ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Outcomes following ACL Reconstruction with Patellar Tendon Autograft and Internal Brace Augmentation plus Anterolateral Ligament Internal Bracing

R.A. McIntyre[1], Z.R. Maas[2], N. Edgar[2], G.P. Hopper[1,4], W.T. Wilson[3,4], G.M. MacKay[4]

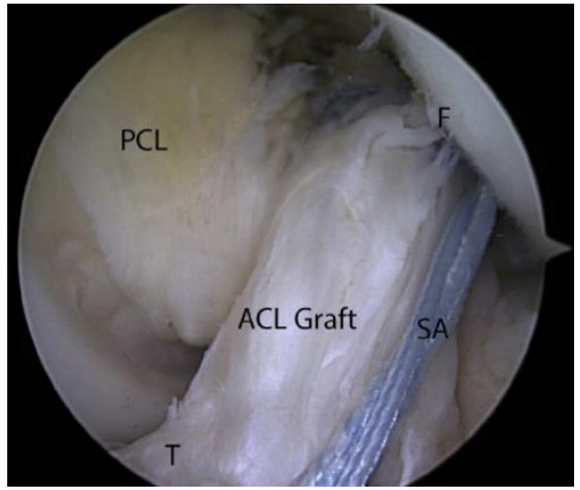
1. Trauma and Orthopaedic Surgery, NHS Lanarkshire, United Kingdom
2. Trauma and Orthopaedic Surgery, NHS Greater Glasgow and Clyde, United Kingdom
3. Trauma and Orthopaedic Surgery, NHS Ayrshire and Arran, United Kingdom
4. Ross Hall Hospital, Glasgow, United Kingdom

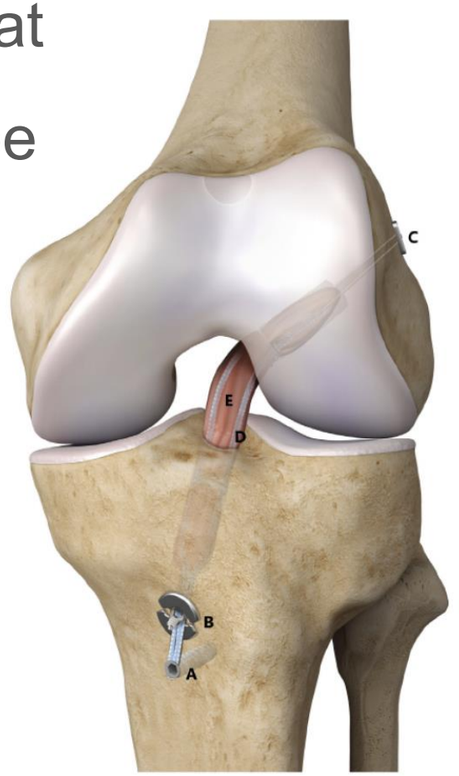
Faculty Disclosure Information

- G.M.M. receives consulting fees and royalties from Arthrex and holds a patent (US20120271416A1) for Internal Brace™ for tissue repairs and reinforcements.
- The other authors have no conflicts of interest to declare

Independently tensioned suture tape utilized to augment ACL reconstruction

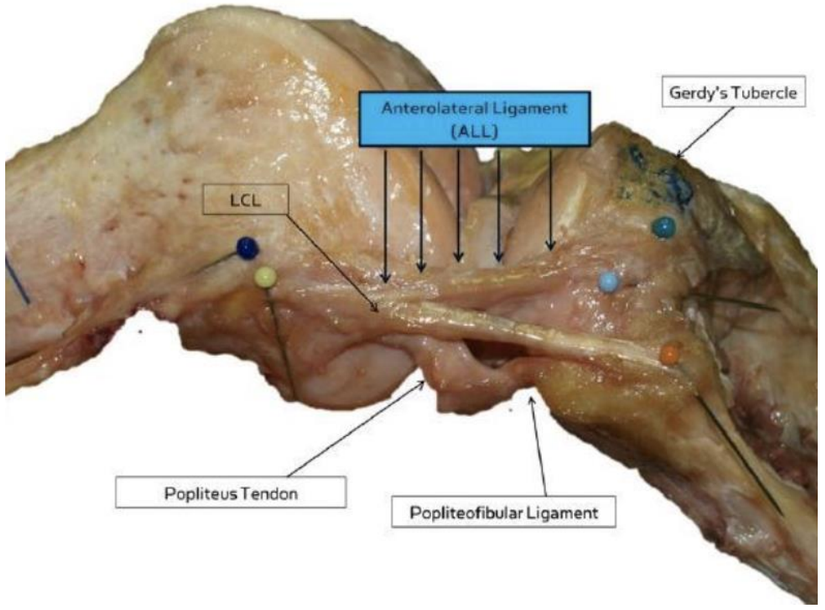
Cadaveric and biomechanical studies have shown that ACL reconstruction with the addition of the suture tape is stronger [1-5]





