

**Clinical Outcomes Of Extra-articular Tenodesis / Anterolateral
Reconstruction In The ACL Injured Knee**

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3

4 **Abstract**

5 **Purpose:** The role of concomitant extra-articular procedures in improving the outcome
6 of ACL reconstruction has experienced a recent resurgence in interest. The aim of this
7 article is to highlight the differences in philosophies and outcomes of historical non-
8 anatomic reconstructions and contemporary, anatomical anterolateral reconstruction.

9 **Methods:** A narrative review was performed using Pubmed/Medline using the key
10 words “lateral extra-articular tenodesis”, and “anterolateral ligament reconstruction”.

11 **Results:** Results of search strategy:37 studies (13 reporting clinical outcomes of
12 isolated lateral extra-articular tenodesis (LET) in ACL deficient knees and 23
13 comparing isolated anterior cruciate ligament reconstruction (ACLR) with ACLR +LET
14 and one study on anterolateral ligament (ALL) reconstruction were identified as
15 relevant and included in the review. Results of literature review: Isolated extra-articular
16 reconstructions are rarely performed in contemporary practice. They are associated with
17 a high rate of persistent anterior instability and early degenerative change. Combined
18 ACL reconstruction and lateral extra-articular tenodeses result in a significant reduction
19 in the prevalence of residual pivot shift but the majority of studies do not demonstrate
20 any significant difference with respect to patient reported outcome measures and return
21 to sport. Although several authors report a trend towards decreased graft rupture rates,
22 significant differences were not demonstrated in most studies. In a single clinical study,
23 combined anatomic ACL and anterolateral ligament reconstruction was reported to be
24 associated with a three-fold reduction in graft rupture rates and improved return to sport
25 compared to isolated ACL graft choices.

26 **Conclusion:** Historical combined ACL reconstruction and lateral extra-articular
27 tenodeses are associated with improved knee rotational stability. Although a trend
28 towards decreased graft rupture rates is reported by several authors, the majority did not
29 demonstrate a significant difference, likely as a result of small and underpowered
30 studies using postoperative immobilisation and delayed rehabilitation protocols. More
31 recently combined anatomic ACLR and ALL reconstruction has been shown to be
32 associated with significant improvements in graft failure and return to sport rates when
33 compared to isolated ACLR. However, these results are from a single clinical series
34 with only medium term follow up.

35

36 **Level of Evidence: IV**

37 **Key words:** ACL, Anterolateral Ligament, Extra-articular Tenodesis, Graft Rupture,
38 Return To Sport, Persistent Instability

39

40 **Introduction**

41 ACL reconstruction is associated with superior quality of life, sports function and knee
42 symptoms when compared to non-operative treatment. [9] However, high rates of graft
43 rupture (16-18% of young patients participating in pivoting, contact sports) [28], low
44 rates of return to pre-injury levels of sport (55%) [8] and persistent rotatory instability
45 (up to 30% of patients) [23,64], remain important post-operative clinical issues.
46 Although the pathophysiology of these adverse outcomes is multifactorial, the rationale
47 for considering a concomitant lateral extra-articular tenodesis (LET) is based on its
48 ability to provide an increased lever arm for controlling rotation (due to its greater
49 distance from the centre of rotation of the knee) than an isolated intra-articular
50 reconstruction [5,19,65]. This is verified in studies that have demonstrated that the

51 addition of a LET results in an improvement in the kinematics of the knee and a
52 reduction in forces transmitted to an ACL graft. [4,21,40]

53 Since the “rediscovery” of the anterolateral ligament of the knee by Claes et al. in 2013
54 [14], there has been considerable interest in the role of LET. However, this is not a new
55 concept and it was perhaps Strickler in 1937 [56] who first described such a procedure
56 but it was not until the 1970’s and 80s that LET reached the height of its popularity with
57 the MacIntosh [27] and Lemaire [31] techniques. These non-anatomical procedures
58 were subsequently largely abandoned after a consensus at the American Orthopaedic
59 Society for Sports Medicine (AOSSM) meeting in 1989, due to reports of poor results,
60 overconstraint, early degenerative change [41,57] and a failure of prospective controlled
61 studies to demonstrate a clinical advantage [1,6,37]. The recent resurgence in interest in
62 the anterolateral structures of the knee has led to important advances in the
63 understanding of their anatomy and biomechanics and this has allowed the development
64 of anatomic anterolateral ligament reconstruction [53]. Although several authors have
65 evaluated the risk of overconstraint with anatomic ALL reconstruction in cadaveric
66 studies these have had several limitations [52] and in contrast clinical results have been
67 promising with no evidence to support previous concerns regarding poor outcomes
68 [54,55].

