New Zealand ACL Registry
Annual Report 2024

10 Years

New Zealand ACL Registry Annual Report 2024

Acknowledgements:
The New Zealand ACL Registry Trust would like to thank the Accident Compensation Corporation for its funding assistance. We also receive funding from our industry partners: DePuy, Arthrex and Smith & Nephew. We are also grateful for the participation of New Zealand Orthopaedic Surgeons for participating in the Registry, both through financial contributions and enrolling their patients.

ACL Registry Trust Structure:
The ACL Registry Trust has been registered as a charitable Trust under New Zealand law. The Trustees are Hamish Love, Orthopaedic Surgeon, Christchurch, Mark Clatworthy, Orthopaedic Surgeon, Auckland and David Barker, Accountant, Christchurch.
The Registry has a permanent database Administrator, Charlotte Smith and employs a part-time data entry assistant.

Introduction:

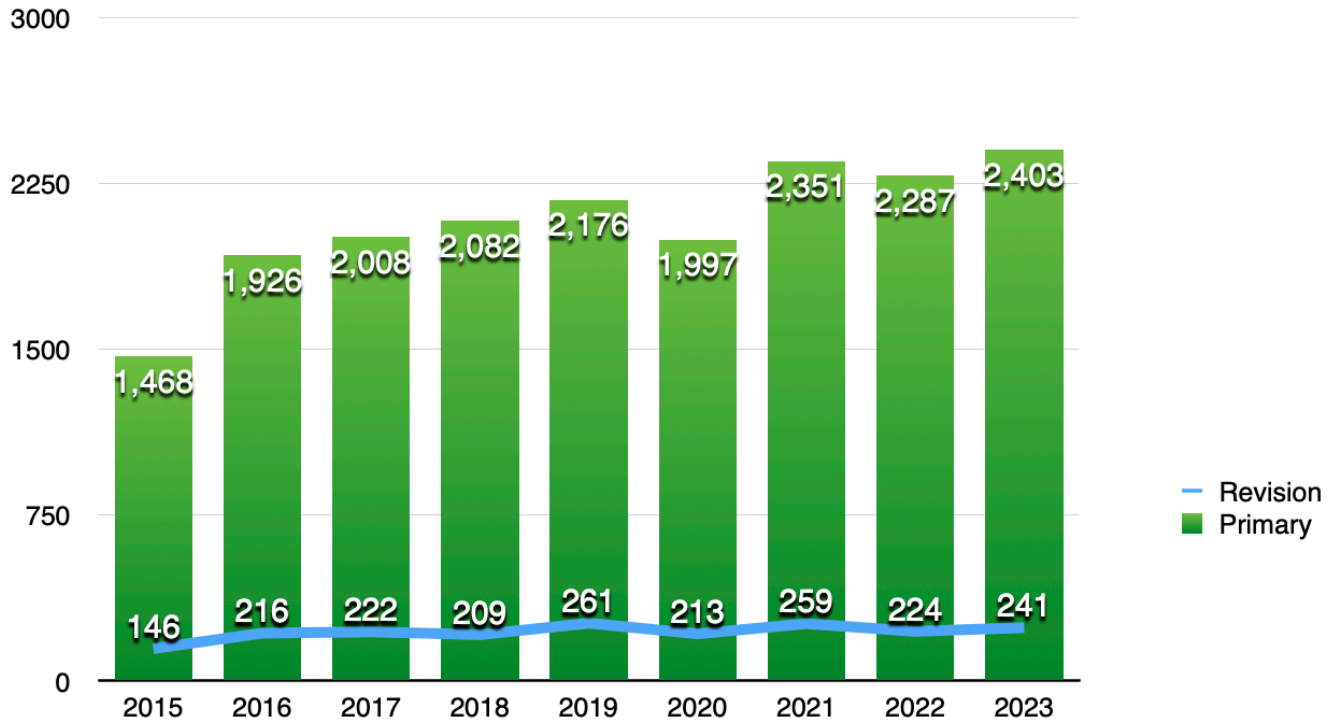
The New Zealand ACL Registry is now in its tenth year of operation. We are progressing towards our goal of capturing all ACL procedures done in New Zealand. The number of Surgeons and Hospitals involved in the Registry has been steadily growing over the last 12 months. In September 2015, there were 68 participating Surgeons, now this number is 110. In the 12 months to 9 August 2024, 2792 new patients were enrolled in the Registry. The numbers through the year continued to grow, and we estimate we enrolled around 88% of the 3001 ACL reconstructions performed in New Zealand last year. As at 9 August 2024, 22657 patients have been enrolled in the ACL Registry.

The ACL Registry has received Protected Quality Assurance Activity status from the Minister of Health. Participation in the ACL registry is a compulsory NZOA CME requirement, similar to Joint Registry participation.

Data set integrity:

The Registry continues to work hard on maintaining a complete date set. The majority of individuals requiring ACL reconstruction are young, mobile and often hard to keep a track of. As a consequence, the well-established Typically, registries only achieve a 50% follow up at the two-year mark, dropping off to less than 40% at the five-year mark. Currently we are achieving over 56% follow up at two years for our primary ACLs and 39% at five years, and better than that at all preceding time points. There are some issues with getting patients to complete all sections of all forms, resulting in some incomplete data sets. We are confident that patient reporting of significant complications is being completed accurately. In 2020 we completed a comprehensive audit of reoperation rates, cross-referencing with ACC data. There were a number of previously unrecorded reoperations and revisions captured through this process. This has increased the integrity of the data set in relation to capturing complications. This ACC cross-referencing will be an ongoing process to ensure we have the most complete data possible. Recent research has shown the ACL Registry's capture of revision surguries to be 96%[1]

[1] Validating the capture rate of revisions by the New Zealand ACL Registry: An analysis of all-cause reoperation following primary ACL reconstruction.Rahardja R, Love H, Clatworthy MG, Young SW.


3000
2250
1500
750
0
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146
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2015
2016
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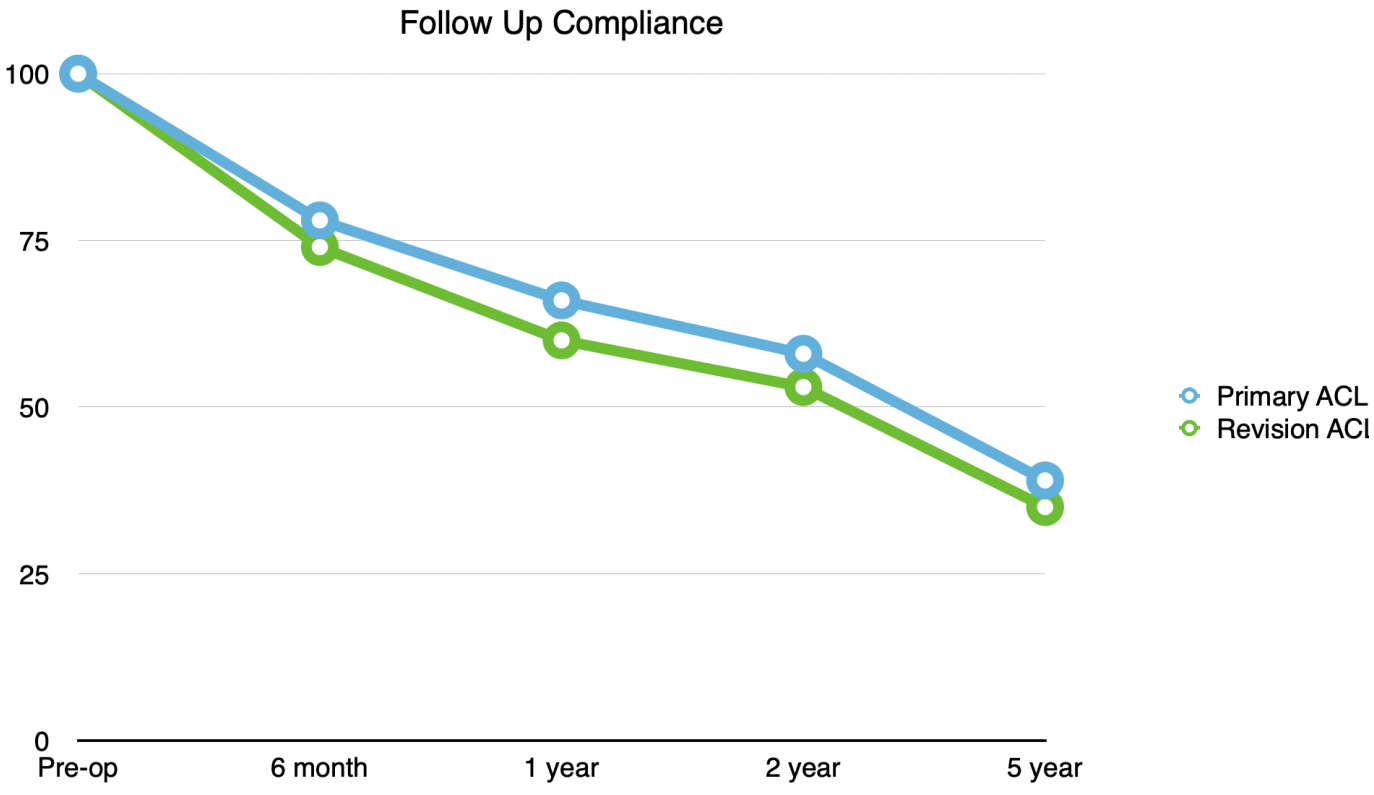
Revision
Primary


