Appendix 1: Tables and Figures

****Key Tables**

PRISMA Flow Diagram of Search Results (Figure 1)[1]

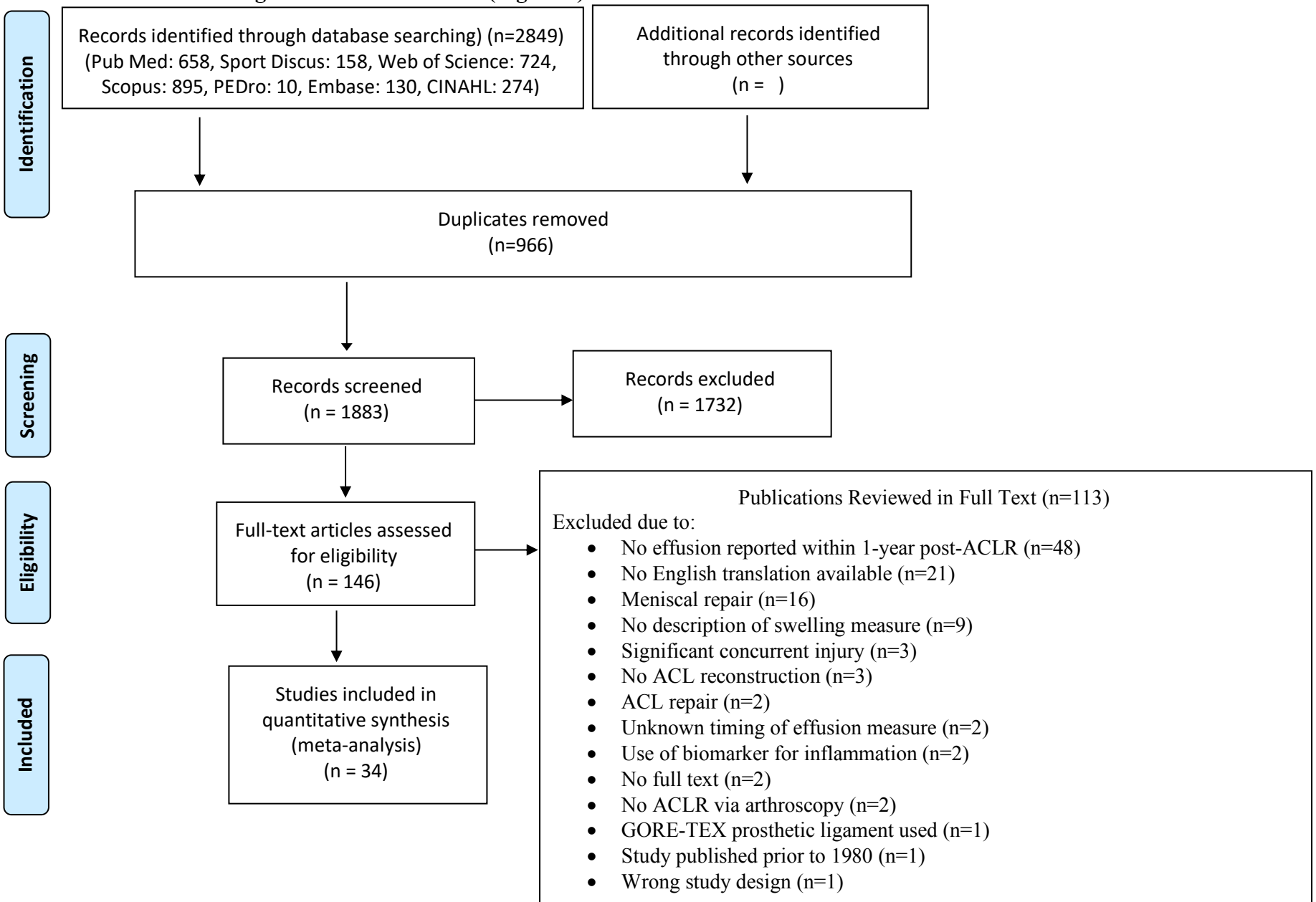

Table 1: Search Terms

Umbrella Terms	"Anterior Cruciate Ligament"	"Effusion"
Equivalents	• "ACL"	• "swelling" • "edema"
Mesh Terms	• "anterior cruciate ligament" • "anterior cruciate ligament reconstruction" • "Bone-Patellar Tendon-Bone Grafts" • "Bone-Patellar Tendon-Bone Grafting"	• "edema"

Search	**Terms**	**Results**
#3	((((((((ACL) OR anterior cruciate ligament) OR anterior cruciate ligament[MeSH Terms]) OR anterior ligament reconstruction[MeSH Terms]) OR Bone-Patellar Tendon-Bone Grafts[MeSH Terms]) OR Bone-Patellar Tendon-Bone Grafting[MeSH Terms])))) AND ((((((swelling) OR edema) OR effusion) OR edema[MeSH Terms]))))	658
#2	(((((swelling) OR edema) OR effusion) OR edema[MeSH Terms]))	295669
#1	((((((ACL) OR anterior cruciate ligament) OR anterior cruciate ligament[MeSH Terms]) OR anterior ligament reconstruction[MeSH Terms]) OR Bone-Patellar Tendon-Bone	26144

	Grafts[MeSH Terms]) OR Bone-Patellar Tendon-Bone Grafting[MeSH Terms])	