69 The aim of this article is to provide a review of the literature relating to LET in order to
70 highlight the differences in philosophies and outcomes of historical reconstructions and
71 contemporary anterolateral reconstruction.

72

73 **Surgical Techniques**

74 A large number of different LET procedures are described. It is beyond the scope of this
75 article to describe all of the reported techniques in detail particularly when many are not

76 associated with published clinical results. However, a brief synopsis of the most
77 frequently used reconstructions is provided here:

78

79 *MacIntosh procedure.* [27]

80 A strip of iliotibial band (ITB) is dissected from its mid-portion and turned down to its
81 attachment at Gerdy's tubercle. It is then passed deep to the collateral ligament and
82 looped behind the insertion of the intermuscular septum. It is then passed deep to the
83 collateral ligament again, and fixed with the knee held at 90° flexion.

84

85 *Ellison's distal ITT transfer.* [20]

86 A distally detached strip of ITB with a bone flake is passed deep to the LCL and
87 anchored in a bone trough slightly anterior to its original harvest site at the Gerdy
88 tubercle with the knee flexed to 90° and held in external rotation.

89

90 *Lemaire operation.* [31]

91 A strip of ITB is detached proximally and passed deep to the LCL, and then through a
92 femoral tunnel. The graft is then passed deep to the LCL a second time and fixed with
93 sutures to the iliotibial band with the knee flexed to 30° and held in external rotation.

94

95 *Marcacci/Zaffagnini technique.* [34]

96 Semitendinosus and gracilis tendons are harvested proximally, sutured together, and
97 passed through a tibial ACL reconstruction tunnel. The graft exits the tibial tunnel intra-
98 articularly and is passed through the posterior aspect of the femoral notch and over the
99 top of the lateral femoral condyle. The graft is then passed deep to the ITB and over the
100 LCL and is then fixed distal to Gerdy's tubercle with the knee flexed to 90° and held in

101 external rotation

102

103 *Combined Anatomic ACL and ALL reconstruction.*[53]

104 The anatomic ACL/ALL graft is composed of a tripled semitendinosus tendon
105 combined with a single strand gracilis tendon. The additional length of the gracilis
106 forms the ALL graft. This exits the femoral tunnel at the anatomical footprint of the
107 ALL on the lateral femoral cortex. It is routed deep to the ITB, through a tibial tunnel
108 and then back proximally to the femur. The ALL graft is fixed in full extension.

109

110 **Review of studies reporting outcome of isolated LET in ACL deficient knees**

111 LET is most frequently performed in combination with ACLR. However, several
112 authors have reported case series of patients undergoing isolated LET [3, 7, 10, 13,
113 18, 20, 24, 27, 30, 33, 35, 39, 61]. These have all been small retrospective non -
114 controlled studies using predominantly the MacIntosh [3, 18, 27, 61] , Ellison [30,
115 35] or Lemaire [39] procedures and the majority have been published prior to 1995.

116

117 Although the majority of these studies described good outcomes in terms of patient
118 reported outcome measures and the ability of LET to provide rotational control, several
119 key findings were identified that limit the use of isolated LET in current practice. One
120 of the main concerns is that high rates of persistent anterior laxity were reported at
121 medium-term follow up, with 40-100% of patients having positive post-operative
122 Lachman tests in multiple series [18, 24, 30, 39, 61]. In addition, several authors
123 reported early degenerative change in the lateral compartment. This has been attributed
124 to numerous factors including overconstraint by the LET [41, 46, 57], the non-
125 anatomical nature of the reconstructions and also prolonged periods of post-operative

126 cast immobilisation rather than the aggressive early rehabilitation typical of
127 contemporary practice.[15, 17, 37, 43, 44, 47] It is for these reasons that isolated,
128 non anatomic LET procedures are rarely reported in the recent literature.