Follow Up Compliance
100
75
50
25
0
Pre-op
6 month
1 year
2 year
5 year
Primary ACL
Revision ACl

Future directions:
International collaboration:
The New Zealand ACL Registry Clinical Advisors remain in regular contact with other Registries around the world. They are working towards international collaboration on major research projects and developing structural arrangements to ensure compatibility between the data sets we collect.

Non-operative patient enrolment:
In conjuction with the College of Sports & Exercise Physicians, we have commenced enrolment in a non-operative arm. Patients with MRI-proven ACL rupture, who choose non-operative management of their ACL injury, will be eligble for enrolment.
Sports Physicians and Surgeons enrol patients into the registry. They are then followed up in a similar manner to operatively managed patients at 6 months, 1, 2 and 5 years. PROMs scores, failure of management requiring ACL reconstruction or other surgical intervention, eg meniscectomy, will be recorded.
Unfortunately, there has been very limited uptake by the Sports & Exercise Physicians and enrolment rates remain low.

Research Projects:

The New Zealand ACL Registry is pleased to be involved with providing data that leads to quality research in ACL injuries and their treatment. As at the beginning of August 2024, there were 19778 patients who have completed 6 months post-op, 18524 past 1 year post-op, 16209 past 2 years and 9522at 5 years. The publications, projects and presentations over the last 12 months include:

Publications:
Published in the Knee Surgery, Sport Traumatology, Arthroscopy February 2024:
Risk Factors for Reoperation for Arthrofibrosis Following Primary Anterior Cruciate Ligament Reconstruction

Published in the Knee Surgery, Sport Traumatology, Arthroscopy May 2024: Validating the Capture Rate of Revisions by the New Zealand ACL Registry: An Analysis of All-Cause Reoperation following Primary ACL Reconstruction

Presentations:
Early Results of Combined ACL Reconstruction with a Lateral Extra-Articular Procedure from the New Zealand. Simon W Young ACL Registry ACL Study Group January 30th 2024 Hokkaido, Japan

Hamstring Tendon Austografts Increase the Risk of Reoperation Following Primary ACL Reconstruction: Combined Data from the New Zealand ACL Registry and the Accendent Compensation Corporation. Mark Clatworthy
ACL Registry ACL Study Group January 30th 2024 Hokkaido, Japan

Hamstring Tendon Autograft Should Be Avoided in High-Risk Patients Undergoing ACL Reconstruction Richard Rahardja NZOA Meeting New Plymouth 2024

Patellar Tendon Versus Hamstring Tendon Autograft in ACL Reconstruction – Does Surgeon Matter? Richard Rahardja NZOA Meeting New Plymouth 2024

Early Results of Combined ACL Reconstruction with a Lateral Extra-Articular Procedure from the New Zealand ACL Registry Richard Rahardja NZOA Meeting New Plymouth 2024 NZOA Meeting New Plymouth 2024

Current projects:

1. Higher Incidence of Concomitant Meniscal and Chondral Injury in Delayed ACL Reconstruction
2. Association Between Timing of ACL Reconstruction and Patient Demographics, Clinical Outcomes and Patient-Reported Outcome Measures
3. Hamstring Tendon Autograft Should Be Avoided in High-Risk Patients Undergoing ACL Reconstruction
4. Predictors of Return to Sport After ACL Reconstruction: A New Zealand ACL Registry Study
5. High Rate of Patient Satisfaction Following ACL Reconstruction in New Zealand

Results:

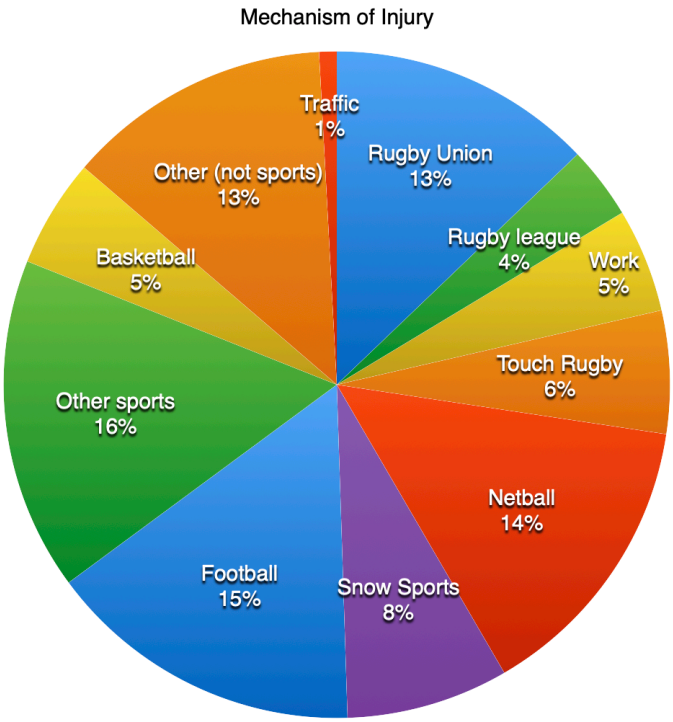
As of August 2024, 22561 patients had been enrolled in the ACL registry. 20399 primary and 2162 revision ACL reconstructions were recorded.

