3.1%)	15 pts (19.0%)	*0.0354*
Type 4 (anterior)	1 pts (1.0%)	3 pts (3.8%)	*NS*

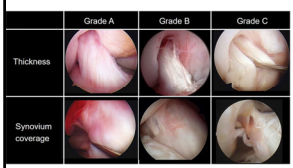
Knee stability and clinical evaluations 10

	R group (n=98)	NR group (n=79)	*P value*
Anterior laxity	0.7 (2.0) mm	1.6 (2.0) mm	*0.035*
Pivot-shift test			
0	88 patients (90%)	61 patients (77%)	*0.0194*
+	10 patients (10%)	18 patients (23%)	
2+	0	0	
Lysholm score	96.2 (4.9) points	95.2 (6.7) points	*NS*
IKDC evaluation			
A	76 patients (78%)	59 patients (75%)	*NS*
B	20 patients (20%)	13 patients (16%)	
C	2 patients (2%)	7 patients (9%)	
D	0	0	
Isokinetic peak torque[a]			
Quad	86.9 (15.6) %	85.2 (17.2) %	*NS*
Ham	86.5 (16.2) %	88.1 (21.3) %	

[a] *% of uninjured knee toque*

Results 11

- Concerning postoperative thickness and synovium coverage of the grafts
  - ✓ R group was significantly better than NR group



Kondo et al Arthroscopy 2008

	Grade A	*Grade B*	*Grade C*
Thickness	*2 points*	*1 point*	*0 point*
Synovium	*2 points*	*1 point*	*0 point*

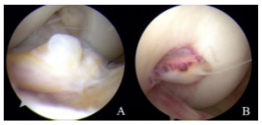
	R group (n=98)	NR group (n=79)	*P value*
Thickness			
A	94 pts (96%)	61 pts (77%)	*0.0006*
B	3 pts (3%)	17 pts (22%)	
C	1 pts (1%)	1 pts (1%)	
Synovium coverage			
A	91 pts (93%)	63 pts (80%)	*0.0358*
B	6 pts (6%)	14 pts (18%)	
C	1 pts (1%)	2 pts (3%)	
Overall evaluation			
Excellent (*4 points*)	90 pts (92%)	49 pts (62%)	*<0.0001*
Fair (*2-3 points*)	7 pts (7%)	25 pts (32%)	
Poor (*0-1 point*)	1 pts (1%)	5 pts (6%)	

Discussion 12

- The occurrence rate of cyclops lesion of NR group was significantly higher than that of R group
- There was a significant difference in the locational patterns of the cyclops lesion between the groups
- Regarding the occurrence rate of cyclops syndrome, there was no significant difference between the groups

Discussion 13

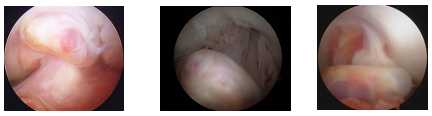
- An increased extension deficit for knees preserving a large remnant
  Muneta et al KSSTA 2013
- Hyperproliferation of the synovia (ie, cyclops syndrome) was identified in 69% of the cases in the R group, while this was not observed in the NR group
  Nakayama et al Knee 2017
- No difference in the incidence of cyclops lesions between remnant-preserving and -resecting ACL-Rs
  Tanabe et al Asia Pac J Sports Med Arthrosc Rehabil Technol 2016



Discussion 14

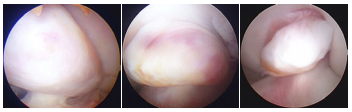
- In the present study, the tibial side of the cyclops lesion occurred w/ greater frequency in NR group
  - ✓ These results suggest that the cyclops lesion frequently occurred from the resected tibial remnant tissue
- The femoral side of the cyclops lesion had a tendency to be detected in R group
  - ✓ Several reasons are considered for this, such as graft impingement, graft coverage w/ the remnant tissue, and bone and cartilage residue, etc

Jackson et al Arthroscopy 1990, Marzo et al Arthroscopy 1992
Delcogliano et al KSSTA 1996, Delince et al Arthroscopy 1998



Conclusion 15

- In this cohort of patients undergoing DB ACL-R, resection of the ACL remnant was associated w/ a significantly higher rate of cyclops formation when compared w/ preservation of the remnant



Thank you 16