129

130 **Review of studies comparing isolated ACLR versus combined ACLR and lateral** 131 **extra articular tenodeses**

132 Numerous studies report a comparison of the outcomes of isolated ACLR versus
133 combined ACLR and non-anatomical LET. The vast majority of these are small
134 retrospective series [2, 11, 12, 16, 25, 26, 29, 32, 41, 42, 46, 48-50, 55, 59, 62,
135 63]. However, prospective randomised controlled trials (RCTs) are also reported but
136 contain small numbers only [1, 6, 37, 58, 60]. These have been the subject of several
137 meta-analyses and the key findings are summarised here.

138

139 **Graft rupture rates**

140 Combined procedures are proposed to reduce forces transmitted to the ACL graft and
141 protect it during ligamentisation. There is therefore an expectation that this may result
142 in reduced graft rupture rates. Rezende et al. [45] studied this in a meta-analysis
143 including 8 RCTs (total of 682 patients) and found no difference in graft rupture rates
144 between isolated ACLR and combined LET procedures. However, it should be noted
145 that most of the included studies did not explicitly report graft rupture and overall
146 numbers were therefore insufficient to draw clear conclusions. Table 1 summarises graft
147 rupture rates from comparative series of isolated ACLR versus combined procedures.
148 Several authors demonstrated a trend towards lower rates of re-rupture when
149 concomitant LET was performed [1,2,22,59,60,40]. However, only Noyes and Barber

150 demonstrated a significantly lower rate when ACLR was combined with non-
151 anatomical LET.[40]

152

153 **Persistent laxity**

154 Biomechanical studies have demonstrated that isolated ACL rupture does not result in
155 high grade pivot shift but if the ALL is also transected then grades II and III pivot are
156 demonstrable. [36] Song et al [51] reported a systematic review of studies evaluating
157 persistent rotatory instability in patients who underwent combined ACLR and LET for
158 high grade pivot shift. The authors evaluated 7 studies, including a total of 326 patients.
159 The three types of LET used were anterolateral ligament (ALL) reconstruction,
160 Marcacci and MacIntosh procedures. The authors reported that among the comparative
161 studies included, the prevalence of residual pivot shift was significantly lower in
162 patients treated with LET plus ACLR (13.3%) than those with ACLR only (27.2%).
163 However, Song et al also highlighted that three previous randomised trials had not
164 shown combined procedures to be superior [1, 6, 25] and attributed this to inclusion of
165 patients with lower pre-operative grades of pivot shift where isolated ACLR was likely
166 sufficient to provide rotatory control.

167

168 These findings are consistent with the results of the meta-analysis from Rezende et al,
169 who demonstrated that the proportion of patients with normal or nearly normal pivot
170 shift and Lachman tests was greater in the group treated with combined reconstructions.
171 However, they also reported that the proportion of patients with a side-to-side difference
172 greater than 3 mm (KT-1000 and KT-2000 arthrometer measurements) did not differ
173 with the numbers available between groups and concluded that combined procedures
174 afford only small improvements in knee stability. It is perhaps the stricter inclusion

175 criteria of the review by Song et al. (including high grade pivot only) that allowed them
176 to draw stronger conclusions regarding the benefit of combined procedures in
177 improving knee stability. However, Rezende et al [45] also highlighted that the pivot
178 shift test is a subjective assessment and that confounding factors such as differences in
179 methodology result in low reliability and a need for cautious interpretation of the results
180 of such studies.

181

182 **Patient reported outcome measures and return to sport**

183 In the same meta-analysis Rezende et al [45] also evaluated patient reported outcome
184 measures. They identified that IKDC subjective scores did not differ between patients
185 who underwent isolated ACLR compared with patients who underwent a combined
186 procedure. Furthermore, treatment groups did not differ regarding Tegner Lysholm
187 activity scores or the proportion of patients able to return to their previous activity
188 levels.

189

190 In contrast, Zaffagnini et al. [63] reported that a substantially greater proportion of
191 patients who underwent LET plus ACLR achieved normal or nearly normal functional
192 scores when compared with those who underwent isolated intra-articular ACLR using
193 hamstring autograft.

194

195 One of the reasons for the difference in findings between studies is the considerable
196 heterogeneity between them. However, it seems reasonable to conclude that patient
197 reported outcome measures in those undergoing combined procedures do not appear to
198 be dissimilar to those undergoing isolated procedures.

199

200 **Rehabilitation protocols**

201 As noted with isolated LET procedures the use of plaster cast immobilisation or bracing
202 has been popular in the historical literature and is much less common in contemporary
203 practice. Of the studies reporting combined procedures considered for this review, over
204 half reported the use of bracing or immobilisation. Many of these studies were
205 published prior to the popularisation of modern early aggressive rehabilitation. Some of
206 the concerns with delayed rehabilitation relate to a predisposition to both early
207 degenerative change and stiffness [22].