Operations by Hospital (all procedures cumulative)

Hospital	Number	Percent
Auckland Surgical Centre	3257	14.5
Mercy/Ascot	3105	13.7
Forte	2046	9
SX, North Harbour	1501	6.6
SX Christchurch	1178	5.2
St Georges	1048	4.6
SX, Hamilton	840	3.7
SX, Wellington	748	3.3
SX, N Shore Surg Centre	734	3.2
Grace	730	3.2
SX, New Plymouth	637	2.8
Wakefield	615	2.7
Royston	537	2.4
Manuka Street	537	2.4
Anglesea	496	2.2
SX, Invercargill	485	2.2
Ormiston	471	2.1
Braemar	460	2
Mercy Dunedin	439	1.9
Bidwill	411	1.8
Bowen Hospital	346	1.7
Northland Orthopaedics	323	1.5
Crest	261	1.1
SX, Rotorua	255	1.3
Belverdale	193	0.9
Boulcott	177	0.6
Churchill	160	0.7
Franklin	129	0.1
Kensington	124	0.6
SX Brightside	112	0.5
Chelsea	85	0.5
Selina Sutherland	77	0.5
SX, Central Lakes	29	0.1
SX Northland Surgical Centre	27	0.1
Burwood	24	0.1
Masterton	20	0.1
Unspecified	16	0.1
Southland, Invercargill	8	0.0
Wanganui	2	0.0
Northshore	2	0.0
Nelson	2	0.0
Middlemore	1	0.0
SX Napier	1	0.0
Timaru	1	0.0
Aorangi	1	0.0
St Marks Surgical Centre	1	0.0
SX Palmerston North	1	0.0
Whangarei	1	0.0

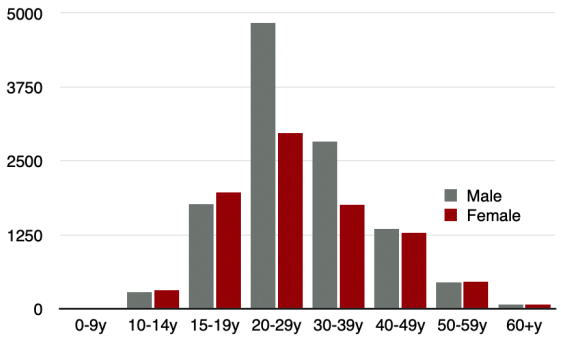
Mechanism of Injury:

Rugby, in its various forms, remains the most common mechanism of injury (23% of patients), with football (15%), netball (14%) and snow sports (8%) being the other common codes.

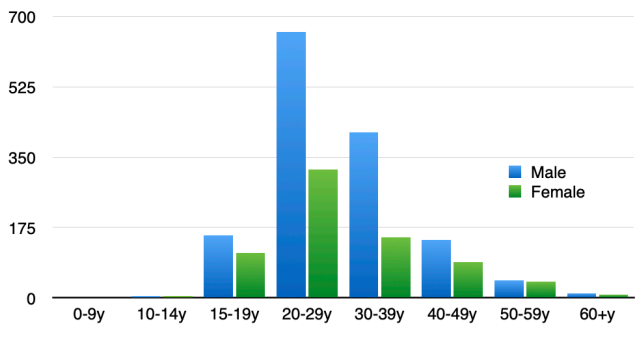


Demographics:

	Primary ACL Reconstruction	Revision ACL reconstruction
Male: female	11581:8816 (56.7% male)	1434:724 (66.4% male)
Average age at surgery	29.5y (7.9-79)	30y (13.2-72.3y)
Delay to surgery	9.7 months	16.9 months



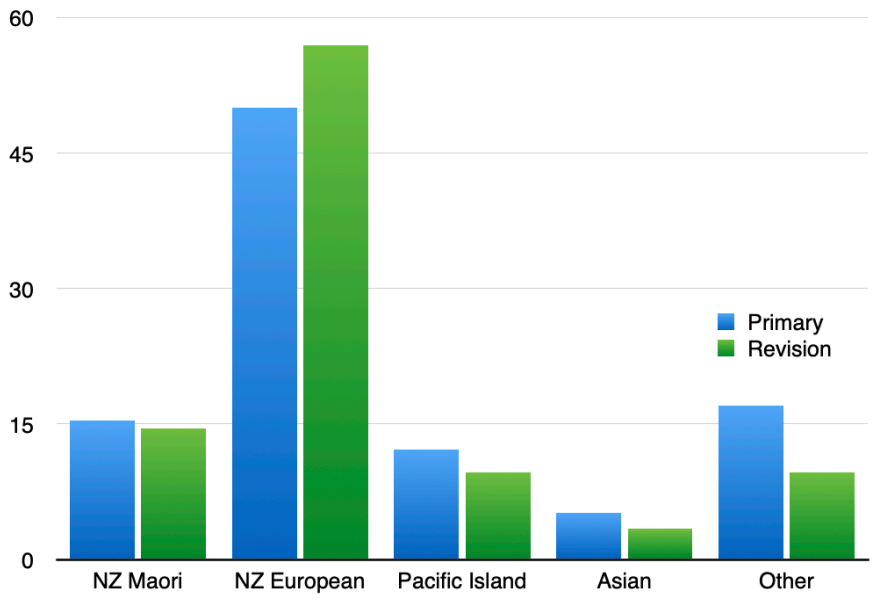
Age distribution: Primary



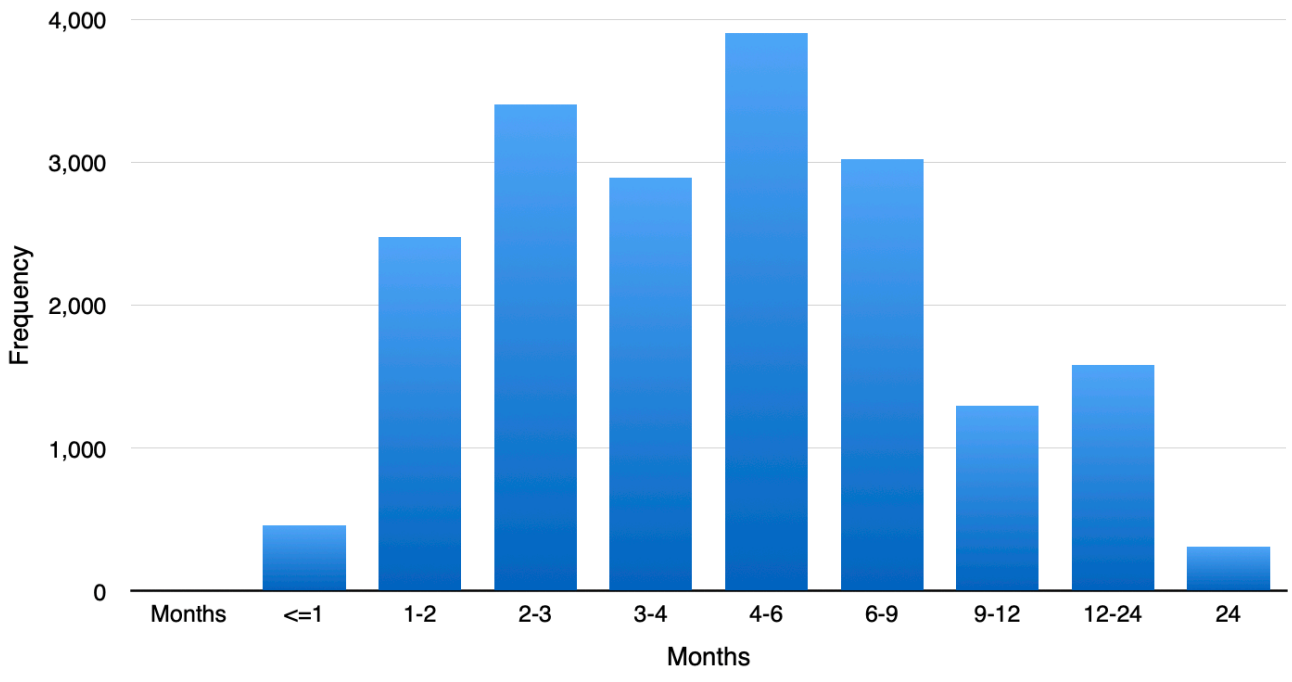
Age distribution: Revision

The majority of patients undergo ACL reconstruction within 6 months of injury. Median time is around 4.4 months. The long tail on the curve pushes the average time out to 9.4 months. Personalised reporting this year contains each surgeons time interval to surgeon compared with the national rates.