Table 2: Study Characteristics

Study (Author, Year)	Study Design	Patient/Subject Number	Sex Distribution	Age (Years)±SD; Range	Graft Type	BMI (kg/m^2)±SD	Concurrent Pathology	Time from Injury to Surgery ±SD and/or range
RCTs								
Boguszewski, 2013[2]	RCT	26	10M, 16F	Unknown	Unknown	Unknown	Unknown	Unknown
Brandsson 2001[3]	RCT	50	37M, 13F	Mean: 26.9 Range: 15-42	PT autograft	Unknown	Unknown	Mean: 11.3 months Range: 1.5-120 months
Cappellino 2012[4]	RCT	14	14M, 0F	Mean: 27±6 Range: 18-35	PT Autograft	Mean: 24 ±2 kg/m2	Unknown	Mean: 6±2 months
Chan, 2017[5]	RCT	60	46M, 14F	Mean: 26.9	HT Autograft	Unknown	21 Meniscectomies	Unknown
Chau, 2012[6]	RCT	32	28M, 4F	Mean: 26.5	HT Autograft	Not Reported	Not Stated	Not Stated
Christanell, 2012[7]	RCT	16	12M, 4F	Mean: 30 Range:20–49	PT Autograft	Mean: 24.6±3.4 kg/m^2	None	Mean: 16 months Range: 2 months-12 years
Dhawan, 2003[8]	RCT	21	19M, 2F	Mean: 28 Range: 19-36	PT Autograft	Unknown	29 Meniscectomies	Unknown

Ediz, 2012[9]	RCT	26	21M, 5F	Mean: 28.0	HT Autograft	Unknown	Unknown	Unknown
Felli, 2019[10]	RCT	80	63M, 17F	Mean: 31.4	HT Autograft	Mean: 22.7	43 Partial meniscectomies, 16 bucket handle tears, 11 chondral damage	Mean: 159.0 days (5.2 months)
Hughes, 2019[11]	RCT	24	17M, 7F	Mean: 29±7	HT Autograft	Mean: 25.9	Unknown	Unknown
Jarit, 2003[12]	RCT	28	18M, 10F	Unknown	Unknown	Unknown	228 meniscal tear, 205 chondral injury, 44 collateral ligament injury	Mean: 171 days (5.6 months)
Lindstrom, 2015[13]	RCT	60	38M, 22F	Mean: 26±8, Median: 24	HT Autograft	Median: 25.5	10 concomitant meniscus injuries	Median: 11 months Range: 2-180 months
Madadi, 2010[14]	RCT	46	40M, 6F	Mean: 27.9	HT Autograft	Unknown	Unknown	Mean 13.1months
Mayr, 2010[15]	RCT	73	Unknown	Mean: 36.1 Range: 17-58	HT Autograft	Not Reported	"No Meniscus Lesions Requiring Surgery"	Unknown
Ruffilli, 2015[16]	RCT	47	29M, 18F	Mean: 31.8	HT Autograft	Unknown	22 Meniscectomies	Mean: 3.0 months
Straw, 2003[17]	RCT	47	30M, 17F	Mean: 26.8 Range: 16-49	PT Autograft	Unknown	Unknown	Unknown

Zamarioli, 2008[18]	RCT	10	12M, 1F (Before Dropouts)	Unknown	PT Autograft	Unknown	10 Meniscectomies	Unknown
Control Trials Without Randomization Status Stated								
Gramatikova, 2015[19]	Control Trial	63	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Rigon, 1993[20]	Control Trial	40	Unknown	Unknown	PT Autograft	Unknown	Unknown	Unknown
Cohort Studies								
Bordes 2017[21]	Retrospective Cohort Study	969	764M, 205F	Mean: 25.7 ±7.0	PT, HT autograft	Unknown	228 meniscal tear, 205 chondral injury, 44 collateral ligament injury	Mean: 171 days (5.6 months)
Drechsler, 2006[22]	Observational Prospective Cohort Study	31	25M, 6F	Mean: 30±8	PT Autograft	Not Reported	Unknown	Unknown
Lentz, 2012[23]	Cross-sectional Cohort Study	94	60M, 34F	Mean: 22.4	PT Autograft, HT Autograft, Anterior Tibialis Allograft, Tibialis Posterior Allograft, Achilles Tendon Allograft	Unknown	Mean # of Concommittant Injuries: 0.86 Injuries include: Meniscal Injuries, Chondral Lesions, and Collateral Ligament Injuries	Mean: 75.0±61.0 days (2.5 months)

Intervention and Comparative Studies Without a Control Group								
Aydogdu, 2017[24]	Non-Randomized Intervention Study	15	13M, 2F	Mean: 23.36±6.76	Unknown	Mean: 25.15±4.86	Not Stated	Not Stated
Benazzo, 2008[25]	Randomized Prospective Study	60	Unknown	Mean: 31.1±1.5	HT autograft	Not Reported	29 Meniscectomies	Unknown
Feller, 2001[26]	Randomized Intervention Study	65	47 M, 18F	Mean: 26.7	PT, HT autograft	Unknown	Unknown	Unknown
Kaeding, 2005[27]	Prospective Randomized Intervention study	97	65M, 32F	Mean: 26.9	PT Autograft	Unknown	Unknown	Unknown
Sarrafan, 2008[28]	Randomized Comparative study	30	30M, 0F	Mean: 25 Range: 19-33	PT, QT Autografts	Unknown	26 Partial injuries of Medial Meniscus	Unknown
Sharifzadeh, 2017[29]	Prospective Randomized Comparative study	100	100M, 0F	Mean: 26.45	HT Autograft	Unknown	None	Unknown
Case Series								
Bach, 2002[30]	Case Series	20	14M, 6F	Mean: 32 (16-47)	PT autograft	Unknown	None	Mean: 16 months Range: 2 months-12 years

