New Zealand ACL Registry

Annual Report 2019

New Zealand ACL Registry Annual Report 2019

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, Device Technologies 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.

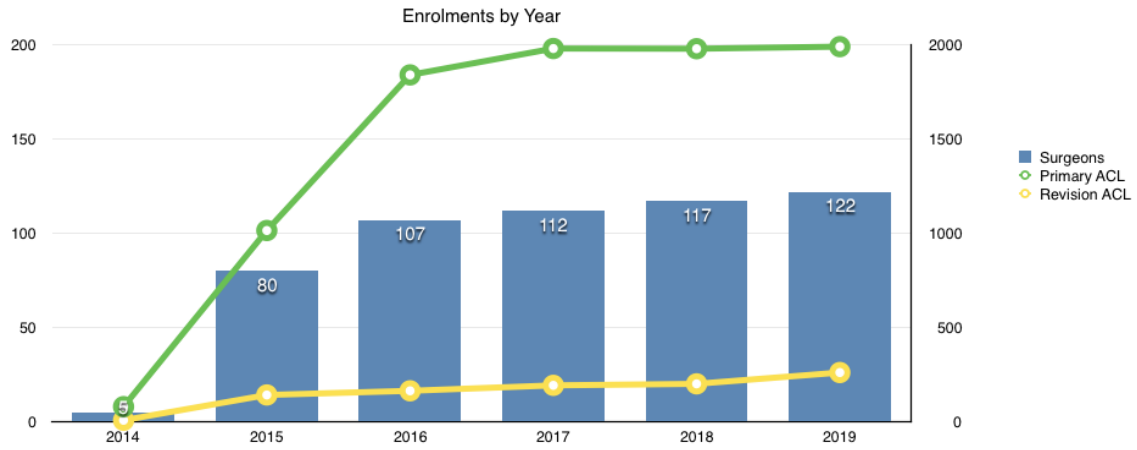
The Registry has a permanent database Administrator, Charlotte Smith and employs a part-time data entry assistant.

The Registry has moved to Forte Sports, Forte 2, 132 Peterborough Street as a permanent home.

Introduction:

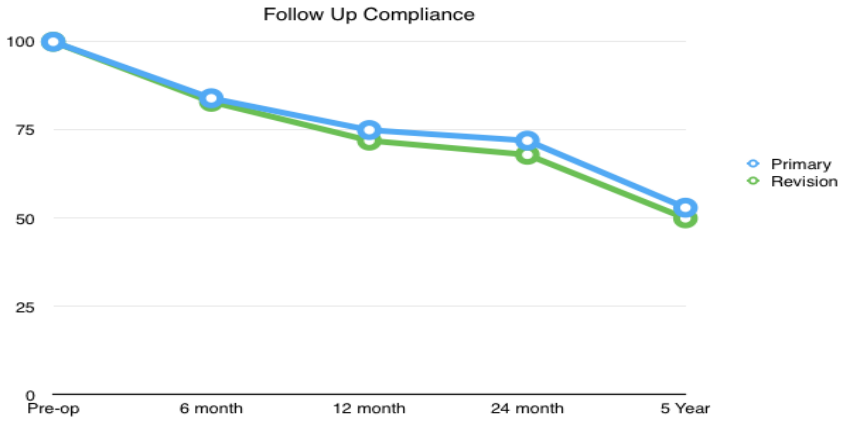
The New Zealand ACL Registry is now in its sixth year of operation. We are progressing towards our goal of capturing all ACL procedures done in New Zealand. The number of Surgeons and Hospitals involved in the Registry has been steadily growing over the last 10 months. In September 2015, there were 68 participating Surgeons, now this number is 122. In the 12 months to August 2019, 2259 new patients were enrolled in the Registry. The numbers through the year continued to grow, and we estimate we are now enrolling around 75% of the estimated 3000 ACL reconstructions performed in New Zealand each year. As at 7 August 2019, 9849 patients have been enrolled in the ACL Registry.

The ACL Registry has received Protected Quality Assurance Activity status from the Minister of Health. NZOA Executive has now made participation in the ACL registry a compulsory CME requirement, similar to Joint Registry participation. We expect this change will increase our capture rate to over 85% of all reconstructions.

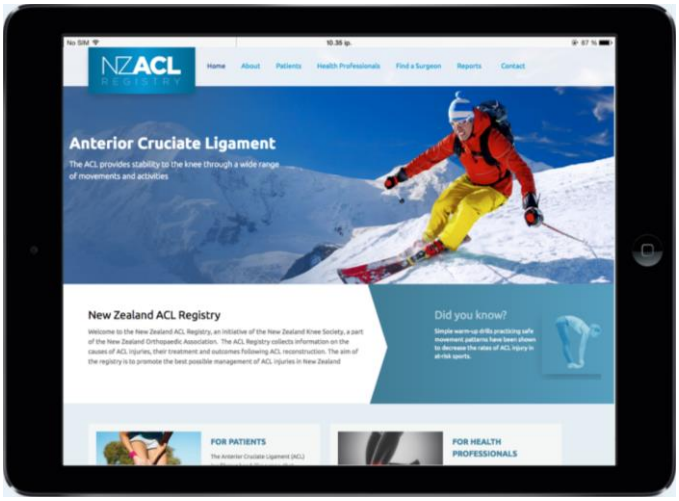


Data set integrity:

The Registry continues to work hard on maintaining a complete date set. The majority of individuals requiring ACL reconstruction are young. This group are mobile and often hard to keep a track of. As a consequence, the well-established Registries manage only around 50% follow up at the two-year mark, dropping off to less than 40% at the five-year mark. Currently we are achieving over 70% follow up at the two year mark for our primary ACLs 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.



The Registry has a stand-alone ACL Registry website. The site contains patient information regarding ACL injuries and the ACL Registry. Research generated by the registry and annual reports are available on-line. Additionally, it provides a link for patients to contact the Registry if required.



Website resources:

- Enter complications directly on-line while in clinic or by the enclosed form. This feature increases the ease of reporting on post-op complications or graft ruptures. Accurate collection of this data is critical for the validity of the registry.
- Downloadable registry forms. Hospital or clinic staff can print out registry enrolment forms.