Ethnicity

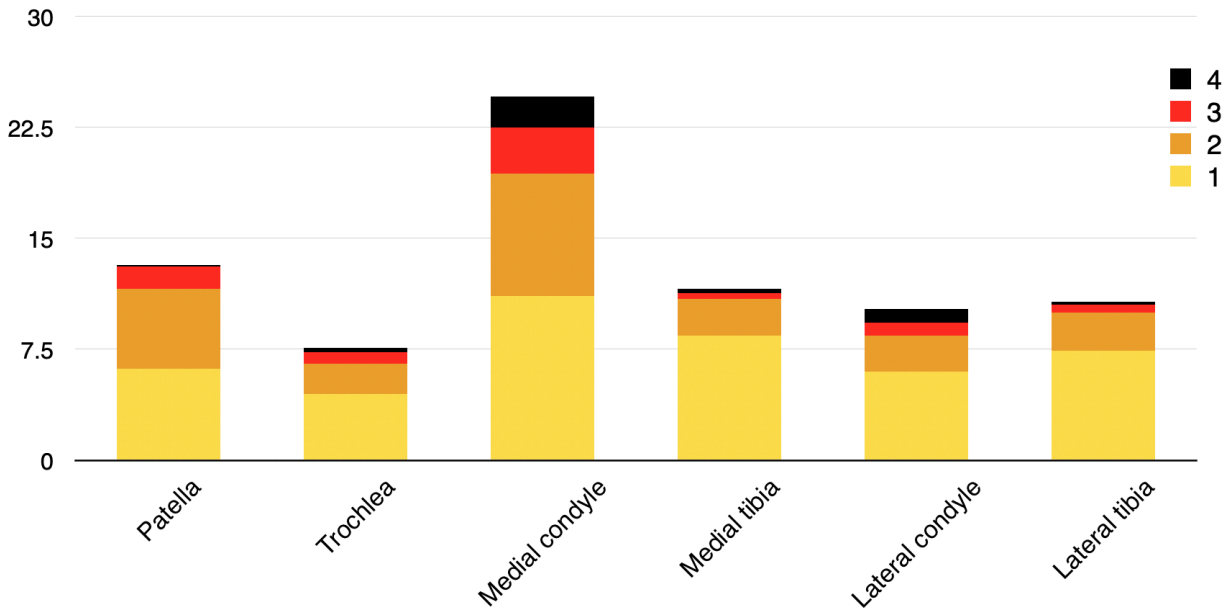


Delay to Surgery:

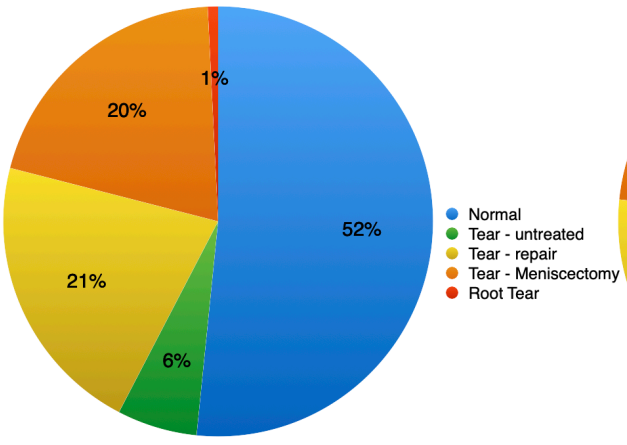


Chondral injury:

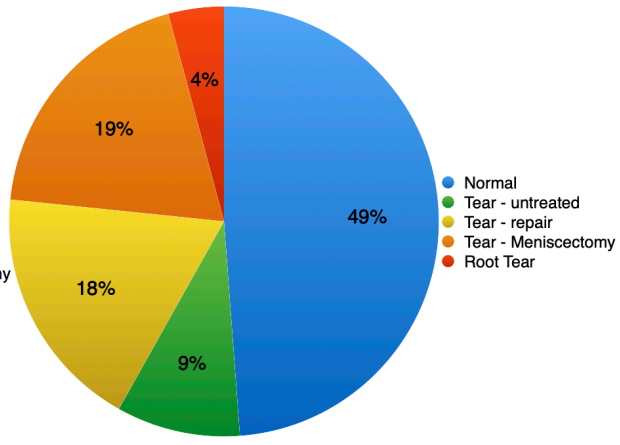
Chondral injuries were common at the time of surgery, the most frequently and severely affected area was the medial femoral condyle, being damaged in 24.6% of cases, it was also the area most frequently associated with higher grade chondral injuries (ICRS grade 3 and 4).
The majority of the injuries were not treated (91.2%). Chondroplasty was completed in 5.8% and microfracture in 2.8%. The chondral treatment field was not completed in 11% of operative data forms.



Meniscal injury:
About 1/3 of menisci have significant tears requiring treatment at the time of ACL reconstruction (48% medial, 51% lateral). The meniscus are found to be similarly reparable on the medial and lateral sides (21% and 18%). Implants are used six times more often as the more traditional sutures techniques on the lateral side and 11 times more often on the medial side of the knee.
Registry data shows that the older generation meniscal implants arare associated with higher failure and reoperation rates than the newer meniscal implants.



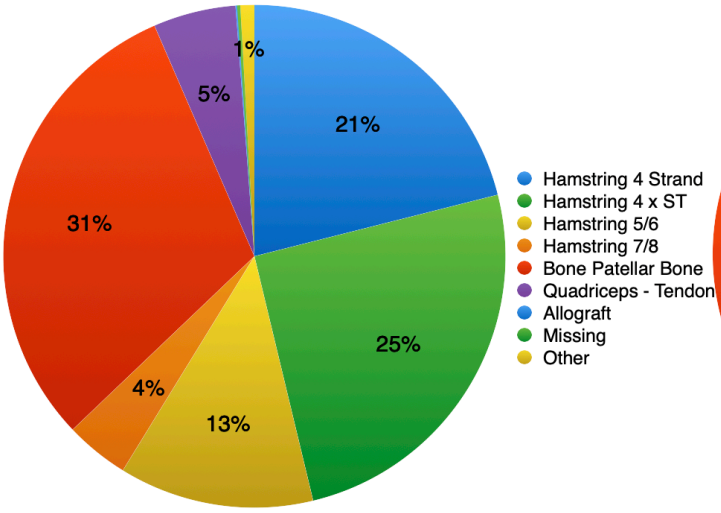
Medial meniscus



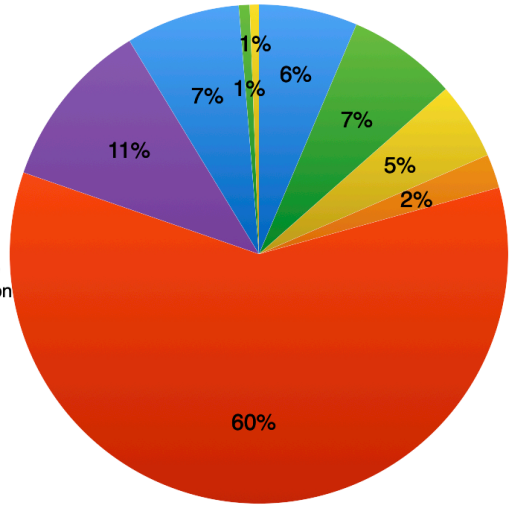
Lateral meniscus

Graft Choice:

For primary ACL reconstruction, the predominant graft choice is hamstring, accounting for 62.7% of all primary ACLs. 21% are 4 strand grafts with semitendinosis and gracilis. The majority of the others are quadrupled semitendinosis grafts (25.1%), there is a trend for decreasing use of all hamstring grafts but the use of 6 to 8 strand grafts (16.6%) has increased bucking this trend. BTB is the next most popular graft, making up 30.5% of primary ACLs. Quads grafts are slowing increasing making up 5.3% of primary grafts.