Lateral Extra-Articular Procedures (LEAPs) and ACL Reconstruction

Following the description of the Anterolateral Ligament (ALL) Lateral Extra-Articular Procedures have been shown to reduce the failure rate of ACL grafts, whilst maintaining excellent patient reported outcome measures[6,7]



Aims

- To **evaluate graft failure rates** in patients undergoing ACL reconstruction with patellar tendon autograft reinforced with internal brace, plus internal bracing to the ALL
- To evaluate **secondary surgery rates** and **patient-reported outcome measures (PROMs)** in those undergoing this procedure

Methods

- Prospectively recruited, single surgeon practice 2018 - 2022
- Followed up clinically for 6 months & virtually for minimum of 2 years

Inclusion criteria:

- Primary ACL reconstruction with patellar tendon autograft augmented with suture tape plus simultaneous Internal Brace to the ALL

Exclusion criteria:

- Previous ACL reconstruction
- Multi-ligament injury

Results

63 patients were included in the study

- Median age 30.7 years (IQR = 23.5 - 45), 38% (24) female
- Mean follow-up duration 3.4 ± 1 years

Primary outcome: Graft failure rate

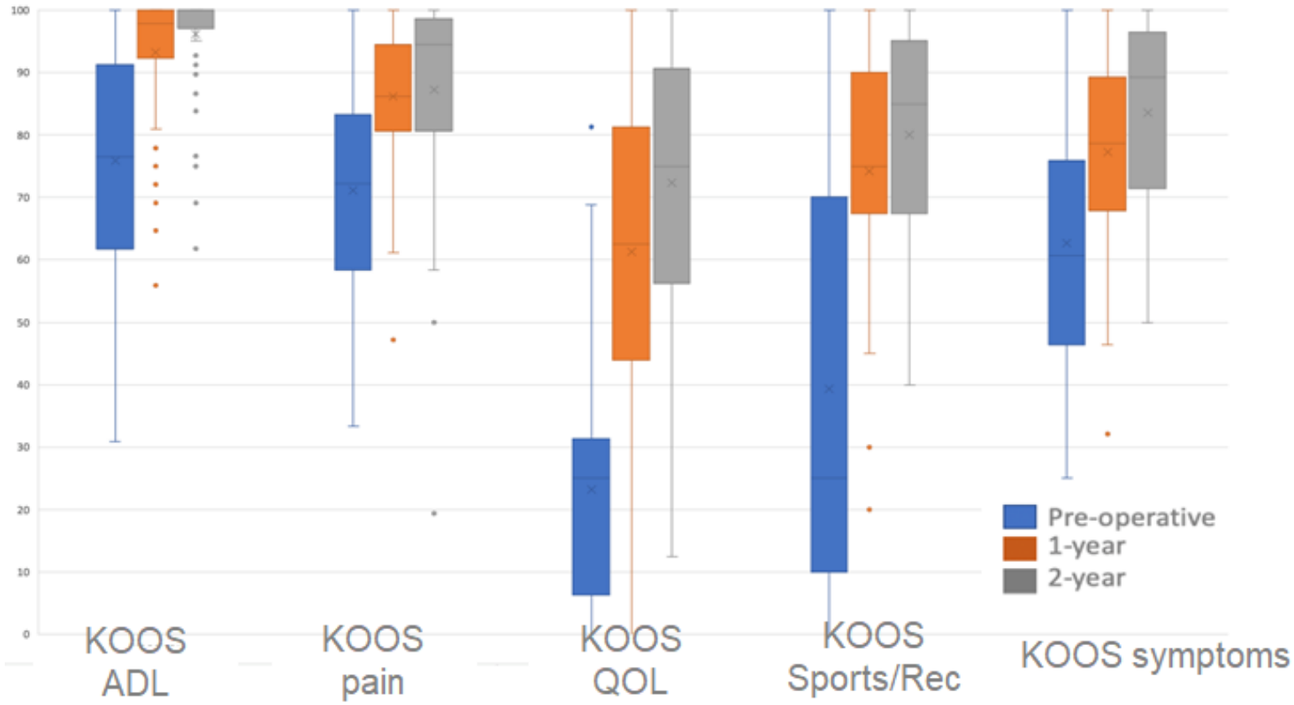
- 1 patient had a re-rupture giving an overall graft failure rate of **1.6%**
- 21-year-old male with hypermobility syndrome who re-ruptured at 42 months post-operatively whilst playing semi-professional football