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 are beginning to roll out 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 will enrol the patients into the registry, they will then be 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.

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 2019, this was 8440 patients who have completed 6 months post-op, 7391 past 1 year post-op, 5226 past 2 years and 97 at 5 years. The data set is now reaching numbers where meaningful research can be completed.

Over the last 12 months, we have funded a Summer Studentship as well as an Honours Student through the University of Auckland. Richard Rahardja has been very diligent, producing several high quality papers using registry data.

Publications , projects and presentations over the last 12 months include:

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. Accepted for publication Americal Journal of Sports Medicine

Factors Associated with Revision following Anterior Cruciate Ligament Reconstruction: A Systematic Review of Registry Data. Richard Rahardja, Mark Zhu, Hamish Love, Mark G. Clatworthy, Andrew Paul Monk, Simon W. Young. submitted to British Journal of Sports Medicine.

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 Revised manuscript submitted to KSSTA, awaiting approval

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

Patients frequently change surgeon when undergoing revision ACL reconstruction. Simon Young

Multi-centre RCT comparing hamstring and quadriceps tendon grafts for ACL reconstruction. Mark Hirner and Mike van Niekerk.

Validation of an Abbreviated Patient Reported Outcome Measure for use in ACL Patients. The NZACL Registry is participating with HSS Study looking at the vexed problem of appropriate PROMs for this unique patient population.

Variables effecting return to pre-injury activity levels after ACL reconstruction. Hamish Love

Factors associated with poor post-operatve PROMs scores after ACL reconstruction. Hamish Love

Are there ethnic variations in the surgical management and outcomes for ACL injuries in the New Zealand population? Hamish Love

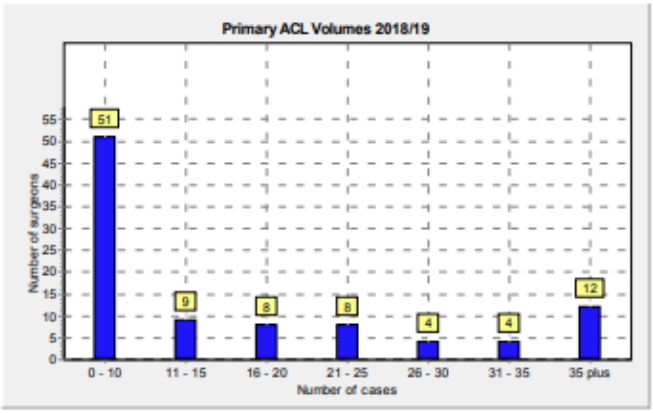
A retrospective analysis looking at the impact of peripheral nerve blockage on intermediate term (six to twelve month) quadriceps function after ACL reconstruction. Matt Boyle

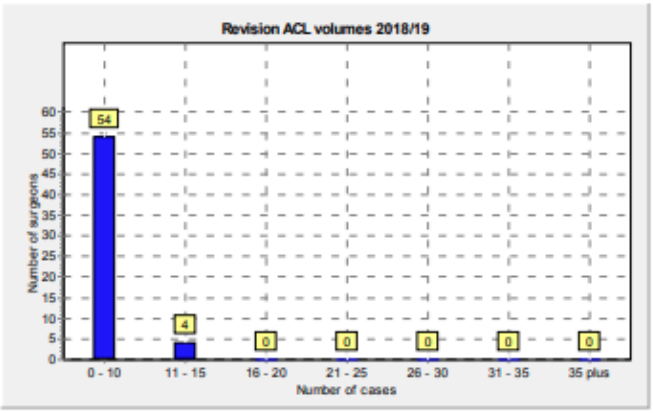
Results:

As of June 2019, 9369 patients had been enrolled in the ACL registry. 8463 primary and 906 revision ACL reconstructions were recorded.

Hospital	Number	Percent
SX Christchurch	631	6.7
St Georges	587	6.2
Royston	164	1.8
Manuka Street	270	2.9
Wakefield	295	3.1
Mercy Dunedin	197	2.1
Selina Sutherland	34	0.4
Bowen Hospital	209	2.3
SX New Plymouth	218	2.3
SX Wellington	366	3.9
SX North Harbour	665	7.1
Southland Invercargill	8	0.1
SX, Invercargill	242	2.5
SX, Hamilton	393	4.2
Belverdale	90	1.0
Mercy/Ascot	1602	16.9
SX, Rotorua	84	0.9
SX, Brightside	65	0.7
Crest	3	0.0
Grace	241	2.6
Forte	719	7.7
Auckland Surgical Centre	1470	15.7
Anglesea	92	1.0
Churchill	85	0.9
Chelsea	51	0.5
Bidwill	155	1.7
Braemar	259	2.8
Kensington	48	0.5
SX Napier	1	0.0
Starship	1	0.0
Masterton	13	0.2
Nelson Hospital	2	0
Northland Orthopaedics	47	0.5
SX Palmerston North	1	0.0
Whangarei	1	0.0
Wanganui	2	0.0
Northshore	1	0.1
Ormiston	43	0.5
Burwood	5	0.1
Unspecified	6	0.1
Boulcott	2	0