Graft choice: Primary

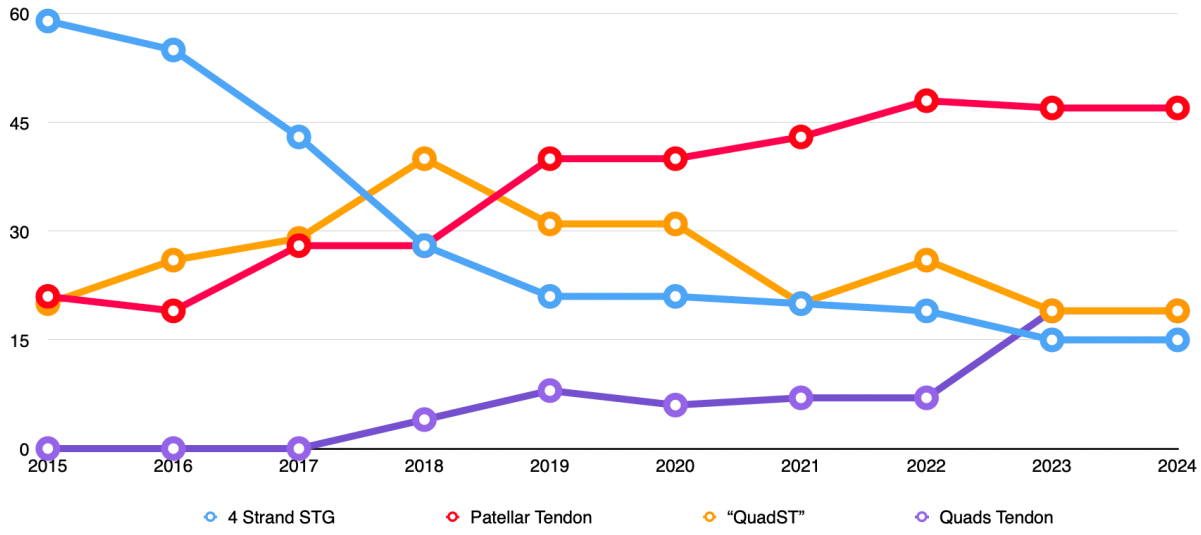


Graft choice: Revision

Trends in graft choice:

There has been a continued upswing in the popularity of both patellar and quads tendon grafts, reflecting concerns about the inferior survival rates in hamstring grafts, particularly in comparison to patellar tendon grafts[2]. Patellar tendon now accounts for 30% of all primary ACL reconstructions and 60% of all revision ACL reconstructions. Quads tendon grafting use continues to incease, but still only accounts for 5.3% of primary procedures.

Discussion on the implications of graft choice and revision rates is included later in this report.

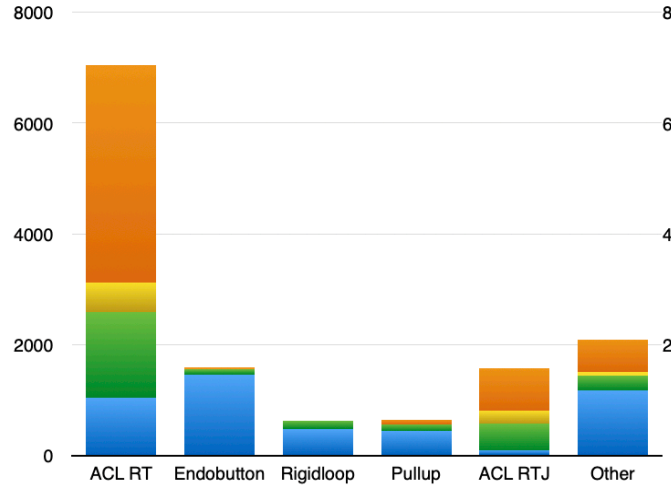


2 *Impact of Graft Choice on Revision and Contralateral Anterior Crutiate Ligament Recontruction: Results from the New Zealand ACL Registry.* Richard Rhardjah, Mark Zhu, Hamish Love, Mark Clatworthy, Andrew Paul Monk, Simon W Young.

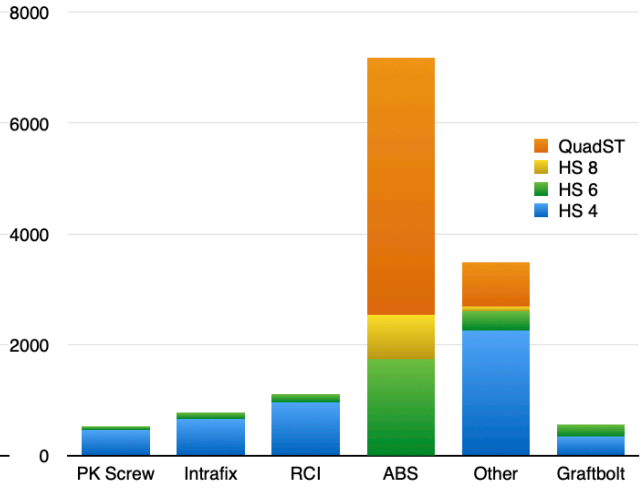
Tunnel drilling technique:

Tibial tunnel drilling data indicates that almost all are completed with antegrade drilling techniques. However, the operative data form was not completed in 16.1% of cases. 22 physeal sparing cases were recorded.
Femoral tunnel drilling was via an anteromedial portal in 73.1% of cases, transtibial in 10% and outside-in with a Flipcutter technique in 0.3% of cases. Data was missing in 16.1% of cases. An analysis of survival rates showed no difference in survival rates comparing trans-tibial and anteromedial drilling techniques[3].

