



Clinical outcome of bicruciate ligament reconstruction in multiple knee ligament injuries: Comparison with bicruciate and collateral ligament reconstruction

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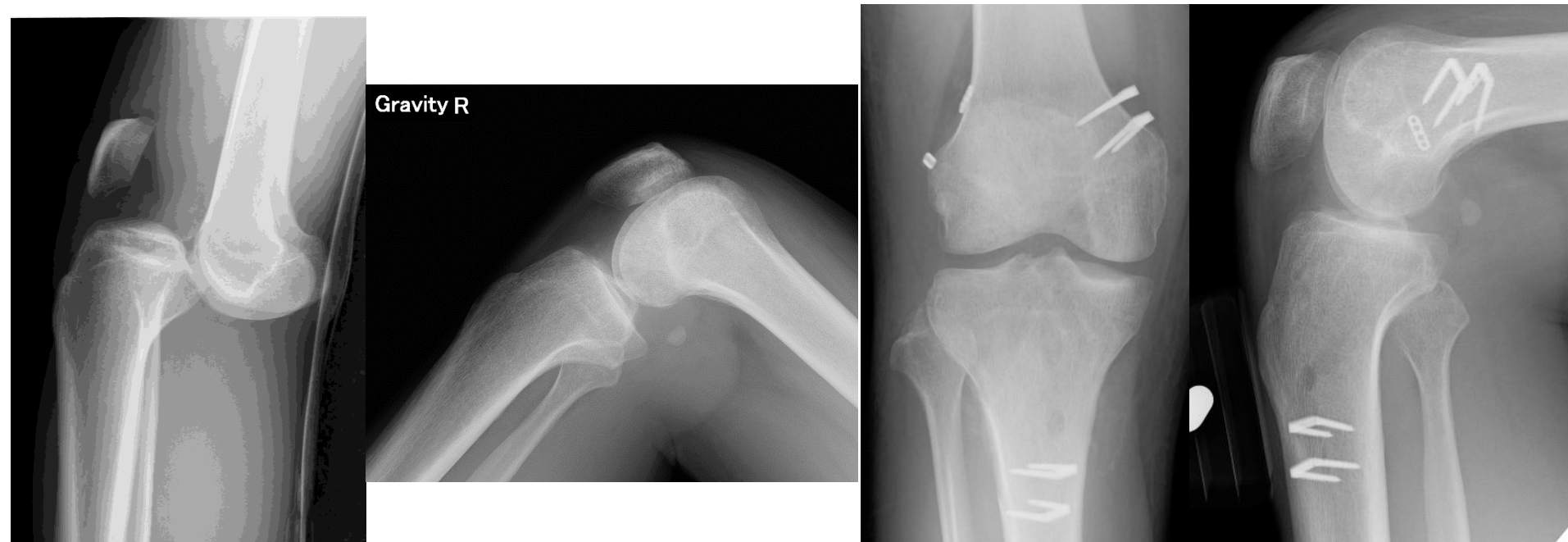
Multiple knee ligament injuries

- Management of multiple knee ligament injuries (ACL & PCL injuries combined w/ medial structure (MS) and/or posterolateral structure (PLS) injury) are remain difficult.
- We have treated the multiple knee ligament injuries using hybrid tendon autografts.^{1,2,3}
- Biomechanical studies have established that injuries to the MS or PLS of the knee worsen the deleterious effects of tears in both cruciate ligaments.⁴



Hypothesis

- Postoperative knee stability and clinical outcomes that underwent simultaneous ACL & PCL-R (reconstruction) may be significantly better from that underwent bicruciate and collateral ligament-Rs.