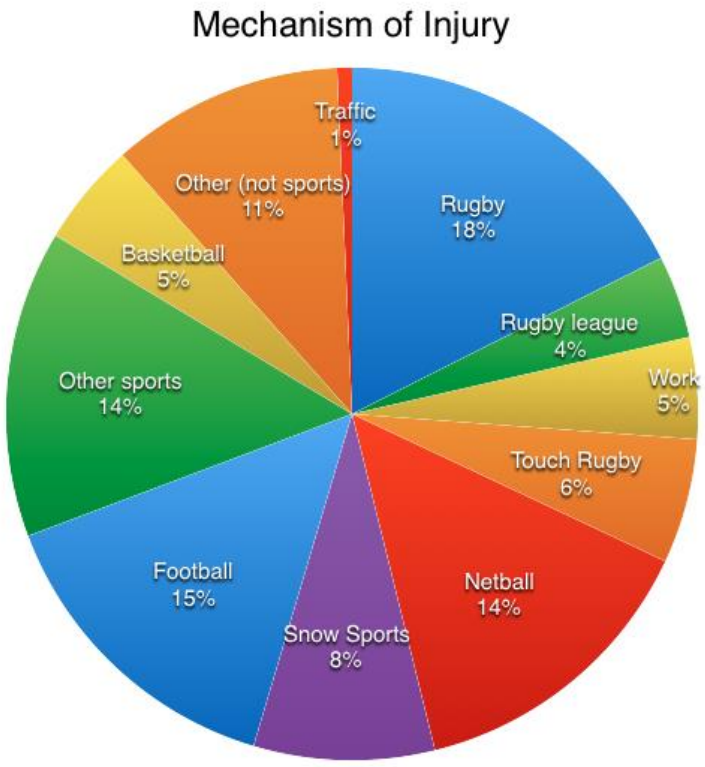
Case volume by surgeon:





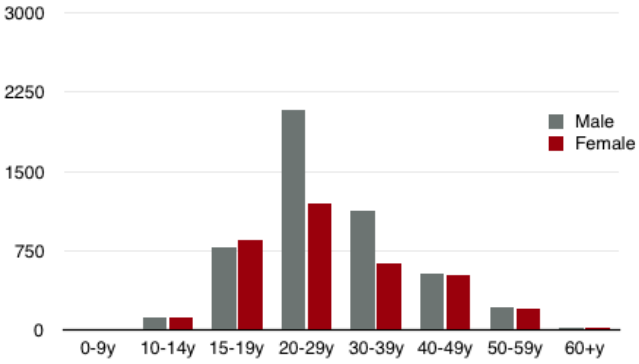
Mechanism of Injury:

Rugby, in its various forms, remains the most common mechanism of injury (28% of patients), with football (15%), netball (14%) and snow sports (8%) being the other common codes.

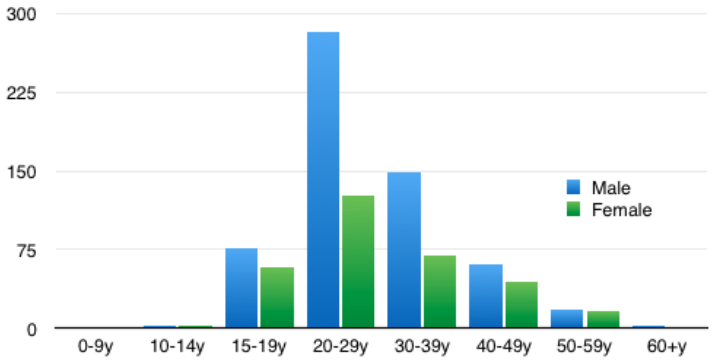


Demographics:

	Primary ACL Reconstruction	Revision ACL reconstruction
Male: female	4903:3560 (57.9% male)	589:317 (65% male)
Average age at surgery	29.2y (8.5-70.1)	29.4y (13.7-64.3y)
Delay to surgery	9.8 months	17.8 months



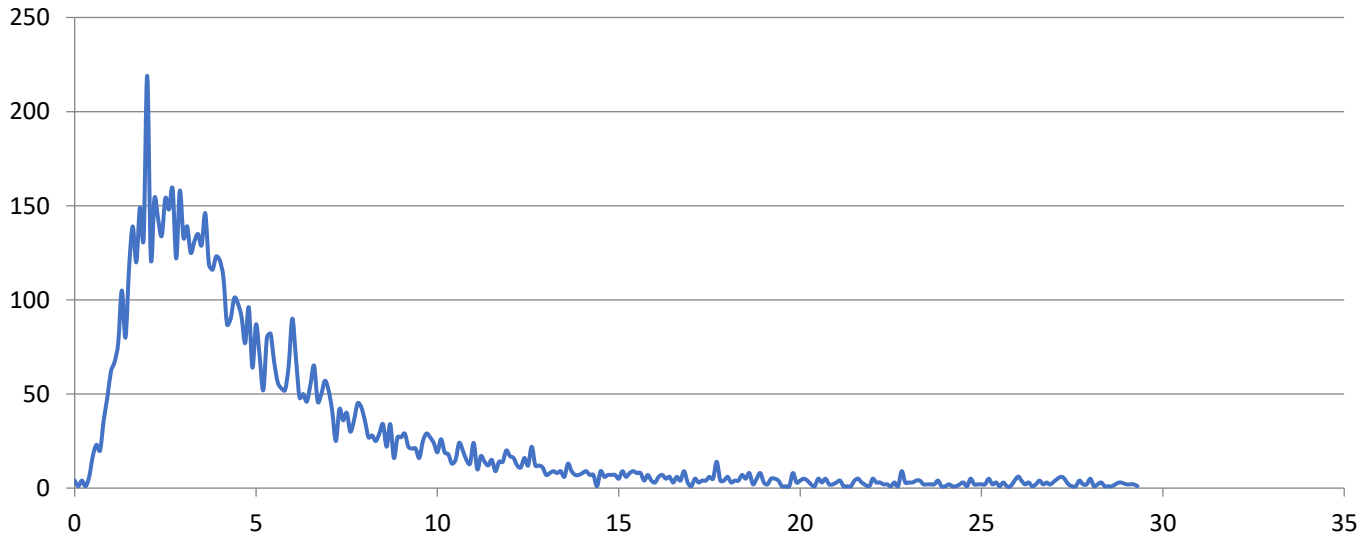
Age distribution: Primary



Age distribution: Revision

The majority of patients receive a primary ACL reconstruction within 6 months of injury. Median time is around 5 months. The long tail on the curve pushes the average time out to 10.1 months.