Calvisi 2008[31]	Case Series	58	46M, 12F	Median: 25 Range: 15-52	PT, HT Autograft	Unknown	Meniscal tears: 27 patients, focal chondral lesions: 12 patients, Meniscal and chondral lesions: 8	Unknown
Morrissey, 2000[32]	Case Series	23	16M, 7F	Mean: 30	PT Autograft	Not Reported	4 Partial Meniscectomies	Mean: 48±57 months
Saddemi,1993[33]	Case Series	50	Unknown	Mean: 22.1	PT Autograft or Allograft	Unknown	Unknown	Unknown
Wilk, 1994[34]	Case Series	50	34M, 16F	Mean: 24.5 Range: 15-52	Unknown	Not Reported	Unknown	Unknown
Witvrouw, 2001[35]	Case Series	49	27M, 22F	Mean: 24.5 Range: 17-63	PT or HT Autograft	Unknown	Unknown	Unknown

Table 3: Risk of Bias for Studies Relevant to Question #2 and Question #3[36]

Study (Author, Year)	ROB Tool	Risk of Bias	Rationale
Benazzo, 2008[25]	ROB-2[37]	Low	Computer generated randomization and double-blind intervention/placebo; Adequate reporting of attrition; No reporting bias detected
Bordes 2017[21]	RoBANS[38]	High	Confounding variables present as there were significant differences between groups at baseline
Cappellino 2012[4]	ROB-2[37]	Unclear	Lack of blinding and attrition status reported
Chau, 2012[6]	ROB-2[37]	Unclear	Methods of allocation, concealment, blinding not stated; No reporting of attrition after randomization
Drechsler, 2006[22]	RoBANS[38]	High	Significant sex differences and subject number between ACLR and uninjured control groups; No blinding stated
Ediz, 2012[9]	ROB-2[37]	High	Detection bias due to knowledge of the allocated interventions by outcome assessment

Felli, 2019[10]	ROB-2[37]	Low	Simple randomization for allocation; Opaque envelopes for concealment; Grouping list only available to one individual who was not a subject or assessor; No patients lost after randomization; No reporting bias noted
Gramatikova, 2015[19]	ROB-2[37]	High	Randomization status and methods (if performed) not stated; Nature of intervention/control resulted in bias regarding subject and assessor blinding
Hughes, 2019[11]	ROB-2[37]	High	Performance bias due to knowledge of the allocated interventions by participants and personnel during the study
Jarit, 2003[12]	ROB-2[37]	High	Measurement bias due to patients measuring their own knee circumference due to knowledge of previous measurement values
Kaeding, 2005[27]	ROB-2[37]	High	Detection bias due to knowledge of the allocated interventions by outcome assessment; Attrition bias due to 33% attrition rate
Lentz, 2012[23]	RoBANS[38]	High	Self-report measures used for numerous outcomes in the study including return to sport
Lindstrom, 2015[13]	ROB-2[37]	High	Lack of blinding of subjects; Loss of follow-up in the treatment group
Madadi, 2010[14]	ROB-2[37]	High	Reporting bias due to the presence of conflicting measures of stability but the authors reported favorable stability in the case group
Mayr, 2010[15]	ROB-2[37]	High	Performance bias due to knowledge of the allocated interventions by participants and personnel during the study; Detection bias due to knowledge of the allocated interventions by outcome assessment; Attrition bias due to amount, nature, or handling of incomplete outcome data
Morrissey, 2000[32]	RoBANS[38]	High	Subjects underwent various procedures performed by three different surgeons among five different sites; Blinding of assessors and attrition rate unclear
Ruffilli, 2015[16]	ROB-2[37]	High	Performance and detection bias due to lack of blinding
Sharifzadeh, 2017[29]	ROB-2[37]	Unclear	Methods of allocation, concealment, blinding not stated; No reporting of attrition after randomization
Straw, 2003[17]	ROB-2[37]	Unclear	Lack of clarity regarding participant blinding and allocation concealment

Table 4: Effusion Method(s) and Measurement Averages**

Circumferential Measurement		
Study (Author, Year)	**Comparison (If Applicable)**	**Measurement Time and Value**
Aydogdu, 2017[24]	Difference from Contralateral Limb	**8 Weeks:** Mean: 0.93 cm ±0.24 cm
Boguszewski, 2013[2]	Difference from Contralateral Limb	**1 Week:** Mean: Intervention: 1.16 cm; Control: 1.4 cm **2 Weeks:** Mean: Intervention: 0.84 cm; Control: 1.2 cm