208

209 **Complications**

210 No significant difference in the rate of complications (including infection, knee
211 stiffness, and recurrent meniscal injury) between isolated ACLR and combined
212 procedure groups has been demonstrated in meta-analysis.[45] However, the meta-
213 analysis was limited by the low number of studies reporting complications. Similarly, a
214 large proportion of the studies considered for this review did not explicitly report
215 complications. Table 2 presents a summary of complications from included studies that
216 reported adverse outcomes.

217

218 **Secondary degenerative change**

219 Concerns exist regarding the risk of secondary osteoarthritis (OA) due to potential
220 overtightening of the lateral compartment with extra-articular reconstruction. However,
221 Ferretti et al recently demonstrated that patients undergoing extra-articular
222 reconstruction did not have an increased risk of OA at a minimum follow-up of 10 years
223 [22]. The number of patients included in Kellgren-Lawrence grades II, III, and IV in the
224 control group (25/49; 51%) was statistically higher than in the extra-articular

225 reconstruction group (6/42; 14%). These findings are in agreement with other authors
226 [34], who also did not find an increased risk of OA with extra-articular tenodesis.
227 Ferretti et al suggested that the previous concept of lateral overtightening causing
228 degenerative changes in the lateral compartment is unlikely to be correct. They
229 postulated that the previously reported increased incidence of OA may have been a
230 result of the cautious postoperative protocol, which included immobilization in a plaster
231 cast for up to 2 months postoperatively. [22] Additional potential causative factors
232 include a combination of imperfectly anatomic ACL reconstruction, and a non-anatomic
233 extra-articular lateral tenodesis, fixed in flexion and often with the tibia in external
234 rotation.

235

236 **Case Series Reporting Results of combined anatomic ACL and ALL** 237 **reconstruction**

238 Although there has been considerable recent interest in ALL reconstruction the vast
239 majority of published studies relating to this topic are laboratory based. However, in
240 2015, Sonnery-Cottet et al [55] published the first prospective clinical series (n=83) of
241 combined ACLR and ALL reconstruction with a mean follow-up of 32.4 months (range
242 24–39 months). Pre-operatively, patients were reported to exhibit the following grades
243 of pivot shift (Grade 1, n=47; Grade 2, n=23; Grade 3, n=19). Post-operatively 76
244 patients had a negative pivot-shift and rest had grade 1 pivot-shift only. This is an
245 important finding because previous authors have reported that regardless of the type of
246 ACL graft used, most clinical series report a rate of residual pivot-shift of up to 15%
247 [31, 46]. The authors reported no complications related to the surgical technique and
248 only one patient had an ACL graft rupture that occurred one year after the index
249 procedure, whereas six patients had a contralateral ACL rupture. Given the results of

250 combined ACL and ALL reconstruction compared to traditional ACL reconstruction in
251 regards to re-rupture rate, return to play and rotational stability, it was concluded that
252 the ALL has an important function concomitant to the ACL.
253 More recently, a large study has provided the first clinical comparison between isolated
254 ACLR and combined anatomic ACL/ALL reconstruction in a high risk population of
255 young patients engaged in pivoting contact sports. Sonnery-Cottet et al reported the
256 outcomes of 105 B-PT-B, 176 4HT and 221 HT+ALL reconstructions [54]. The mean
257 age for the study cohort was 22.4 ± 4.0 years (range 16-30), 72.5% (n=364) were male.
258 The mean duration of follow-up was 38.4 ± 8.5 months (range 24-54). 39 professional
259 athletes participated in this series: 6 in the HT group, 13 in the B-PT-B group and 20 in
260 the HT + ALL group. The key findings of this study in relation to graft rupture, clinical
261 outcomes and return to sport are reported below. It should also be noted that the
262 limitations of this study included that it was a single surgeon, non-randomised,
263 retrospective study.