Study design

- Retrospective study: 41 pts (41 knee)
 - ✓ Sex: 37 male, 4 female
 - ✓ Mean age: 31 (16-60) yrs
 - ✓ Surgical management
 - Acute phase (5 pts): Two stage procedure
 - Chronic phase (36 pts): One stage procedure
- Group
 - ✓ Group I (19 pts): bicruciate-R
 - ✓ Group II (22 pts): bicruciate and MS or PLS-R
- Clinical evaluation@ over 2 yrs

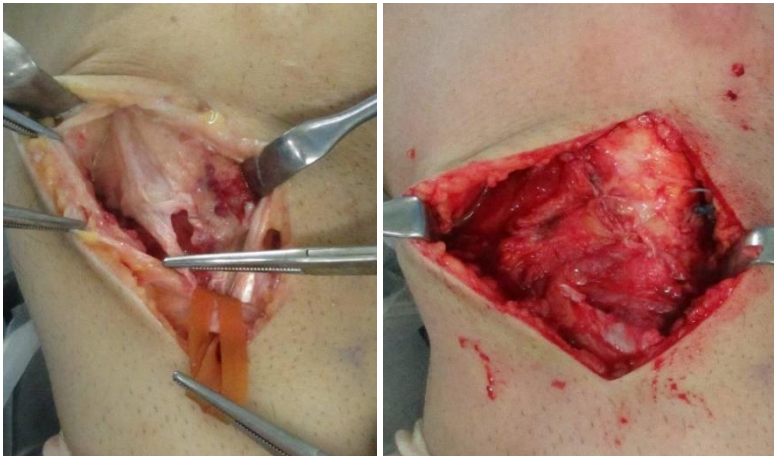


Surgical technique (1st stage in acute phase)

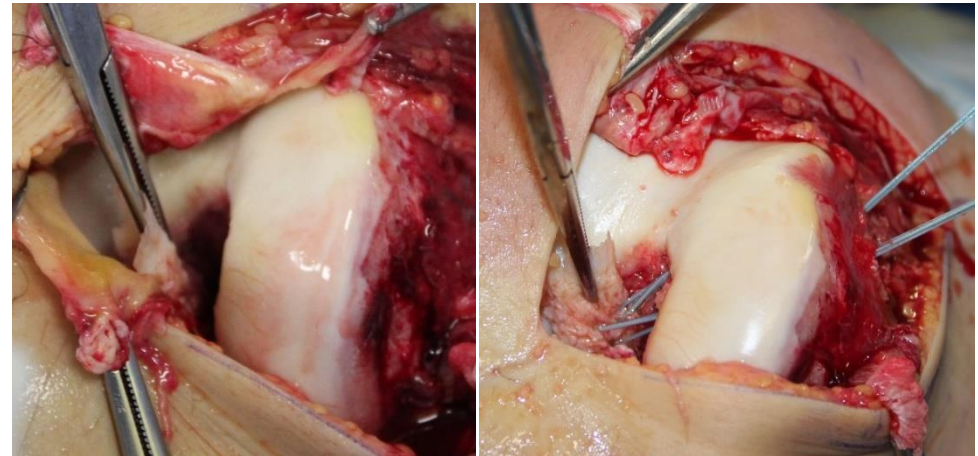
- MS or PLS injury
 - ✓ Repair w/ suture anchor for injury of insertion part
 - ✓ Suture w/ fiber wire for injury of ligament part
- Avulsion fx of ACL or PCL
 - ✓ Fixation with pull out technique



LCL Avulsion fx



MS repair

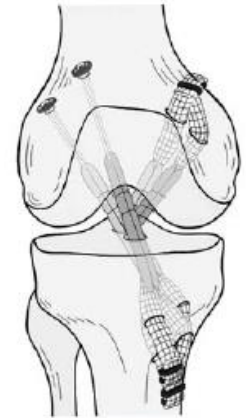
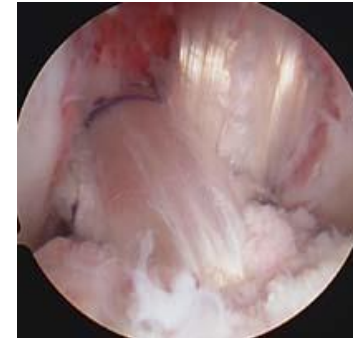


PCL Avulsion fx

Surgical technique

- ACL & PCL-Rs¹

- ✓ DB ACL-R: 9 knees, DB PCL-R: 10 knees
- ✓ SB ACL-R: 12 knees, SB PCL-R: 11 knees
- ✓ Semi-T and Gr hybrid graft