		3 Weeks: Mean: Intervention: 0.57 cm; Control: 1.0 cm **4 Weeks:** Mean: Intervention: 0.33 cm; Control: 0.8 cm
Bordes, 2017[21]	Difference from Contralateral Limb	**32.4±3.4 days (~5 Weeks):** Total Mean: 0.9±0.6 cm
Cappellino, 2012[4]	Difference from Contralateral Limb	**1 Month (~4 Weeks):** Mean: Intervention: 1.5±0.4 cm; Control: 2.1±0.7 cm; Total: 1.8±0.62 **3 Months (~13 Weeks):** Mean: Intervention: 0.2±0.3 cm ; Control: 0.9±0.4 cm; Total: 0.55±0.48 **6 Months (~26 Weeks):** Mean: Intervention: 0.1±0.2 cm ; Control: 0.2±0.3 cm; Total: 0.15±0.25
Chan, 2017[5]	None	**1 Week:** Mean: Intervention: 39.43±3.43 cm; Control: 40.57±3.14 cm **2 Weeks:** Mean: Intervention: 38.23±2.89 cm; Control: 39.36±2.94 cm **6 Weeks:** Mean: Intervention: 37.02±3.12 cm; Control: 38.34±3.44 cm
Chau, 2012[6]	Difference from Pre-operative Measurement	**1 Day:** Mean: Intervention: 1.56±1.3 cm; Control: 3.0±1.1 cm **2 Days:** Mean: Intervention: 1.63±1.5 cm; Control: 2.63±0.95 cm **2 Weeks** Mean: Intervention: 1.0±1.6 cm; Control: 2.85±1.1 cm **6 Weeks:** Mean: Intervention: 0.64±1.82 cm; Control: 1.46±1.9 cm **12 Weeks:** Mean: Intervention: 0.25±1.4 cm; Control: 0.5±1.8 cm
Dhawan, 2003[8]	None	**1 Day:** Mean: Intervention: 38.6±1.0 cm; Control: 39.7±1.0 cm **2 Days:** Mean: Intervention: 43.5±0.9 cm; Control: 44.8±0.8 cm **3 Days:** Mean: Intervention: 44.4±0.9 cm; Control: 45.6±0.9 cm **4 Days:** Mean: Intervention: 44.0±1.0 cm; Control: 45.2±0.9 cm **5 Days:** Mean: Intervention: 43.8±1.0 cm; Control: 44.7±0.9 cm **6 Days:** Mean: Intervention: 43.1±1.1 cm; Control: 44.6±0.9 cm **1 Week:** Mean: Intervention: 43.9±1.1 cm; Control: 44.3±1.0 cm
Ediz, 2012[9]	Difference from Contralateral Limb	**1 Day:** Mean: Intervention: 1.9±1.0 cm; Control: 1.6±0.8 cm; Total: 1.75±1.4 **1 Week:** Mean: Intervention: 1.7±1.2 cm; Control: 3.4±1.5 cm; Total: 2.55±1.57 **2 Weeks:** Mean: Intervention: 1.1±1.2 cm; Control: 2.5±1.3 cm; Total: 1.8±1.4 **8 Weeks:** Mean: Intervention: 0.4±0.5 cm; Control: 1.5±0.6 cm; Total: 0.95±0.76 **12 Weeks:** Mean: Intervention: 0.2±0.8 cm; Control: 0.8±0.9 cm; Total: 0.5±0.88 **6 Months (~26 Weeks):** Mean: Intervention: 0.1±0.2 cm; Control: 0.3±0.4 cm; Total: 0.2±0.325
Felli, 2019[10]	Difference from Contralateral Limb	**1 Day:** Mean: Intervention: 14.6±11.6 cm; Control: 14.2±11.5 cm **1 Week:** Mean: Intervention: 19.6±17.1 cm; Control: 26.2±14.6 cm

		15 Days (~2 Weeks): Mean: Intervention: 10.4±12.5 cm; Control: 16.2±12.3 cm **1 Month (~4 Weeks):** Mean: Intervention: 8.6±13.1 cm; Control: 9.6±11.6 cm **3 Months (~13 Weeks):** Mean: Intervention: 2.4±4.5 cm; Control: 1.0±2.9 cm
Gramatikova, 2015[19]	Difference from Contralateral Limb	**1 Day:** Mean: Intervention: 2.67±0.21 cm; Control: 2.16±0.19 cm **10 Days (~1 Week):** Mean: Intervention: 0.98±0.19 cm; Control: 1.51±0.17 cm
Hughes, 2019[11]	Difference from Post-Operative Baseline; None	**4 Weeks Post-Operative Baseline-:** Mean: Intervention: -1.2±1.4 cm; Control: -0.1±0.19 cm **8 Weeks Post-Operative Baseline:** Mean: Intervention: -1.0±1.1 cm; Control: 0.9±0.4 cm **4 Weeks (No Comparison):** Mean: Intervention: 37.9 cm; Control: 39.7 cm **8 Weeks (No Comparison):** Mean: Intervention: 38.1 cm; Control: 38.9 cm
Jarit, 2003[12]	Difference from Pre-operative Measurement	**1 Day:** Mean: Intervention: 2.8 cm ; Control: 4.9 cm **2 Days:** Mean: Intervention: 3.3 cm ; Control: 5.0 cm **3 Days:** Mean: Intervention: 2.3 cm ; Control: 4.8 cm **1 Week:** Mean: Intervention: 1.8 cm ; Control: 4.0 cm **2 Weeks:** Mean: Intervention: 1.6 cm ; Control: 3.4 cm **3 Weeks:** Mean: Intervention: 1.2 cm ; Control: 2.8 cm **4 Weeks:** Mean: Intervention: 1.1 cm ; Control: 2.6 cm **5 Weeks:** Mean: Intervention: 0.9 cm ; Control: 2.4 cm **6 Weeks:** Mean: Intervention: 0.8 cm ; Control: 2.2 cm **7 Weeks:** Mean: Intervention: 0.7 cm ; Control: 2.1 cm **8 Weeks:** Mean: Intervention: 0.6 cm ; Control: 1.8 cm
Mayr, 2010[15]	Difference from Contralateral Limb	**Mid-Patellar Circumference Compared to Contralateral Limb** **1 Day:** Mean: Hard brace: 1.5±0.9 cm; Soft Brace: 2.3±1.3 cm; Total: 1.9±1.53 **5 Days:** Mean: Hard brace: 3.1±1.2 cm; Soft Brace: 1.6±1.1 cm; Total: 2.3±1.37 **12 Days (~2 weeks):** Mean: Hard brace: 2.5±1.2 cm; Soft Brace: 0.4±1.1 cm; Total: 1.4±1.55 **6 Weeks:** Mean: Hard brace: 1.5±1.2 cm; Soft Brace: 0.2±0.6 cm; Total: 0.84±1.14 **12 Weeks:** Mean: Hard brace: 0.8±0.9 cm; Soft Brace: 0.1±0.6 cm; Total: 0.45±0.83 **6 Months (26 Weeks):** Mean: Hard brace: 0.7±0.8 cm; Soft Brace: 0.0±0.5 cm; Total: 0.35±0.75 **1 Year (52 Weeks):** Mean: Hard brace: 0.5±0.8 cm; Soft Brace: 0.0±0.0 cm