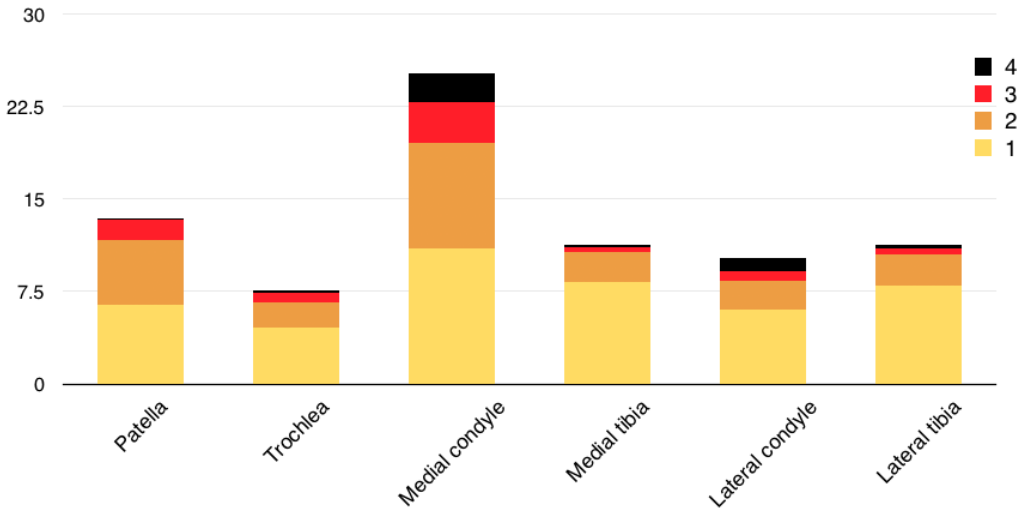
Delay to Surgery



Chondral injury:

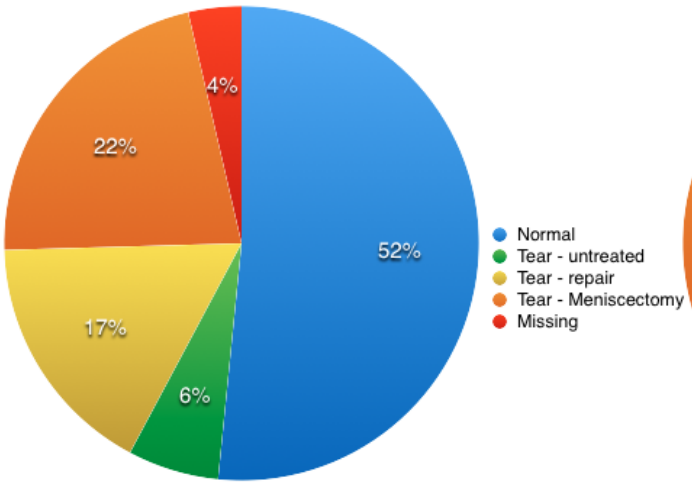
Chondral injuries were common at the time of surgery, the most frequently and severely affected area was the medial femoral condyle, being damaged in 25.5% of cases, it was also the area most frequently associated with higher grade chondral injuries (ICRS grade 3 and 4).

The majority of the injuries were not treated (76.2%). Chondroplasty was completed in 5.7% and microfracture in 2.9%. The chondral treatment field was not completed in 14.9% of operative data forms.

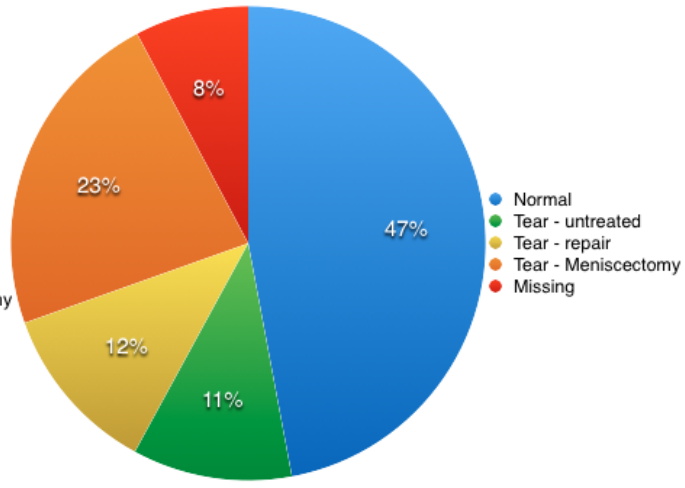


Meniscal injury:

About 1/3 of menisci have significant tears requiring treatment at the time of ACL reconstruction (39% medial, 35% lateral). The meniscus are found to be similarly reparable on the medial and lateral sides (17% and 12%). Implants are used six times more often as the more traditional sutures techniques on both sides of the knee.