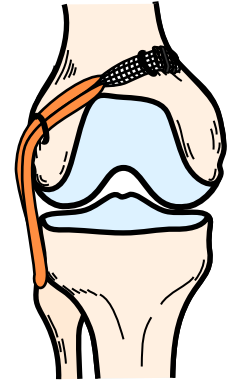
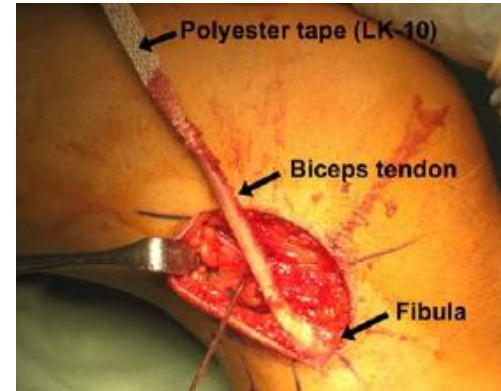
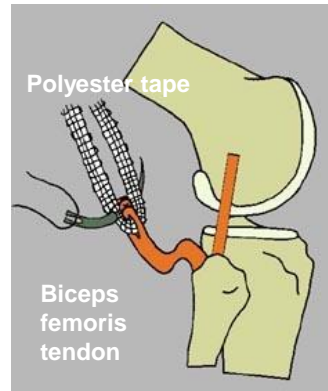
- MCL-R

- ✓ The Semi-T from the ipsilateral knee for sMCL-R⁵



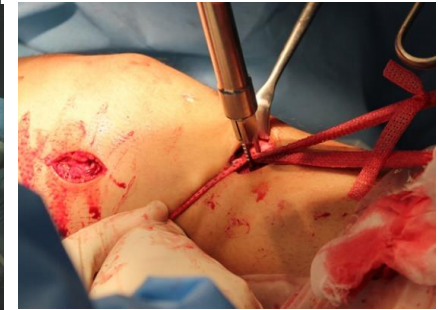
Surgical technique

- PLS-R (modified Clancy methods)
 - ✓ The anterior half of biceps femoris tendon⁶



- Graft fixation

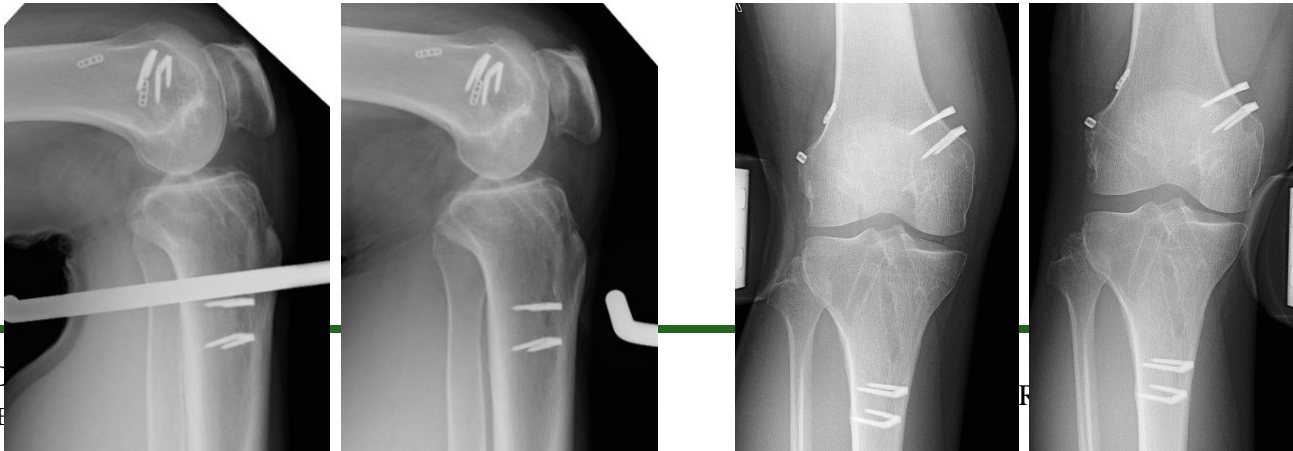
- ✓ PCL graft was tensioned @ 90° to obtain an anatomic position for reduction of posterior sag
- ✓ The grafts were simultaneously fixed @ 10° using staples