Results

KOOS (The Knee injury and Osteoarthritis Outcome Score)

Significant improvements were observed in **all KOOS domains** from preoperative to 2 years postoperative (**p<0.001**)

Boxplot showing KOOS Scores at pre-op, 1 year and 2 years post-op



ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

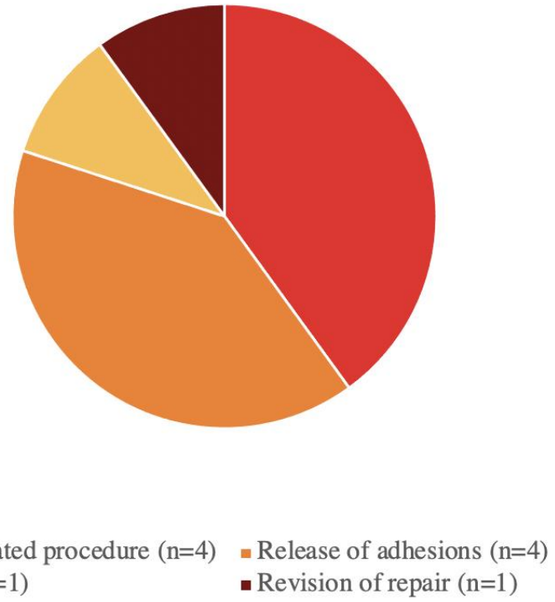
Results

Marx activity level

There was a statistically significant decline in median Marx activity score from 12 (IQR = 4–15.8) pre-operatively to 8 at 2 years (IQR = 3 – 12, p=0.046)

Secondary surgeries

The rate of secondary surgery was 16% (10 patients)



Discussion: Graft Failure Rate

- The literature quotes a **3.1 – 17.2%**[8,9] graft failure rate for ACL reconstruction
- A large registry study indicated a graft failure rate with patellar tendon ACL reconstruction at **2.8%**[10], with a systematic review indicating a yearly failure rate of **1.16%**[11]
- Our graft failure rate of **1.6%** at a **mean of 3.4 years** is lower than that reported for conventional ACL reconstruction

Discussion: PROMs & Secondary Surgery

PROMS

KOOS

- Patients saw an improvement across all KOOS domains
- This improvement is in keeping with previous research[12-14]

Marx activity level

- Patients saw a reduction in Marx activity levels at 2 years
- This is in keeping with previous research[14]

Secondary Surgery

- No secondary surgery for infection
- 1 (1.6%) revision ACL reconstruction
- 1 (1.6%) required removal of hardware from the ALL due to irritation
- 4 (6.3%) secondary surgeries for arthrofibrosis
- This data is comparable with previous literature[15]

Conclusion

This novel operative technique demonstrates a **low failure rate** at a mean of **3.4 ± 1 years**, with satisfactory PROMs and satisfactory secondary surgery rates

This suggests the potential for routine clinical use of **ACL & ALL Internal Bracing** to reduce graft failure rates with ACL Reconstruction