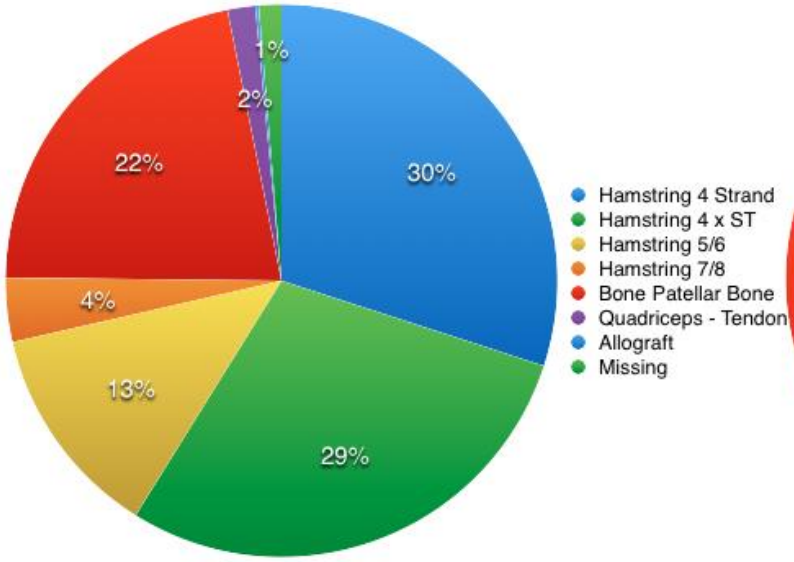
Medial meniscus



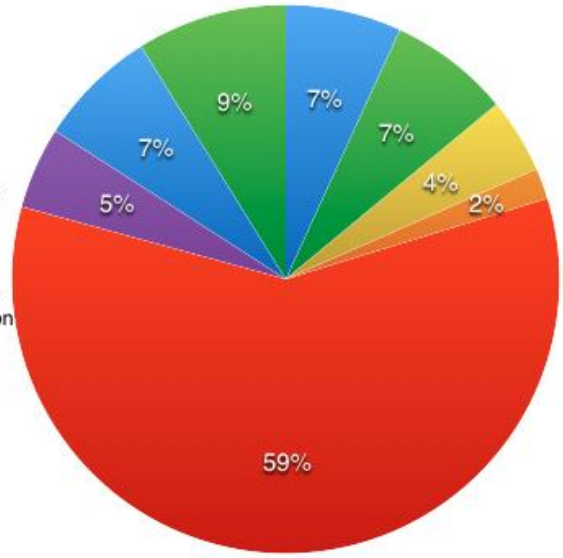
Lateral meniscus

Graft Choice:

For primary ACL reconstruction, the predominant graft choice is hamstring, accounting for 73.5% of all primary ACLs. 30% are 4 strand grafts with semitendinosis and gracilis. The majority of the others are quadrupled semitendinosis grafts (29%), although there is a trend for an increasing use of 6 to 8 strand grafts (17%). BTB is the next most popular graft, making up 21.4% of primary ACLs.



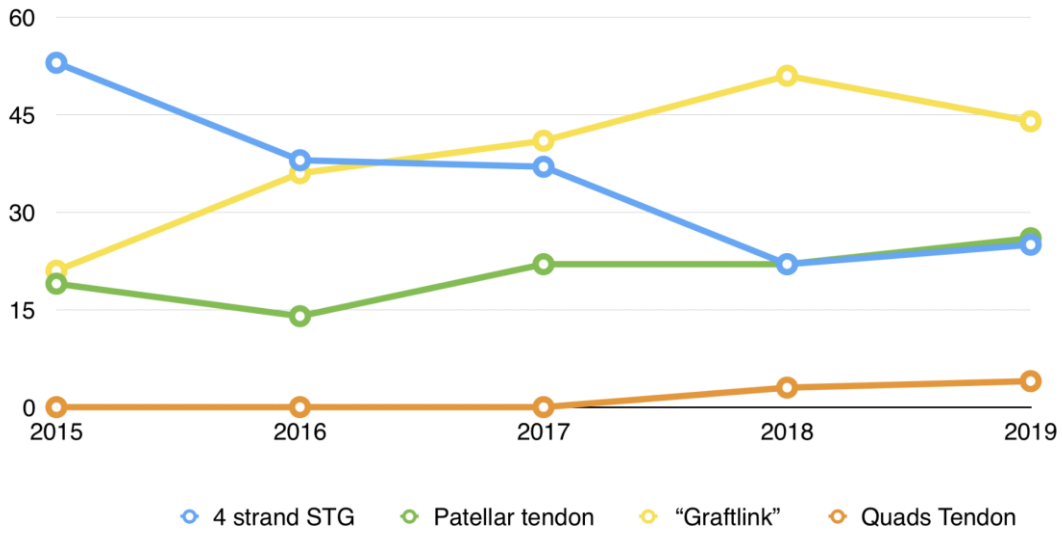
Graft choice: Primary



Graft choice: Revision

Trends in graft choice:

The last 12 months has seen a small decrease in the rate of hamstring grafts for primary ACL reconstruction and an upswing in the popularity of both patellar and quads tendon grafts. Anecdotally, this reflects surgeon concern about the emerging evidence of inferior survival rates in hamstring grafts. Quads tendon is gaining popularity, for perceived survival advantages as well as less donor site morbidity. An RCT, comparing hamstring and patellar tendon grafts has received ethical approval to explore this question.



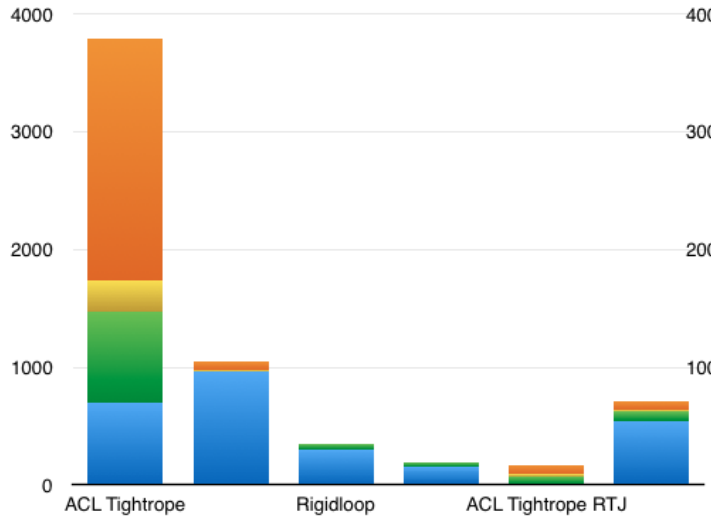
Tunnel drilling technique:

Tibial tunnel drilling data indicates that almost all are completed with antegrade drilling techniques. However, the operative data form was not completed in 13.5% of cases. 6 physeal sparing cases were recorded.

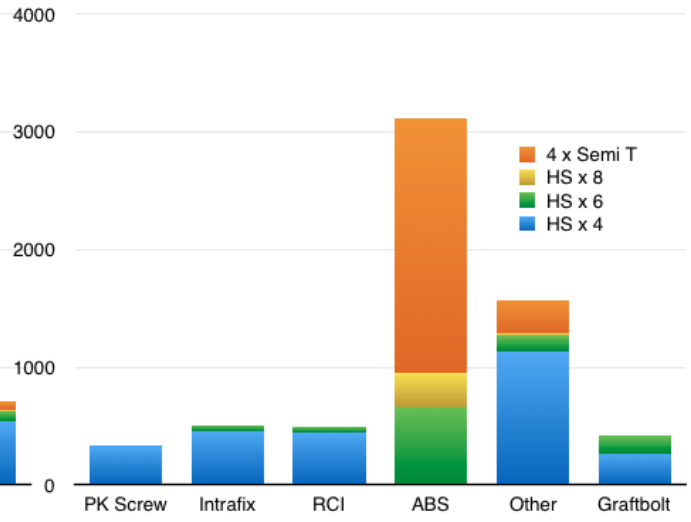
Femoral tunnel drilling was via an anteromedial portal in 72.3% of cases, transtibial in 10.3% and outside-in with a Flipcutter technique in 1.1% of cases. Data was missing in 16.1% of cases. An analysis of survival rates showed no difference in survival rates comparing trans-tibial and anteromedial drilling techniques[1].