Results

	Group I	Group II	<i>p-value</i>
Loss of extension (>5°)	0 pts	0 pts	<i>n.s.</i>
Loss of flexion (>15°)	0 pts	4 pts	<i>n.s.</i>
A-P difference @ 20°	1.9 (2.8) mm	2.0 (1.9) mm	<i>n.s.</i>
@ 70°	1.8 (0.8) mm	2.7 (2.8) mm	<i>n.s.</i>

Stress radiograph	Group I	Group II	<i>p-value</i>
ADT @ 90°	62.4 (5.8) %	63.0 (5.9) %	<i>n.s.</i>
PDT @ 90°	54.8 (5.5) %	52.7 (7.1) %	<i>n.s.</i>
Valgus @ 30°	7.3 (1.0) mm	7.7 (1.1) mm	<i>n.s.</i>
Varus @ 30°	8.8 (1.2) mm	9.6 (1.9) mm	<i>n.s.</i>



Clinical outcomes

	Group I	Group II	<i>p-value</i>
Lysholm score (points)	92.4 (6.1)	87.6 (11.2)	<i>n.s.</i>
IKDC Grade A	10 pts (53%)	9 pts (41%)	<i>n.s.</i>
B	9 pts (47%)	8 pts (36%)	<i>n.s.</i>
C	0 (0%)	5 pts (23%)	<i>n.s.</i>
D	0 (0%)	0 (0 %)	<i>n.s.</i>
KOOS (points) Pain	82.4 (8.3)	75.8 (21.8)	<i>n.s.</i>
Symptom	80.7 (9.3)	78.4 (17.9)	<i>n.s.</i>
ADL	87.0 (5.5)	80.7 (17.3)	<i>n.s.</i>
Sports/rec	68.6 (14.3)	66.1 (27.2)	<i>n.s.</i>
QOL	71.3 (8.0)	63.7 (24.5)	<i>n.s.</i>

- Isokinetic peak torque

	Group I	Group II	<i>p-value</i>
Quadriceps muscle	85.4 (9.3)%	87.4 (10.2)%	<i>n.s.</i>
Hamstring muscles	84.9 (9.0)%	83.9 (7.7)%	<i>n.s.</i>

% of uninjured knee torque

- Complications

- ✓ Acute intraarticular infection: 3 patients in Group II
 - All patients were improved by synovectomy and continuous irrigation treatment

Management of multiple knee ligament injuries

- Superficial MCL using a ST tendon hybrid autograft for chronic medial knee instability.⁵
- Treatment of grade III PLC-R of midsubstance tears, and concurrent-R of any cruciate ligament tears resulted in significantly improved objective stability.⁷
 - ✓ There were no significant differences in the postoperative knee stability and clinical outcomes between Groups I and II.
- 5 patients were Grade C IKDC rating, one important factor contributing to the unfavorable IKDC rating was knee contracture that had already existed before surgery.
 - ✓ The initial treatment and rehabilitation in the acute stage after injury are of importance for the following surgery.

Conclusions

- The present study demonstrated that the effectiveness and safety of simultaneous ACL & PCL-R using 'hybrid' tendon autografts for combined ligamentous injuries.
- There were no significant differences in the postoperative knee stability and clinical outcomes between bicruciate-R and bicruciate and collateral ligament-R groups.

References

- 1) Yasuda K, Kitamura N, Kondo E et al. KSSTA 2009
- 2) Ohkoshi Y, Nagasaki S, Shibata N et al. CORR 2002
- 3) Hayashi R, Kitamura N, Kondo, E Yasuda K et al. KSSTA 2008
- 4) Veltri DM, Deng XH, Maynard MJ et al. Am J Sports Med. 1995
- 5) Kitamura N, Ogawa M, Kondo, E Yasuda K et al. Am J Sports Med 2013
- 6) Veltri DM, Warren RF J Bone Joint Surg Am. 1994
- 7) Geeslin H, LaPrade RF, J Bone Joint Surg Am. 2011