Graft fixation technique: Hamstring Primary Patients

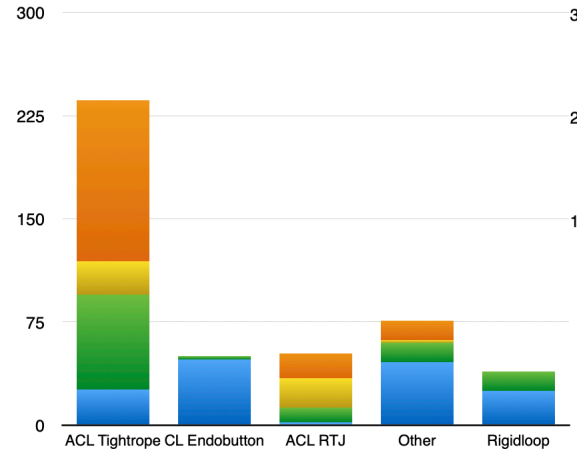


Femoral fixation

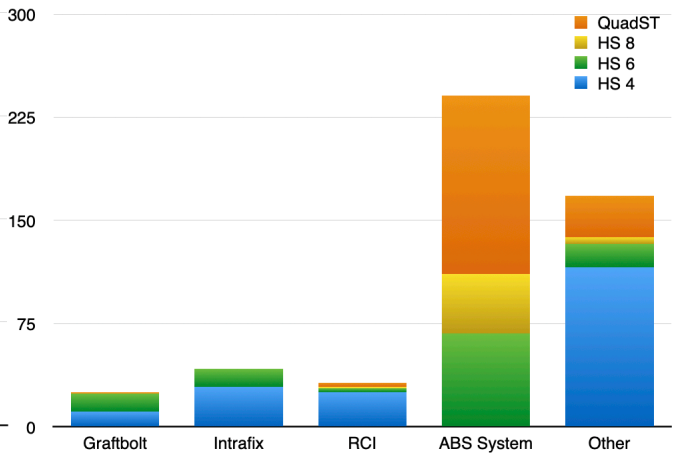


Tibial fixation

Graft fixation: Hamstring Revision Patients



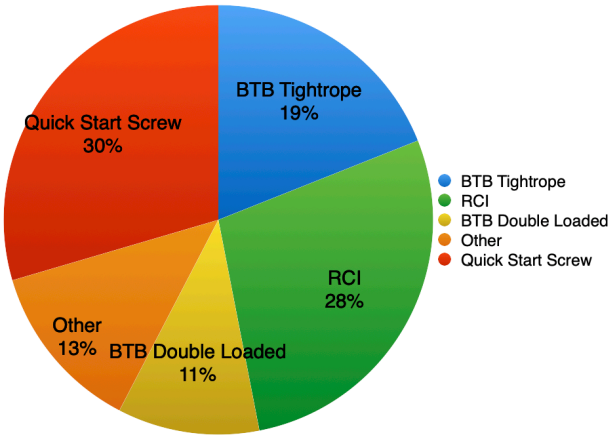
Femoral fixation



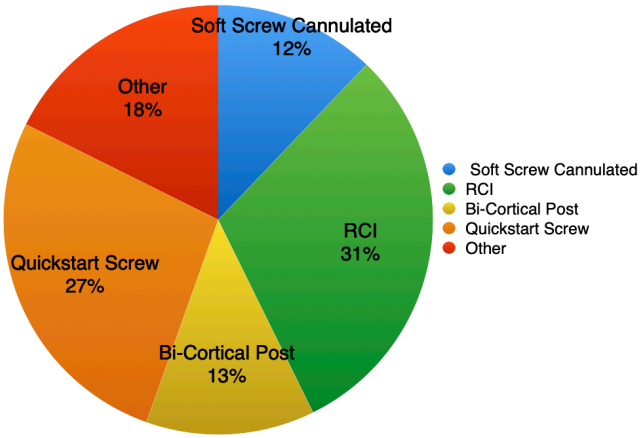
Tibial fixation

[3] *No Difference in Revision Anterior Cruciate Ligament (ACL) Reconstruction between Anteromedial Portal and Transtibial Drilling of the Femoral Graft Tunnel: Results from the New Zealand ACL Registry*. Richard Rahardja, Mark Zhu, Hamish Love, Mark G. Clatworthy, Andrew Paul Monk, Simon W. Young

Graft fixation: Patellar tendon Primary Patients

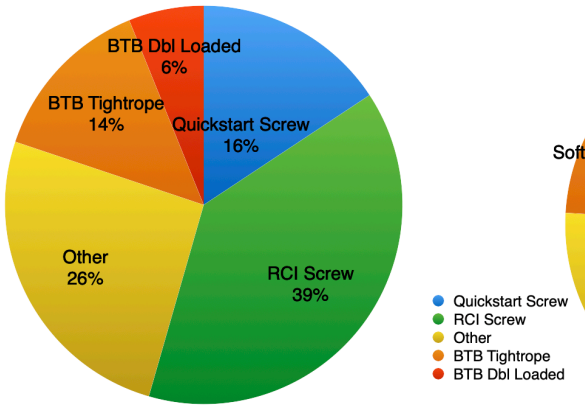


Femoral fixation

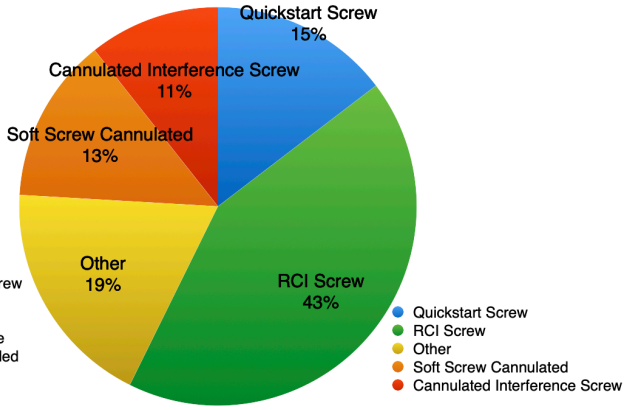


Tibial fixation

Graft fixation: Patellar tendon Revision Patients



Femoral Fixation



Tibial Fixation

Antibiotic use:

Cephazolin	66%
Cefuroxime	1.2%
Augmentin	2%
Vancomyacin/ceph	21%
Other	0%
None recorded	9.6%

Thromboprophylaxis:

None	54%
Aspirin	18.3%
TEDs	11.1%
ICD	13.5%
Clexane	2.9%
Other	0.2%

Complications:

Intraoperative Complication	Number
Implant Failure	173
Patella Rupture	9
Hamstring Amputation	30
Tunnel/Graft Mismatch	6
Inadequate graft	37
Contaminated Graft	3
Other	130

Post-operative complication	
Infection (Includes 33 with reoperation)	111
DVT/PE (includes 5 re-operation)	63
Arthrofibrosis (Includes 338 with re-operation)	432
Implant-irritation/removal (includes 68 re-operation)	110
Other hospital admission/reoperation (not meniscus, chondral or Arthrofibrosis)	112
Meniscal Resection/Repair (includes 130 with no re-operation)	578
Chondral Repair (includes 19 with no re-operation)	131
Donor site problem: Hamstring	430
Donor site problem: Patella	126
Complex regional pain syndrome	11
Patella tendon rupture (Includes 1 re-operation)	6
Other (no re-operation)	193
Septic Arthritis (Includes 5 re-operations)	10

Recurrent Instability	
Atraumatic	155
Traumatic	708
Not recorded (failures but no revision)	43
Graft Rupture Implant Failure	7
Not specified	109

Revision ACL Reconstruction Number of procedures not patients	693

Complications are captured in 4 ways.

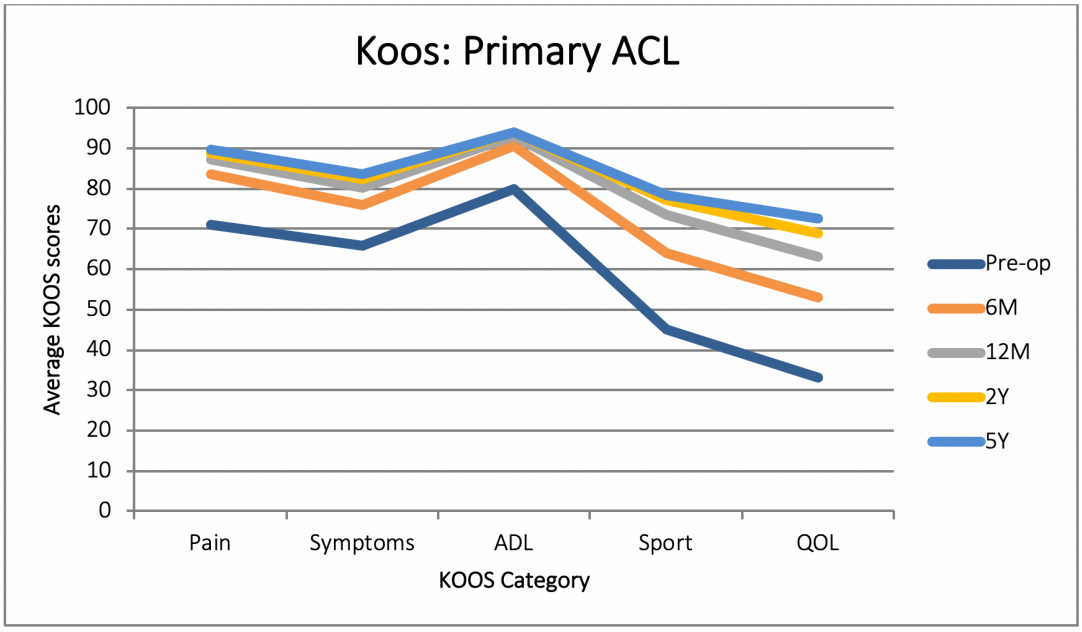
- Operative complications are recorded on the operative data form by the treating surgeon.
- Post-op complications identified by treating surgeons are recorded on the complications form and returned to the registry.
- Patients completing follow up questionnaires are asked if they have had any complications relating to their ACL surgery or further injuries to their knee.
- Finally, a cross-referencing with ACC data on further procedures related to the original surgery claim ensures a complete data set regarding subsequent surgery to the same knee.