Graft fixation technique: Hamstring Primary Patients

Femoral fixation

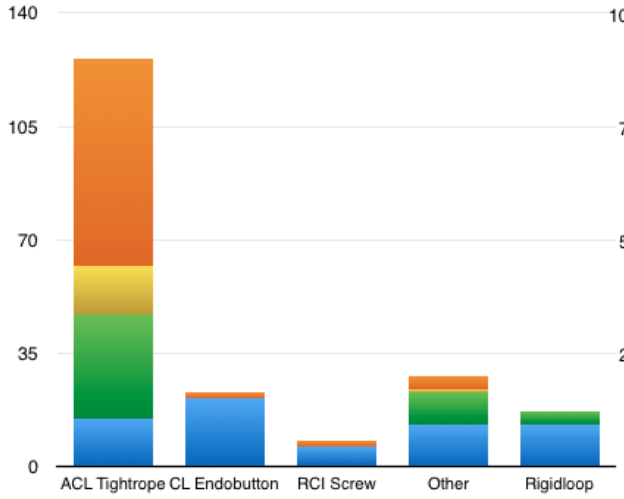


Tibial fixation

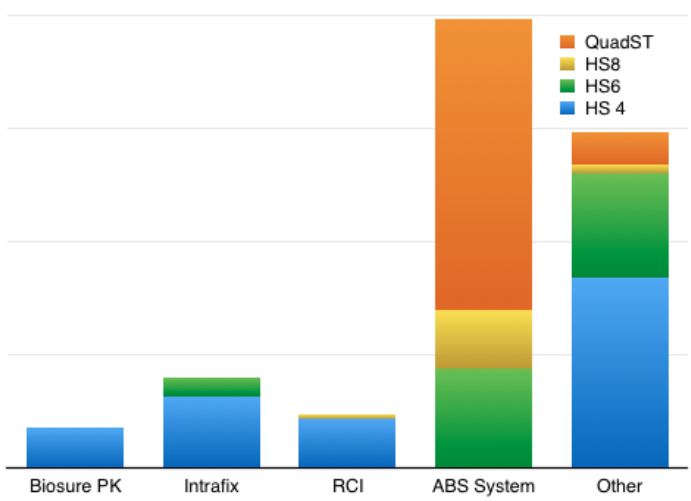


Graft fixation: Hamstring Revision Patients

Femoral fixation

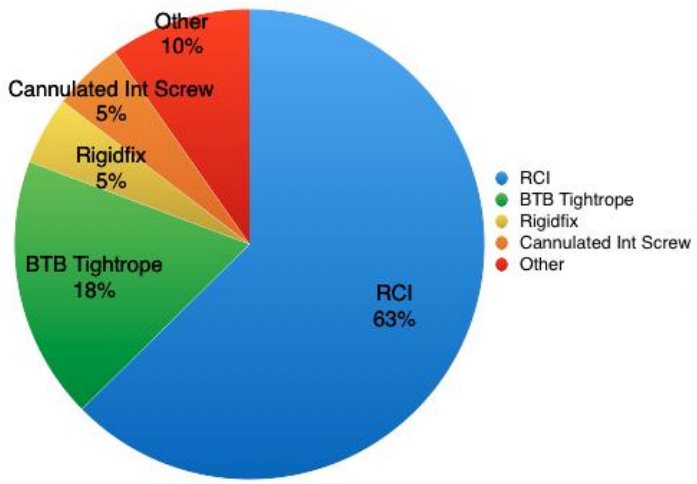


Tibial fixation

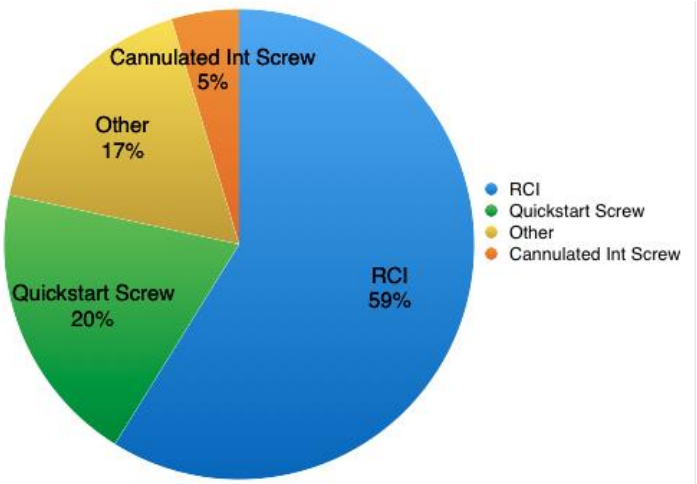


[1] *No Difference in Revision Anterior Cruciate Ligament (ACL) Reconstruction between Anteromedial Portal and Transtibial Drilling of the Femoral Graft Tunnel: Results from the New Zealand ACL Registry*. Richard Rahardja, Mark Zhu, Hamish Love, Mark G. Clatworthy, Andrew Paul Monk, Simon W. Young