		Proximal Patellar Margin Compared to Contralateral Limb **1 Day:** Mean: Hard brace: 1.7±1.0 cm; Soft Brace: 1.5±1.1 cm **5 Days:** Mean: Hard brace: 3.5±1.3 cm; Soft Brace: 2.8±1.1 cm **12 Days (~2 weeks):** Mean: Hard brace: 2.7±1.2 cm; Soft Brace: 1.7±1.2 cm **6 Weeks:** Mean: Hard brace: 1.2±1.1 cm; Soft Brace: 0.3±0.9 cm
Morrissey, 2000[32]	Contralateral Limb (See appendix II)	**2 Weeks:** Mean: Injured Knee: 40.0±2.5 cm; Uninjured Knee: 38±2.5 cm **6 Weeks:** Mean: Injured Knee: 40.0±2.5 cm; Uninjured Knee: 38±2.5 cm
Rigon,1993[20]	Difference from Contralateral Limb	**5 Days:** Mean: Intervention: 3.8 cm; Control: 3.3 cm **15 Days (~2 Weeks):** Mean: Intervention: 1.4 cm; Control: 1.7 cm **45 Days (~6 Weeks):** Mean: Intervention: 0.9 cm; Control: 1.2 cm
Ruffilli, 2015[16]	Difference from Pre-op Measurement; None	**1 Day:** Median Intervention: 2 cm; Control: 3 cm **1 Day:** Median Intervention: 40.0 cm; Control: 40.0 cm
Saddemi, 1993[33]	Difference from Contralateral limb	**1 Week:** Mean: Autograft: 2.8 cm; Allograft: 3.2 cm **2 Weeks:** Mean: Autograft: 1.2 cm; Allograft: 1.9 cm **6 Weeks:** Mean: Autograft: 1.0 cm; Allograft: 1.2 cm **12 Weeks:** Mean: Autograft: 0.2 cm; Allograft: 0.3 cm
Straw, 2003[17]	Difference from Contralateral Limb	**2 Weeks:** Mean: Intervention: 1.3±0.97 cm; Control: 1.9±0.16 cm **4 Weeks:** Mean: Intervention: 1.2±0.18 cm; Control: 1.1±0.14 cm **6 Weeks:** Mean: Intervention: 1.0±0.4 cm; Control: 1.1±0.34 cm
Witvrouw, 2001[35]	Difference from Contralateral Limb	**6 Weeks:** Mean: Patellar Tendon Graft: 1.6±0.4 cm; Hamstring Tendon Graft: 0.7±0.9 cm **3 Months (~13 Weeks):** Mean: Patellar Tendon Graft: 0.7±0.9 cm; Hamstring Tendon Graft: 0.6±0.6 cm **6 Months (26 Weeks):** Mean: Patellar Tendon Graft: 0.7±0.4 cm; Hamstring Tendon Graft: 0.2±0.5 cm **12 Months (52 Weeks):** Mean: Patellar Tendon Graft: 0.1±0.5 cm; Hamstring Tendon Graft: 0.1±0.4 cm
Zamarioli, 2008[18]	None	**9 Weeks:** Mean: Water Rehabilitation: 39.3±3.8 cm; Land Rehabilitation: 41±1.0 cm
Bulge/Stroke Test		
Study (Author, Year)	**Measurement Scale**	**Measurement Time and Value**
Feller, 2001[26]	Bulge Sign - % of Subjects with None, Small, Moderate or Large Effusion (See Appendix II)	**2 Weeks:** Hamstring Tendon Group: No Effusion: 0%, Mild Effusion: 27%, Moderate Effusion: 65%, Severe Effusion: 8%; Mean: 1.8 as scored by Mayr et al.[15]