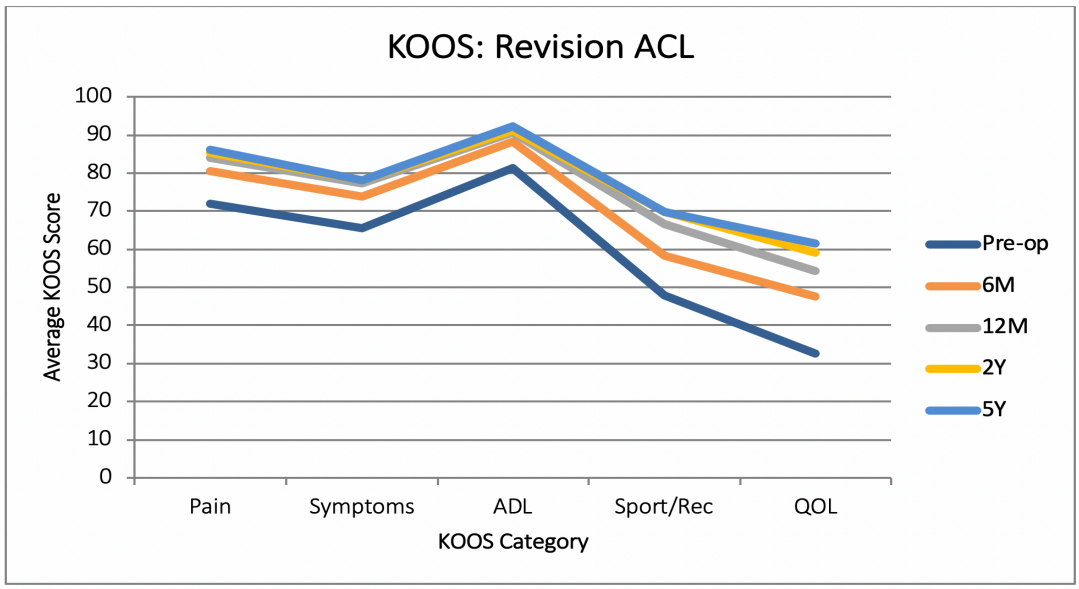
* Complications are recorded if they are significant to require hospital readmission or reoperation.
**The exception to this is donor site problems. These are listed if the patient reports significant symptoms related to the graft harvest site.

Outcome scores:

The KOOS score is a validated outcome questionnaire for ACL injuries and surgery. A 5 point scale from 0: none, to 4: Extreme, is completed for each of the subscales. These include:

- Pain: amount of pain in the last week
- Symptoms: Knee injury symptoms in the last week e.g. swelling, grinding, ability to straighten knee.
- ADL: Functional problems with activities of daily living, e.g. descending stairs
- Sport/Recreation: The degree of difficulty in physical tasks performed in the last week e.g. squatting pivoting etc.
- Quality of Life: Awareness of knee problems and confidence in the knee.

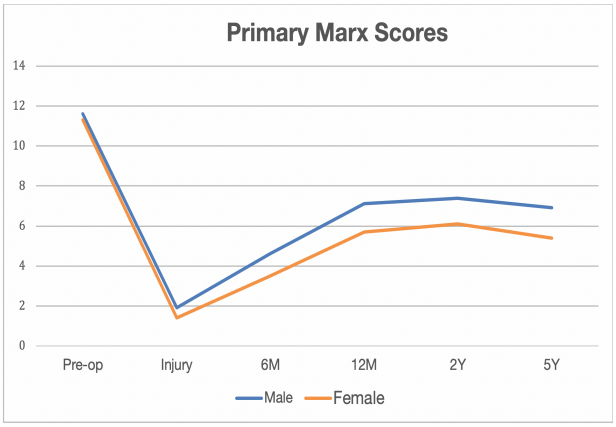


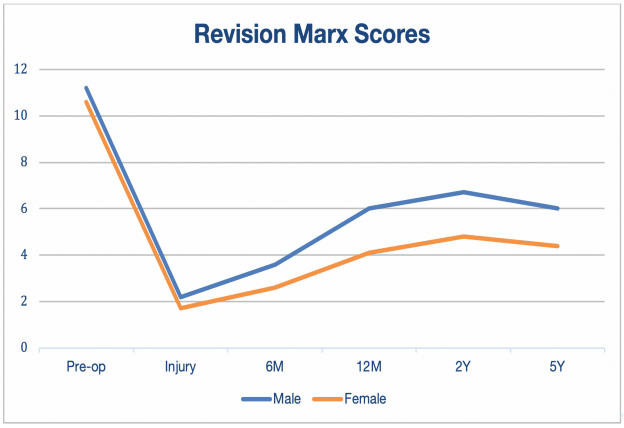


The scores in our cohort over time are very similar to those presented in other registry data. KOOS scores show improvement over all time points in primary ACL reconstruction. Revision KOOS scores show less improvement overall, in spite of a similar starting point.

Marx Scores:

The Marx score is a measurement of how often the individual engages in ACL-dependent physical activities including running, cutting, decelerating and pivoting. The Marx scores show a poorer return to activity after revision surgery when compared with primary ACL reconstruction.





Survivorship:

Cumulative survival for ACL reconstruction in the NZ ACL Registry is 94% (95%CI 93.2-94.7) at five year follow up.

Independent patient-related risk factors for graft rupture and revision included[4]:

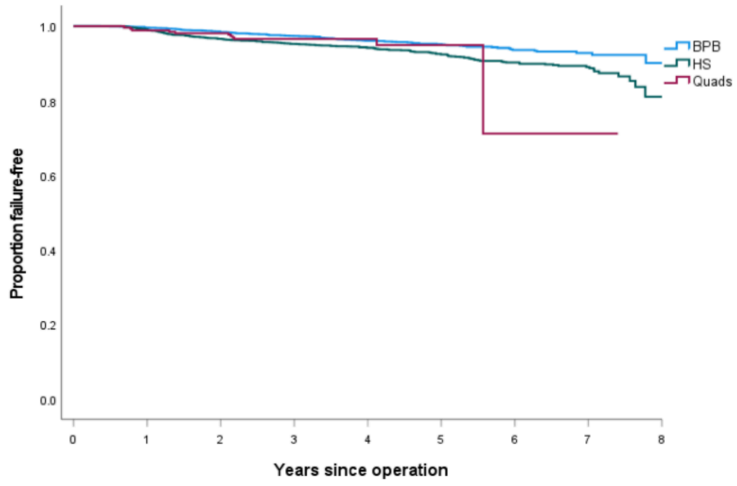
- Age. Patient <18y old have the greatest risk of re-injury. Those >36y old were at the lower risk of re-injury or revision surgery
- Male gender. Increased risk of graft rupture (RR 1.81) and of revision (RR 1.65) compared with females (p = 0.001)
- Early ACL reconstruction (within 6 months of injury) had a higher risk of revision compared with delayed reconstruction (>12 months post injury.

Graft Choice:

Registry data shows that patella tendon grafts have lower revision rates compared with hamstring grafts. 1.3% vs 2.7% (adjusted HR = 2.51; 95% CI 1.55 – 4.06; p<0.001)[5]. However there was an increased rate of contralateral ACL rupture in the patellar tendon group 1.8% vs 0.9% (adjusted HR = 1.91; 95% CI 1.15 – 3.16; p = 0.012).