Graft fixation: Patellar tendon Primary Patients

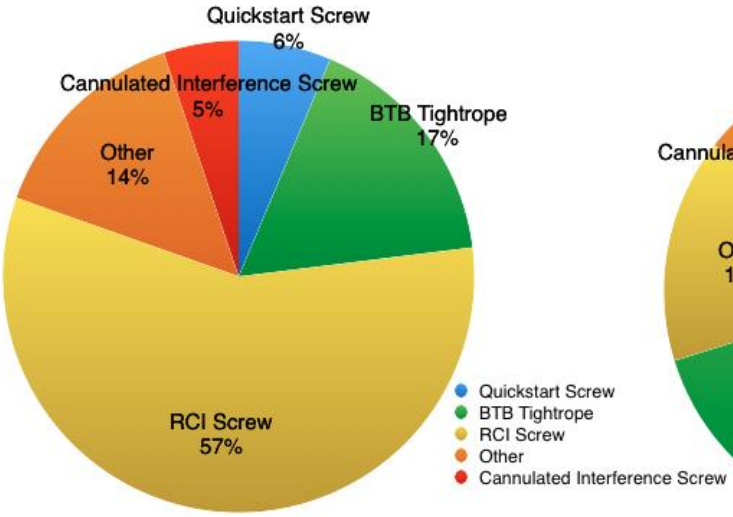


Femoral fixation

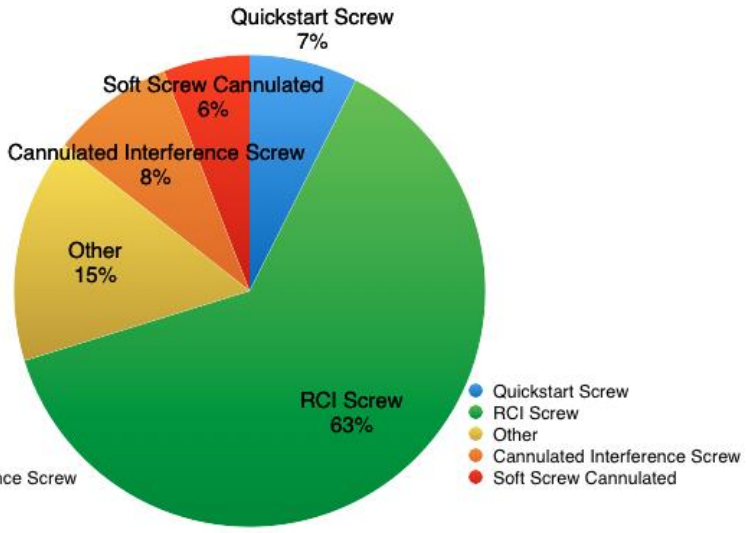


Tibial fixation

Graft fixation: Patellar tendon Revision Patients



Femoral Fixation



Tibial Fixation

Antibiotic use:

Cephazolin	76.6%
Cefuroxime	0.8%
Augmentin	2.2%
Vancomyacin/ceph	5%
Other	1.1
None recorded	14.3%

Thromboprophylaxis:

None	71.4%
Aspirin	12.3%
TEDs	5%
ICD	8.4%
Clexane	3%

Complications:

These are broken down into intra-operative complications, post-operative complications and re-ruptures. Complications are captured in 3 ways. Firstly, treating surgeons enter operative complication on the operative data form. Secondly, post-op complications are recorded on the complications form and returned to the registry. Finally, patients completing follow up questionnaires are asked if they have had any complications relating to their ACL surgery or further injuries to their knee.

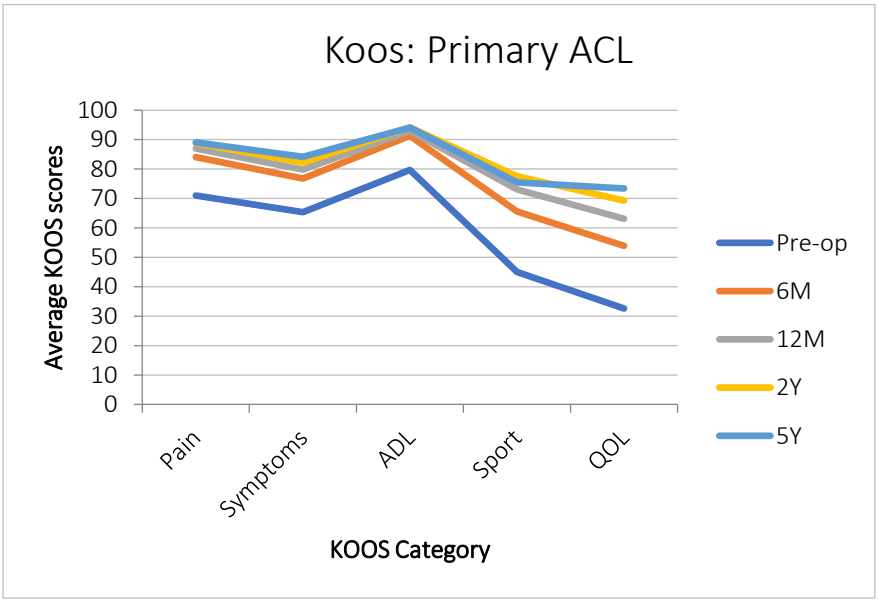
	Primary ACL (n)	Revision ACL (n)
Intraoperative complication		
Implant failure	89	8
Hamstring Amputation	11	-
Inadequate Graft	24	1
Other	88	13
Patella Rupture	6	2
*Post-operative complication**		
Infection	35	9
DVT	28	1
Arthrofibrosis	81	10
Implant-irritation/removal	15	5
Other hospital admission	32	7
Meniscal tear	97	10
Donor site problem – hamstring**	136	9
Donor site problem – patella**	64	6
Recurrent instability		
Atraumatic	114	21
Traumatic	192	9
Other / not recorded	33	14
Patients with recurrent instability requiring revision ACL reconstruction:	256	16