		Patellar Tendon Group: No Effusion: 0%, Mild Effusion: 32% (10), Moderate Effusion: 49% (15), Severe Effusion: 19% (6); Mean: 1.9 as scored by Mayr et al.[15] **8 Weeks:** Hamstring Tendon Group: No Effusion: 29% (10), Mild Effusion: 44% (15), Moderate Effusion: 27% (9), Severe Effusion: 0% (0); Mean: 0.97 as scored by Mayr et al.[15]; Mean: 0.97 as scored by Mayr et al.[15] Patellar Tendon Group: No Effusion: 19%, Mild Effusion: 58%, Moderate Effusion: 23%, Severe Effusion: 0%; Mean: 1.03 as scored by Mayr et al.[15] **4 Months (~17 Weeks):** Hamstring Tendon Group: No Effusion: 62% (21), Mild Effusion: 35% (12), Moderate Effusion: 3% (1), Severe Effusion: 0% (0); Mean: 0.41 as scored by Mayr et al.[15] Patellar Tendon Group: No Effusion: 68% (21), Mild Effusion: 29% (9), Moderate Effusion: 3% (1), Severe Effusion: 0% (0);); Mean: 0.35 as scored by Mayr et al.[15]
Lentz, 2012[23]	Bulge sign - Yes/No Determination (See Appendix II)	**1 Year (52 Weeks):** Effusion Present in 10/94 Subjects
Mayr, 2010[15]	Bulge-Dancing Patella Signs (See Appendix II)	**1 Day:** Mean Hard Brace: 1.6±0.8; Soft Brace: 1.6±0.7; Total: 1.6±0.75 **5 Days:** Mean Hard Brace: 2.3±0.7; Soft Brace: 1.8±0.8; Total: 2.04±0.79 **12 Days (2 weeks):** Mean Hard Brace: 2.1±0.6; Soft Brace: 1.4±0.7; Total: 1.75±0.74 **6 Weeks:** Mean Hard Brace: 1.3±0.5; Soft Brace: 0.5±0.7; Total: 0.89±0.72 **12 Weeks:** Mean Hard Brace: 0.4±0.5; Soft Brace: 0.2±0.5; Total: 0.30±0.51 **6 Months (26 Weeks):** Mean Hard Brace: 0.2±0.4; Soft Brace: 0.1±0.3; Total: 0.15±0.35 **1 Year (52 Weeks):** Mean Hard Brace: 0.1±0.3; Soft Brace: 0.2±0.3
Ediz, 2012[9]	Bulge-Dancing Patella Signs (See Appendix II)	**1 Day:** Mean: Intervention: 1.7±1.4; Control: 1.8±1.3; Total: 1.75±1.3 **1 Week:** Mean: Intervention: 1.8±1.3; Control: 2.4±1.7; Total: 2.1±1.74 **2 Weeks:** Mean: Intervention: 1.4±1.4; Control: 2.2±1.5; Total: 1.8±1.47 **8 Weeks:** Mean: Intervention: 0.6±0.7; Control: 1.8±1.3; Total: 1.2±1.18 **12 Weeks:** Mean: Intervention: 0.6±0.7; Control: 1.3±0.8; Total: 0.95±0.81 **6 Months (~26 Weeks):** Mean: Intervention: 0.1±0.4; Control: 0.2±0.2; Total: 0.15±0.31
Imaging		
Study (Author, Year)	**Measurement Scale**	**Measurement Time and Value**

Bach, 2002[30]	MRI - Presence/Absence of Effusion	**6 Months (~26 Weeks):** Effusion Present in 6/20 Subjects **1 Year (52 weeks):** Effusion Present in 1/10 Subjects
Lindstrom, 2015[13]	CT Scan - Presence/Absence of Effusion	**3 Months (~13 Weeks):** Effusion Present in 36/53 Subjects **12 Months (52 Weeks):** Effusion Present in 13/52 Subjects
Ballottement/Dancing Patella		
Study (Author, Year)	**Measurement Scale**	**Measurement Time and Value**
Calvisi, 2008[31]	Ballottement Test - Presence/Absence of Effusion (See Appendix II)	**1 Week:** Effusion Present in 30/58 Subjects **3 Months (~13 weeks):** Effusion Present in 0/58 Subjects **6 Months (~26 Weeks):** Effusion Present in 0/58 Subjects
Subjective Knee Form		
Study (Author, Year)	**Measurement Scale**	**Measurement Time and Value**
Benazzo, 2008[25]	IKDC Knee Examination Form - Presence or Absence of Effusion (See Appendix II)	**1 Month (~4 Weeks):** Effusion Present in 11/60 Subjects **2 Months (~9 Weeks):** Effusion Present in 2/60 Subjects **6 Months (~26 Weeks):** Effusion Present in 0/60 Subjects
Felli, 2019[10]	IKDC (See Appendix II)	**1 Month (~4 Weeks):** Mean: Intervention: 1.6±0.7; Control: 1.6±0.6 **3 Months (~13 Weeks):** Mean: Intervention: 1.2±0.4; Control: 1.2±0.4
Kaeding, 2005[27]	IKDC (% of Subjects with Effusion with Various Activity Intensity) (See Appendix II)	**1 Year (52 Weeks):** Titanium Screw Group: Sedentary: 0%; Light: 0%; Moderate: 2.5%; Strenuous: 97.5%; Mean: 1.02 as scored by Felli et al.[10] Phantom Screw Group: Sedentary: 0%; Light: 0%; Moderate: 2.3%; Strenuous: 97.7%; Mean: 1.02 as scored by Felli et al.[10]
Sarrafan, 2008[28]	Modified Lysholm Knee Score (See Appendix II)	**6 Months (26 Weeks):** Score 10: 28/30, Score 5: 2/30. Score 0: 0/30
Sharifzadeh, 2017[29]	Lysholm Knee Score - Swelling Sub-Section (See Appendix II)	**1 Year (52 Weeks):** 9.72/10
Wilk, 1994[34]	Modified Noyes Form-Swelling Sub-Section (See Appendix II)	**25.98 Week Average (Range 21-30 Weeks):** Mean: 8.83/10±1.1; 10 Score: 32/50, 8 Score: 17/50, 6 Score: 1/50
Other		
Study (Author, Year)	**Measurement Method(s)**	**Measurement Time and Value**
Brandsson, 2001[3]	Subjective Visual Determination (Presence/Absence of Effusion)	**2 Weeks:** Effusion Present in 11/50
Christanell, 2012[7]	Un-named Standardized Scale (See Appendix II)	**1 Week:** Mean: Intervention: 3.3/4±0.5; Control: 3.3/4±0.9
Drechsler, 2006[22]	Knee Volumeter (See Appendix II)	**1 Month (~4 Weeks):** 260 mL±27 mL