264

265 **Graft rupture rate**

266 In contrast to previous meta-analyses comparing the outcomes of isolated ACLR and
267 LET, Sonnery-Cottet et al. [54] demonstrated that combined anatomic ALL
268 reconstruction was associated with significantly decreased graft rupture rates in a high
269 risk population. At a mean follow up of 38.4 months, the graft rupture rates were as
270 follows: isolated quadrupled hamstring tendon ACLR (4HT): 10.77% (6.60 to 17.32),
271 isolated bone - patella tendon – bone ACLR (B-PT-B): 16.77% (9.99 to 27.40) and
272 combined ACLR + ALL reconstruction (HT+ALL): 4.13% (2.17 to 7.80). When the
273 differences in the demographics of the population relating to age and gender, and pre-
274 operative side to side laxity differences were accounted for in multivariate analysis, the

275 rate of graft failure in HT+ALL was 3.1 times less than the 4HT group and 2.5 times
276 less than the B-PT-B group. There was no significant difference in the graft failure rate
277 between 4HT and B-PT-B groups.

278

279 **Clinical Outcomes**

280 In keeping with previous reports of combined procedures there was no difference
281 between groups with respect to the mean pre-operative subjective IKDC score or side-
282 to-side laxity. The mean post-operative subjective IKDC score was 84.4 +/- 11.6 and
283 there was no difference between groups with respect to delta subjective IKDC. The
284 mean post-operative side-to-side laxity difference was 0.5 +/-0.9mm and again, there
285 was no significant difference between groups in terms of delta Rolimeter. The mean
286 Lysholm score at the last follow-up was 91.8 ± 9.6 (63;100) and the mean Tegner score
287 was 7.0 ± 2.0 (1;9), with no significant difference between the groups. Complications
288 were rare and are reported in Table 2 along with data from other included studies.

289

290 **Return to sport**

291 Overall, 93% of patients returned to sport at the latest follow-up. Return to self-
292 described pre-injury level of sport (RPLS) was 64.6% (272/421). In the professional
293 athlete population (n=39), five patients incurred a graft rupture (3 B-PT-B, 1 HT, 1
294 HT+ALL) and six incurred a contralateral ACL injury and were excluded from RPLS
295 analyses. Of the remaining 28 professional athletes, all returned to their pre-injury level
296 of sport. Combined ACL and ALL reconstruction was associated with higher odds of
297 RPLS than 4HT but not compared to B-PT-B.

298

299

300 **Conclusions**

301 Historical combined ACL reconstruction and lateral extra-articular tenodeses are
302 associated with improved knee rotational stability. Although a trend towards decreased
303 graft rupture rates is reported by several authors, the majority did not demonstrate a
304 significant difference, likely as a result of small and underpowered studies using
305 postoperative immobilisation and delayed rehabilitation protocols. More recently
306 combined anatomic ACLR and ALL reconstruction has been shown to be associated
307 with significant improvements in graft failure and return to sport rates when compared
308 to isolated ACLR. However, these results are from a single clinical series with only
309 medium term follow up.

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320 **References**

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528 Table 1. Summary of graft rupture rates reported in comparative series of isolated ACLR and combined procedures. Only data from studies that
 529 explicitly reported these outcomes are included. BTB – Bone Patella Tendon Bone, TFL – Tensor Fascia Lata, ITB – Iliotibial Band, BF – Biceps
 530 Femoris, HT – Hamstring Tendon, ALL – Anterolateral Ligament.

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Author	Method (Follow up - months)	Number of patients in each study and group	Graft rupture rates at latest follow up: Isolated ACLR / ACLR and combined LET
1. Acquitter	Randomized study Min 30, mean 58	100 (50 BTB ; 50 BTB + LET with Quadriceps tendon graft)	12% ACLR / 4 % ACLR Combined LET
6. Anderson	Prospective randomised Min 24, Mean 34.4	105 (35 BTB; 35 Hamstring; 35 Hamstring + TFL)	2% BTB / 2 % Hamstring / 0% Hamstring + LET
22. Ferretti	Retrospective Min 10 years, Mean 25 years	140 (72 Quadrupled HT; 68 ACLR + LET with ITB)	1.4 % ACLR / 0% ACLR + LET
40. Noyes	Retrospective Min 23; Mean 35	100 (60 BTB; 40 BTB +LET with ITB)	16% ACLR / 3% ACLR combined LET p<0.05
46. Roth	Retrospective Min 24, Mean 38	93 (50 ACLR; 43 ACLR + BF advancement)	4% ACLR / 9% ACLR combined LET
54. Sonnery- Cottet	Prospective cohort , Min 24, Mean 38.4	502 (105 BTB; 176 Hamstring; 221 HT + ALL)	16.7 % BTB / 10,7 % 4HT / 4HT + ALL p<0.05
58. Trichine	Prospective randomised Min 6 , Mean 24.5	107 (52 BTB; 55 BTB + LET with ITB)	0% ACLR / 0% ACLR Combined LET
59. Trojani	Retrospective multicentre Series of ACL revision Min 24, Mean 44	189 revision ACLR (105 ACLR; 84 ACLR + LET with various grafts used for revision)	15% ACLR/ 7% ACLR Combined LET
60. Vadala	Prospective randomised Min 36, Mean 44.6	60 (32 Quadrupled HT; 28 Quadrupled HT + LET with ITB)	6.2 % ACLR / 0% ACLR Combined