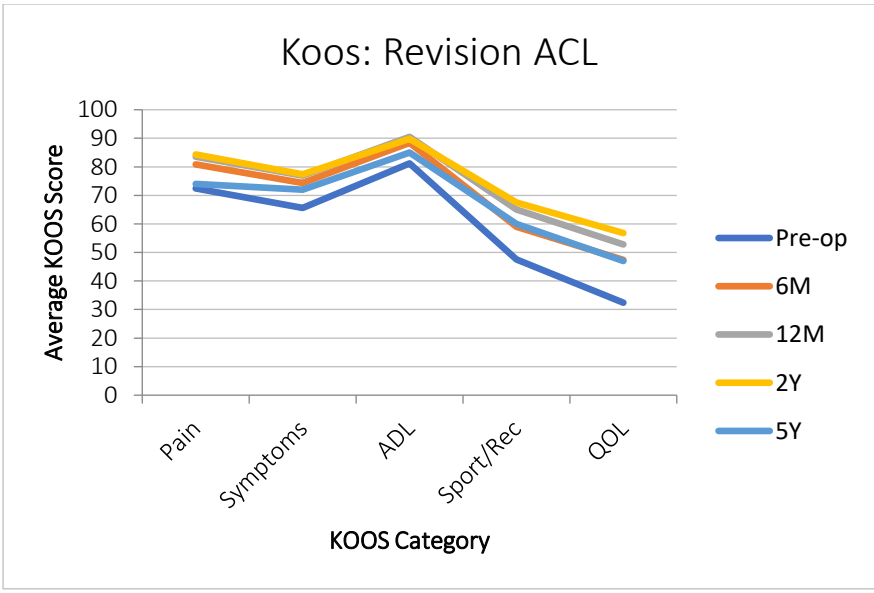
* Complications are recorded if they are significant to require hospital readmission or reoperation.
**The exception to this is donor site problems. These are listed if the patient reports significant symptoms related to the graft harvest site.

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.

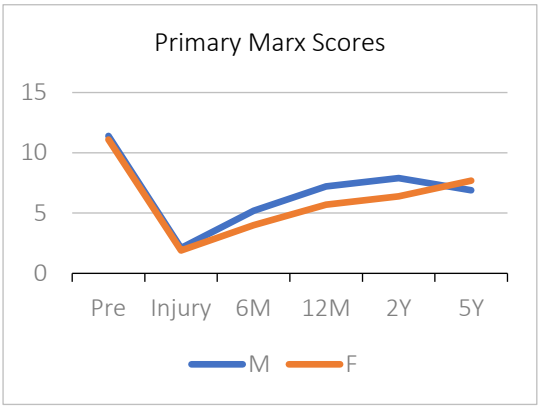


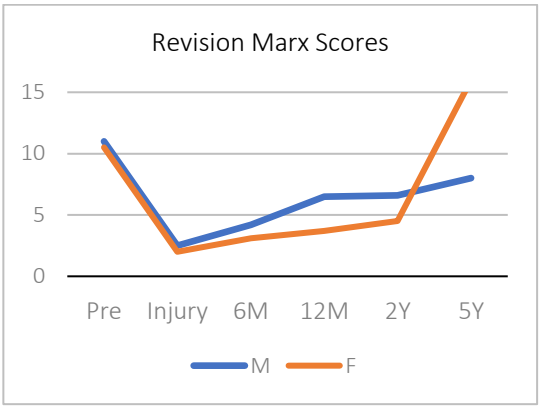


The scores in our cohort over time are very similar to those presented in other registry data. KOOS scores show improvement over all time points in primary ACL reconstruction. Revision KOOS scores show less improvement overall, in spite of a similar starting point.

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.





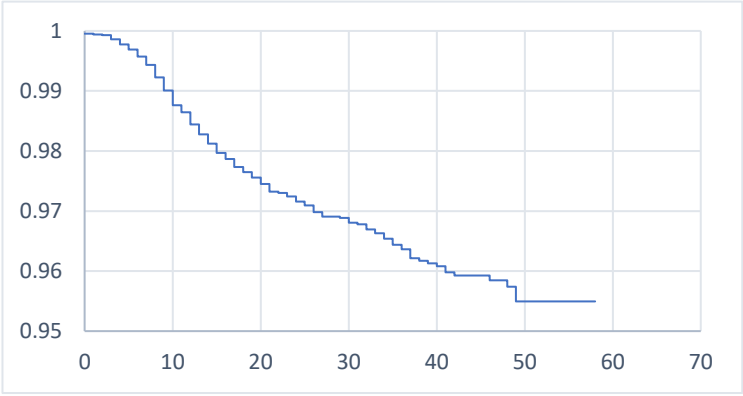
Survivorship:

Cumulative survival probability for a reconstructed ACL in 95.4% (95%CI 94.5-96.1)

Independent patient-related risk factors for graft rupture and revision included[2]:

- 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.

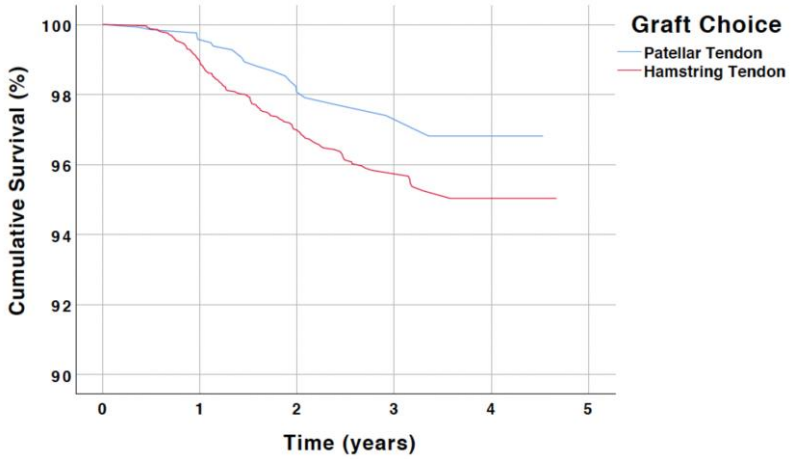
Cumulative graft survival: All patients



[2] *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

Graft Choice:

There is a trend in registry data showing 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)[3]. 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).



The difference in graft choice failure rates tends to be magnified by independent variables, for example age, as an analysis of failure rates among female patients comparing hamstring to patellar tendon shows.

Age group	BTB	HS
< 20y	2.7%	12.4%*
20 – 24y	4.3%	10.3%**
25+	0.9%	3.8%

* p = 0.02
** p = 0.03

These trends need more analysis before firm conclusions can be reached and recommendations about graft choice made.

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.

[3] *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.