		3 Months (~13 Weeks): 169 mL±27 mL
Kaeding, 2005[27]	Clinical Assessment (None or Mild)	**1 Year (52 Weeks):** Mild Effusion Present in 1/97 Subjects
Madadi, 2010[14]	Subjective Visual Determination (Excellent, Good, Moderate)	**1 Year (52 Weeks):** Intervention: 13/22 (59%) excellent, 9/22 (41%) good, 0/22 (0%) moderate; Control: 22/24 excellent (92%), 2/24 (8%) good, 0/24 (0%) moderate

Table 5: Common Measurement Times

Common Measurement Times	Number of Studies
Day 1	8[6,8–10,12,15,16,19]
Week 1	11[2,5,7–10,12,15,19,31,33]
Week 2	13[2,3,5,6,9,10,12,15,17,20,26,32,33]
Week 4	8[2,4,10–12,17,22,25]
Week 6	9[5,6,12,15,17,20,32,33,35]
Week 8	5[9,11,12,24,26]
Week 26	9[4,9,15,25,28,30,31,34,35]
Week 52	7[13,15,23,27,29,30,35]

Table 6: Average Effusion±SD as Measured by Mid-patellar Circumference Compared to the Contralateral Limb**

	Mid-Patellar Circumferential Measurement with Comparison to Contralateral Limb (cm)
Day 1	1.9±1.5[9,15]
Day 5-7	2.4±1.4[9,15]
Week 2	1.5±1.5[9,15]
Weeks 4-5	0.91±0.61[4,21]
Weeks 6-8	0.87±1.1[9,15]
Weeks 12-13	0.47±0.84[4,9,15]
Week 26	0.29±0.63[4,9,15]

Table 7: Average Effusion±SD as Measured by the Bulge/Stroke Test**

	Bulge/Stroke Test (See Appendix II)
Day 1	1.6±0.92[9,15]
Day 5-7	2.1±1.1[9,15]
Week 2	1.8±0.95[9,15]
Weeks 6-8	0.97±0.87[9,15]
Week 12	0.47±0.66[9,15]
Week 26	0.15±0.34[9,15]

Table 8: Effusion Correlations to Knee Related Outcomes and Between Group Differences**

Study	Between Group Significant Effusion Differences	Between Group Outcomes with Significant Differences	Association Stated
Benazzo, 2008[25]	• Month 2: Faster resolution of effusion in the intervention group ($p<0.05$)	• Baseline-6 months: Mean changes of SF-36 Health Survey score in the I-ONE group were during follow-up ($P<0.05$) • Month 1: Decreased use of NSAIDs in the intervention group ($p<0.05$)	N/A
Cappellino, 2012[4]	• Month 3: Decreased circumferential measurement in the intervention group ($p=0.057$)	• 3 months: Improved Flexion Force ($p=0.037$)	• Swelling correlated to dynamic load asymmetry in the intervention group, $R=0.909$; $p=0.005$ • Swelling correlated to knee flexion range of motion, $R=0.866$

			• Swelling was found not to be correlated to several measures in the following categories: baropodometric (static load), gait (walking speed, stride length, cadence, step width), clinical (trophism, pain, knee force), and quality of life (SF-36)
Chau, 2012[6]	• Day 1: Decreased circumferential measurement in the intervention group (p=0.009) • Day 2: Decreased circumferential measurement in the intervention group (p=0.038)	• Day 1: Significantly increased KOOS pain score (p=0.024) • Day 1: Significantly increased KOOS ADLs (p=0.024) • Day 1: Significantly increased KOOS sports (p=0.013) • Day 2: Significantly increased KOOS pain score (p=0.012) • Day 2: Significantly increased KOOS ADLs (p=0.007) • Day 2: KOOS sports (p=0.003) • Day 2: Significantly increased KOOS symptom score (p=0.018)	N/A
Drechsler, 2006[22]	• N/A	• N/A	• No association found between swelling and quadriceps strength or activation 1- and 3-months post ACLR
Ediz, 2012[9]	• Day 7: Decreased bulge/stroke scale score (p=0.024) and decreased	• Decreased pain in intervention group at week 1 (p=0.012), week	N/A

	circumferential measurement (p=0.017) in the intervention group • Day 14: Decreased bulge/stroke scale score (p=0.018) and decreased circumferential measurement (p=0.011) in intervention group • Week 8: Decreased bulge/stroke scale score (p=0.002) and decreased circumferential measurement (p=0.022) in the intervention group • Week 12: Decreased bulge/stroke scale score (p=0.013) and decreased circumferential measurement (p=0.036) in the intervention group	2 (p=0.031), week 8 (p=0.027), week 12 (p=0.033) • Decreased extension deficit in intervention group at week 2 (p=0.039), Week 8 (p=0.039), Week 12 (p=0.036) • Decreased thigh atrophy in the intervention group at week 2 (p=0.041), week 8 (p=0.032) • Increased IKDC score in the intervention group at week 12 (p=0.036)	
Felli, 2019[10]	• Day 7: Decreased patellar circumference in the intervention group (p=0.0015) • Day 15: Decreased patellar circumference in the intervention group (p=0.0019)	• Day 7: Increased ROM in the intervention group (p=0.0031) • Day 7: Increased quadriceps strength in the intervention group (p=0.015) • Day 7: Decreased pain (VAS) in the intervention group (p=0.011) • Day 15: Increased quadriceps strength in the	• Day 1: Strong correlation between patellar circumference and CY value, which is a measure of hemarthrosis (R=0.81, P<0.05) • Week 1: Strong correlation between patellar circumference and CY value, which is a measure of hemarthrosis (R=0.73, P<0.05) • Week 2: Strong correlation between patellar circumference and CY value, which is a measure of hemarthrosis (R=0.66, P<0.05)