References

1. Bachmaier S, Smith PA, Argintar EH, Chahla J, Higgins LD, Wijdicks CA. Independent Suture Augmentation With All-Inside Anterior Cruciate Ligament Reconstruction Reduces Peak Loads on Soft-Tissue Graft. A Biomechanical Full-Construct Study. *Arthroscopy*. 2022;38(1):88-98. doi:10.1016/j.arthro.2021.09.032
2. Smith PA, Bradley JP, Konicek J, Bley JA, Wijdicks CA. Independent Suture Tape Internal Brace Reinforcement of Bone-Patellar Tendon-Bone Allografts: Biomechanical Assessment in a Full-ACL Reconstruction Laboratory Model. *J Knee Surg*. 2020;33(10):1047-1054. doi:10.1055/s-0039-1692649
3. Bachmaier S, Smith PA, Bley J, Wijdicks CA. Independent Suture Tape Reinforcement of Small and Standard Diameter Grafts for Anterior Cruciate Ligament Reconstruction: A Biomechanical Full Construct Model. *Arthroscopy*. 2018;34(2):490-499. doi:10.1016/j.arthro.2017.10.037
4. Wilson WT, Kennedy MJ, MacLeod D, Hopper GP, MacKay GM. Outcomes of Anterior Cruciate Ligament Reconstruction With Independently Tensioned Suture Tape Augmentation at 5-Year Follow-up. *Am J Sports Med*. 2023;51(14):3658-3664. doi:10.1177/03635465231207623
5. Daniel AV, Wijdicks CA, Smith PA. Reduced Incidence of Revision Anterior Cruciate Ligament Reconstruction With Internal Brace Augmentation. *Orthop J Sports Med*. 2023;11(7):23259671231178026. Published 2023 Jul 24. doi:10.1177/23259671231178026
6. Getgood, A. M. J., Bryant, D. M., Litchfield, R., Heard, M., McCormack, R. G., Rezansoff, A., Peterson, D., Bardana, D., MacDonald, P. B., Verdonk, P. C. M., Spalding, T., STABILITY Study Group, Willits, K., Birmingham, T., Hewison, C., Wanlin, S., Firth, A., Pinto, R., Martindale, A., O'Neill, L., … Van Haver, M. (2020). Lateral Extra-articular Tenodesis Reduces Failure of Hamstring Tendon Autograft Anterior Cruciate Ligament Reconstruction: 2-Year Outcomes From the STABILITY Study Randomized Clinical Trial. *The American journal of sports medicine*, *48*(2), 285–297.
7. Hopper GP, Aithie JMS, Jenkins JM, Wilson WT, Mackay GM. Combined Anterior Cruciate Ligament Repair and Anterolateral Ligament Internal Brace Augmentation: Minimum 2-Year Patient-Reported Outcome Measures. Orthop J Sports Med. 2020 Dec 18;8(12):2325967120968557. doi: 10.1177/2325967120968557. PMID: 33415174; PMCID: PMC7750774.
8. Wiggins AJ, Grandhi RK, Schneider DK, Stanfield D, Webster KE, Myer GD. Risk of Secondary Injury in Younger Athletes After Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis. *Am J Sports Med*. 2016;44(7):1861-1876. doi:10.1177/0363546515621554
9. Liukkonen RJ, Ponkilainen VT, Reito A. Revision Rates After Primary ACL Reconstruction Performed Between 1969 and 2018: A Systematic Review and Metaregression Analysis. *Orthopaedic Journal of Sports Medicine*.
10. Persson A, Kjellsen AB, Fjeldsgaard K, Engebretsen L, Espehaug B, Fevang JM. Registry data highlight increased revision rates for endobutton/biosure HA in ACL reconstruction with hamstring tendon autograft: a nationwide cohort study from the Norwegian Knee Ligament Registry, 2004-2013. *Am J Sports Med*. 2015;43(9):2182-2188. doi:10.1177/0363546515584757
11. Haybäck G, Raas C, Rosenberger R. Failure rates of common grafts used in ACL reconstructions: a systematic review of studies published in the last decade. *Archives of Orthopaedic and Trauma Surgery*. 2021;142(11):3293-3299. doi:https://doi.org/10.1007/s00402-021-04147-w
12. Ingelsrud LH, Terwee CB, Terluin B, et al. Meaningful Change Scores in the Knee Injury and Osteoarthritis Outcome Score in Patients Undergoing Anterior Cruciate Ligament Reconstruction. *Am J Sports Med*. 2018;46(5):1120-1128. doi:10.1177/0363546518759543
13. Salavati M, Akhbari B, Mohammadi F, Mazaheri M, Khorrami M. Knee injury and Osteoarthritis Outcome Score (KOOS); reliability and validity in competitive athletes after anterior cruciate ligament reconstruction. *Osteoarthritis Cartilage*. 2011;19(4):406-410. doi:10.1016/j.joca.2011.01.010
14. MOON Knee Group, Spindler KP, Huston LJ, et al. Ten-Year Outcomes and Risk Factors After Anterior Cruciate Ligament Reconstruction: A MOON Longitudinal Prospective Cohort Study. *Am J Sports Med*. 2018;46(4):815-825. doi:10.1177/0363546517749850
15. Hettrich CM, Dunn WR, Reinke EK; MOON Group, Spindler KP. The rate of subsequent surgery and predictors after anterior cruciate ligament reconstruction: two- and 6-year follow-up results from a multicenter cohort. *Am J Sports Med*. 2013;41(7):1534-1540. doi:10.1177/0363546513490277