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Study	Graft type	Mean follow up (Months)	n	Range of motion/ Stiffness (% of patients)	Persistent pain (% of patients)	Persistent instability (% of patients)	Other complications
Acquitter ¹	BTB	60	50	Ext. deficit 4% Flex. deficit 0%	42%	12%	NR
	BTB + QT		50	Ext. Deficit 4% Flex. deficit 0%	54%	6%	NR
Anderson ⁶	BTB	35.4	35	Ext. deficit 8.6% Flex. Deficit 2.8%	NR	NR (20% PS)	1 (2.9%) staple and plica removal
	Hamstring + ITB		35	Ext. deficit 20% Flex. Deficit 23%	NR	NR (20% PS)	2 (5.7%) mobilisation for flexion deficit, 3 staples removal
	Hamstring		35	Ext. deficit 2.8% Flex. Deficit 5.7%	NR	NR (23%PS)	4 (11.4%) staples removal
Dejour ¹⁶	Double bundle Hamstring	24	25	NR	24%	NR	44% patients with Hypoaesthesia
	BTB		25	NR	36%	NR	68% patients with Hypoaesthesia
	BTB+ Modified Lemaire with Gracilis		25	NR	36%	NR	76% patients with Hypoaesthesia
Giraud ²⁵	BTB	84	34	No difference between the two groups for flexion recovery (139° / 140°)	NR	NR	NR
	BTB + QT (MacIntosh)		29		NR	NR	NR
Lerat ³²	BTB	48	50	No difference between the two groups for flexion recovery and extension recovery	0%	NR	1 (2%) Arthrolysis
	BTB + QT (MacIntosh)		60		5%	NR	3 (5%) Arthrolysis
O'Brien ⁴¹	BTB	48	31	NR	NR	NR	Swelling in LET group (friction of ITB graft on lateral collateral ligament)
	BTB+ ITB		48	NR	42% pain on LET	NR	
Sgaglione ⁵⁰	ST Graft	38.5	21	NR	NR	NR	2 staple removals and debridement at lateral femoral condyle in ST graft + ITB group
	ST Graft + ITB		51	NR	15.7% pain on LET	NR	

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Study	Graft type	Mean follow up (Months)	n	Range of motion/ Stiffness (% of patients)	Persistent pain (% of patients)	Persistent instability (% of patients)	Other complications
Sonnerly-Cottet ⁵⁴	BTB	38.4	105	NR	NR	No persistent instability reported. No differences in side to side laxity	1 (0.9%) tibial screw removal. 1(0.9%) Septic arthritis+ 11(10.4%) arthrolysis (Cyclops)
	Quadrupled Hamstring		176	NR	NR		1 (0.5%) tibial screw removal + 1 (0.5%) mobilisation (stiffness)+ 5 (2.8%) arthrolysis (Cyclops)
	Tripled ST + ALL reconstruction with Gracilis		221	NR	NR		1(0.4%) tibial screw removal +1 (0.4%) mobilisation for Stiffness)+ 1 (0.4%) lavage for haemarthrosis + 6 (2.7%) arthrolysis (Cyclops)
Vadala ⁶⁰	Quadrupled Hamstring	44.6	28	Full ROM in both group at final evaluation	No differences between groups	No persistent instability reported. (PS better result in LET group)	NR
	Quadrupled Hamstring + ITB		27				NR

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Table 2. Summary of complications reported in comparative studies of isolated ACL reconstruction versus combined procedures. Only data from studies that explicitly reported complications are included. BTB – Bone Patella Tendon Bone, QT – Quadriceps Tendon, ITB – Iliotibial Band, ST – Semitendinosus, ALL – Anterolateral Ligament, PS – Pivot shift, NR – Not reported.