		intervention group (p=0.0089) • Day 15: Decreased pain (VAS) in the intervention group (p=0.032)	•
Hughes, 2019[11]	• Week 0-4: Decreased circumference in the intervention group (p<0.05) • Week 0-8: Decreased circumference in the intervention group (p<0.01)	• Week 0-8: Increased IKDC score in the intervention group (p<0.01) • Week 0-8: Increased LEFS score in the intervention group (p<0.01) • Week 0-8: Increased KOOS (pain, symptoms, ADL, QOL) score in the intervention group (p<0.05) • Week 0-8: Increased Lysholm score in the intervention group (p<0.05) • Week 0-8: Increased SEBT score (anterior, posteromedial, posterolateral) in the intervention group (p<0.05) • Week 0-8: Increased knee flexion in the intervention group (p<0.01)	N/A

		• Week 0-8: Increased ROM difference in the intervention group ($p<0.01$)	
Jarit, 2003[12]	• Significantly decreased knee circumference in the intervention group at all time points after day 0 (day 1, day 2, day 3, and week 1 through week 8)	• Significantly decreased pain in the intervention group at all time points after day 0 (day 1, day 2, day 3, and week 1 through week 9) • Significantly decreased pain medication used in the intervention group at days 1-2 and days 6-10.	N/A
Lentz, 2012[23]	• Year 1: Significantly decreased knee effusion as measured by stroke test in return to sport group vs non-return to sport group	• Year 1: Improved Tegner change score in return to sport group ($p<0.01$) • Year 1: Increased knee extensor torque in return to sport group ($p=0.05$) • Year 1: Decreased average pain intensity in return to sport group ($p=0.005$) • Year 1: Increased IKDC score in return to sport group ($p<0.001$) • Year 1: Decreased Tampa Scale for Kinesiophobia score in return to sport group ($p<0.001$)	• Knee joint effusion was a strong contributor to the discriminant function analysis (DFA) for return to sport vs non-return to sport at 1- year post ACLR, 0.519

		• Year 1: decreased knee instability in return to sport group (p=0.004) • Year 1: Increased return to sport rate (p=0.005)	
Lindstrom, 2015[13]	N/A	N/A	• Month 3: Female patients with excessive joint effusion had significantly lower subjective one-year KOOS Sport and Recreation Activity subscale scores (p = 0.003) compared to male patients
Madadi, 2009[14]	• 1 year: Reduction of the effusion was better in the case group (double fixation) compared to the control group (single fixation) (p=0.01)	• Case group (double fixation) demonstrated significantly less anterior translation of the tibia as measured by KT-2000 measurement compared to the control group (single fixation) (p=0.016) • Control group demonstrated significantly better pivot-shift results compared to the case group (p=0.02) • No significant differences found between groups regarding knee extension or flexion lag	• "Reduction of the effusion was better in the case group (double fixation). It seems that more stability and less anterior translation in the tibia are the main causes of the lower effusion."
Mayr, 2010[15]	• Day 5: Significantly decreased knee effusion as measured by bulge sign (p=	• Week 6: Increased IKDC in soft brace group (p=0.020)	N/A

	0.002) and circumferential measurement (p=0.009) in the soft brace group • Day 12: Significantly decreased knee effusion as measured by bulge sign (p<0.001) and circumferential measurement (p=0.001)in the soft brace group • Week 6: Significantly decreased knee effusion as measured by bulge sign and circumferential measurement in soft brace group (p<0.001) • Month 6: Significantly decreased knee effusion as measured by circumferential measurement in soft brace group (p=0.001) • Month 12: Significantly decreased knee effusion as measured by circumferential measurement in soft brace group (p=0.005)	• Month 6: Increased IKDC in soft brace group (p=0.029) • Month 12: Increased IKDC in soft brace group (p=0.002)	
Morrissey, 2000[32]	N/A	N/A	• Greater reduction in effusion as assessed by circumferential measurement weakly correlated to decreased knee laxity (r = – 0.159)
Ruffilli, 2015[16]	• Pre-Op to Day 1: Decreased knee circumference increase in the intervention group at	• Day 1: Decreased pain in the intervention group (p<0.0001)	N/A

	the patellar apex (p=0.013) and superior patellar pole (p=0.001)	• Day 1: Increased knee flexion ROM in the intervention group (p<0.0001)	
Sharifzadeh, 2017[29]	• Year 1: Decreased swelling in Aperfix group as measured by the swelling component of the Lysholm knee score (p<0.01)	• Year 1: Decreased locking of the knee in Aperfix group (p=0.041) • Year 1: Improved stair-climbing ability in Aperfix group (p<0.01)	N/A
Straw, 2003[17]	• Week 2: Decreased knee circumference in the intervention group (p<0.002)	• Week 2: Increased knee ROM in the intervention group (p<0.002)	N/A

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