[4] *Patient Risk Factors for Revision Anterior Cruciate Ligament (ACL) Reconstruction in the New Zealand ACL Registry* Richard Rahardja, Mark Zhu, Hamish Love, Mark G. Clatworthy, Andrew Paul Monk, Simon W. Young

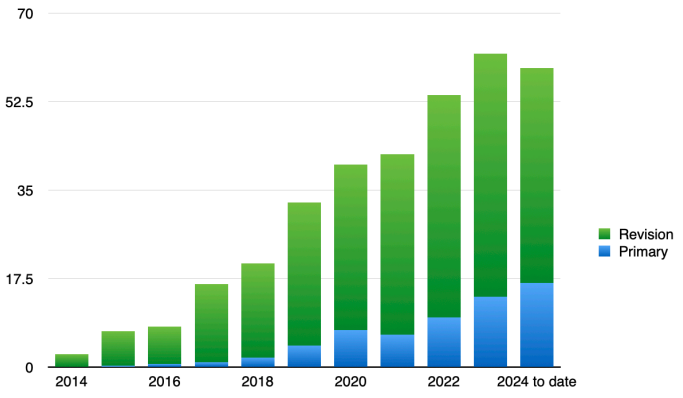
[5] *Impact of Graft Choice on Revision and Contralateral Anterior Cruciate Ligament Reconstruction: Results from the New Zealand ACL Registry* Richard Rahardja, Mark Zhu Hamish Love, Mark G. Clatworthy, Andrew Paul Monk, Simon W. Young.



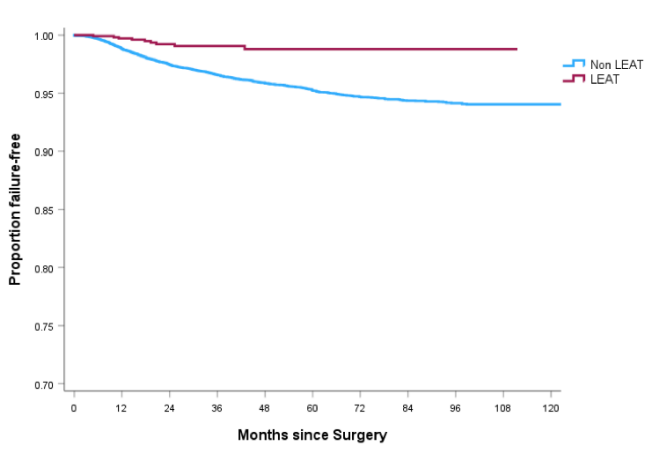
Our data is showing a strong trend towards increasing use of BPB grafts and increasing use of quad tendons. Initial quads graft techniques used in New Zealand showed a high failure rate. However modifications to graft preparations and implants have been associated with much improved outcomes since that initial experience. Zhou, Van Niekerk, Hirner et al 2023[6] study suggested Quad tendons were non- inferior to hamstring grafts when considering graft survival and return to sport. However risk factors such as age, gender, and specific groups such as hamstring grafts in females under 25 were not taken into account in this study.

A recent analysis of graft survival with and without LEAT has shown that Quads tendon grafts are performing as well as BTB in terms of overall survival rates in both young and older patients. There are potential confounding factors, including the preferential use of BTB grafts in high risk patients. Further research will be carried out to establish the survival of the various graft types in respect of failures and survival, however this trend is worthy of note at this time.

The use of Lateral Extra Articular Tendonesis (LEAT) has been increasing over the last 10 years. The use of LEAT in higher risk patients is associated with improved survival rates in patients of all ages in primary ACL patients when compared with patients undergoing isolated ACL reconstruction. The survival benefit seen with the addition of an LEAT was present, regardless of ACL graft choice or patient age.



Trends in LEAT use over time:



Revision Rates:LEAT vs Non-LEAT

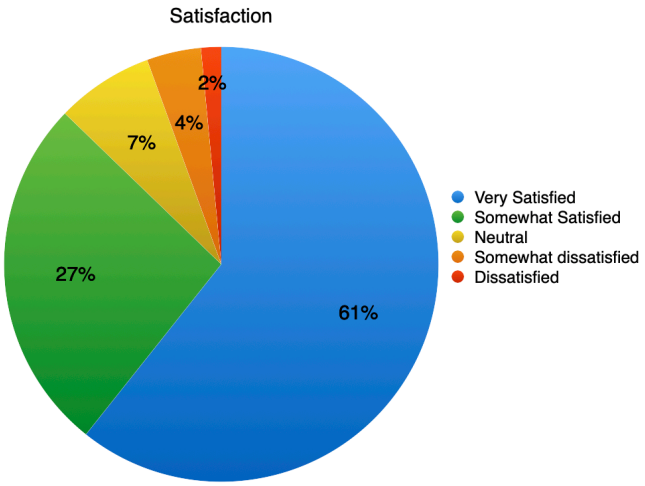
[6] *Quad Tendon Autograft is Comparable to Hamstring Tendon and Bone-Patella-Bone up to 2 Years After Isolated Primary Anterior Cruciate Ligament Reconstruction.* Yushy Zhou, Atua Fuimaono-Asafo, Chris Frampton, Michael van Niekerk & Marc Hirner

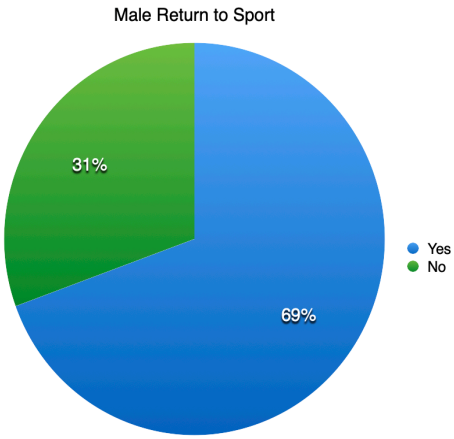
Primary Graft Failure using Non-LEAT or LEAT Techniques

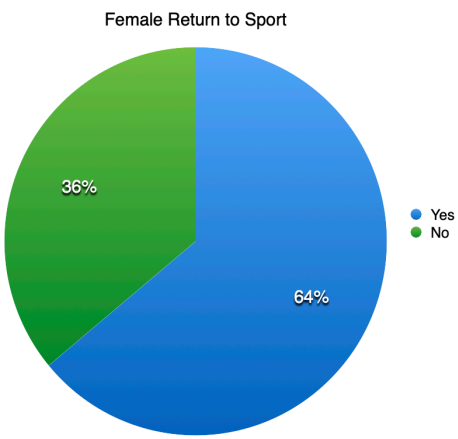
	LEAT (%)	Non-LEAT (%)
BPB 16-25	0.76%	3%
BPB 26+	0	1.5%
Hanstring 16-25	1.8%	8.6%
Hamstring 26+	0	2.7%
Quadriceps 16-25	1.8%	2.6%
Quadriceps 26+	0	1.3%

Satisfaction

Additional questions have been added to the PROMS to determine patients return to sport and satisfaction with their ACL reconstruction. The preliminary results suggest that 69% of all male patients are returning to sport versus 63% of all female patients. Overall 61% of patients are very satisfied with their ACL reconstruction. 86% of patients of all ages and genders are either satisfied or very satisfied. Further research is being carried out on this data.







Conclusions:

The Registry is producing a high quality and robust data set. This will enable us to generate meaningful information on patient outcomes and research into the variables of ACL injury and reconstruction. Our primary goal is to improve the quality of patient care in the management of ACL injuries. The Trustees of the ACL Registry wish to express their gratitude to all participating Surgeons and to the New Zealand Orthopaedic Association, in particular its Knee Society, for making the ACL Registry possible.