Title:

The clinical relevance of PCL-Index on the reconstruction of anterior cruciate ligament with hamstring tendon autograft

Authors:

Pombo, Bruno[1]; Ferreira, Ana Cristina[2]; Marques, Pedro[3]
1 – Orthopaedics Department, Unidade Local de Saúde do Alto Minho – Portugal
2 – Mathematics Department – Minho University – Portugal
3 – Orthopaedics Department, Hospital Garcia de Horta – Portugal

Corresponding author:

Bruno Pombo Ferreira da Silva
Email: bruno.pombo@icloud.com
Mobile Phone: +351 967565149
ORCID: 0000-0002-6337-2368

Abstract:

The posterior cruciate ligament index (PCL index) has been reported as a diagnostic and prognostic marker for anterior cruciate ligament (ACL) reconstruction. The clinical relevance of PCL-Index on the reconstruction of ACL with hamstring tendon autograft has not described in the literature. The objective of this study is to evaluate the importance of the PCL index as a marker of anatomic reconstruction and of functional improvement of patients undergoing ACL reconstruction with HT autograft.
Twenty-four patients were submitted to ACL reconstruction with HT autograft. The PCL index was assessed by magnetic resonance imaging before and after surgery. The functional evaluation was performed through the International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form© and Knee Society Knee Scoring System© (IKS).
Patients presented a significant positive variation of the PCL index, IKDC and IKS scores. There is no significant correlation between PCL index variation and IKDC and IKS scores ($p>0.05$).
Unlike other studies reporting a relationship between the PCL index, control of rotational kinematics, and functional improvement in patients undergoing ACL reconstruction with bone-patellar tendon-bone autograft, this study does not demonstrate this association.
There is evidence in this study to show that the PCL index may be used as an anatomic reconstructive marker of ACL but not to predict the clinical outcome in this type of reconstruction.

Keywords:

Posterior Cruciate Ligament Index, Anterior Cruciate Ligament Reconstruction; Hamstring Tendon; Autograft

Funding:

This study was not funded

Conflict of Interest:

Bruno Pombo, Ana Cristina Ferreira and Pedro Marques declare that they have no conflict of interest

Introduction:

Trauma of the knee is frequent and can affect about 1080 / 100.000 people[1]. The rupture of the anterior cruciate ligament (ACL) has a variable incidence and can affect 8 to 80 / 100.000 people[2-4]. This pathology is frequent in young athletic males and occurs by external rotation mechanism or valgus stress.
The diagnosis is presumed by the clinical history but often becomes unnoticed if the rupture is partial[5]. Knee pain, increased joint volume, popping sensation, giving way, positive Lachman sign, pivot shift test and arthrometry make the diagnosis[6-9]. MRI of the knees allows confirmation of suspicion[10]. Arthroscopy is the gold standard diagnostic method.
ACL is a fibrous bundle composed of dense connective tissue[11] and is based on two bundles, one anteromedial and one posterolateral[11-13]. This ligament has as main function to be a restrictor of the anterior translation of the tibia and as a secondary function to give stability on the external or internal rotation, valgus or varus stress[14,15]. This stability is altered by the ACL rupture, allowing an anterior tibial translation and external rotation, conditioning an increase in the anterior curvature of the posterior cruciate ligament (PCL)[16-18]. This curvature of the PCL has a sigmoid shape. The PCL index is the ratio between the shorter distance between the tibial and femoral insertion of the PCL and the distance measured in a perpendicular line to the first one at the point of greater curvature of the PCL. This index was proposed as a preoperative diagnostic method[19-21] or as a postoperative clinical[22] and imaging evaluation[23]. Zampeli et al[22] correlated the PCL index with the anatomic reconstruction of the ACL showing that tibiofemoral joint alignment translates into better functional outcome. The objective of this study is to evaluate the clinical importance of the PCL index in patients undergoing reconstruction of the ACL with hamstring tendon (HT) autograft.

Methods:

An observational and retrospective study was performed through clinical reports consultation and clinical interview. A convenience sample was used in which 27 patients with a clinical diagnosis of complete unilateral ACL rupture were identified, with no history of anterior ligament injury, all less than 40 years-old, submitted to ACL reconstruction between 2014 and 2015 in a Portuguese public hospital. Twenty-six patients were used as a control group, from a convenience sample, without ACL rupture who performed MRI on outpatient orthopaedic consultation. Patients with multi-ligament lesions (PCL and collateral ligaments lesions associated), chondral lesions (Outerbridge grade III and IV), meniscal ruptures, pregnant patients with a history of connective tissue disease and patients with previous knee surgery were excluded. All patients signed the informed consent form following the rules of the hospital ethics committee.
A paired sample was used with all patients with unilateral ACL rupture being submitted to magnetic resonance imaging of the knee (Siemens® Magnetom Tesla 1.5). The symptoms, function and participation in sports activities were evaluated through the International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form©. The joint function and functional capacity was tested through the Knee Society Knee Scoring System©. Evaluation of IKDC Score (0-100%) and IKS Score (0-200%) was performed before and after surgical reconstruction (2 years). The validated Portuguese IKDC and IKS questionnaire version was used[24,25]. The IKDC questionnaire was answered independently by the patient. The IKS questionnaire was completed by an orthopaedic surgeon. The PCL index was defined in the sagittal plane of MRI by the Liu method[20] (ratio between the distance from the most anterior femoral insertion to posterior tibial insertion and the radius at the point of greatest curvature). All data were collected and recorded by an orthopaedic surgeon.
The sample was organized into three groups: Group 1 - Patients with ACL rupture; Group 2 - Patients with unilateral ACL rupture submitted to ACL reconstruction; Group 3 - Patients without ACL rupture.
The median PCL index was compared between groups 1 and 3 to compare the sample with the control group and between groups 2 and 3 to assess the degree of effectiveness in ligament reconstruction.
A non-normal distribution of the sample was assumed on account of the low number of patients. The statistical data treatment was performed with SPSS v22 software, using non-parametric tests (Chi-Square

Test, Fisher's Exact Test, Mann-Whitney U Test, Wilcoxon Signed Rank Test and Spearman´s Rank Order Correlation). An error margin of 0.05 was considered.

Surgical procedure:
The patients were submitted to balanced general anaesthesia or neuro-axis block. They were operated by the arthroscopic route by a proficient operating team. The homolateral HT was harvested. The reconstruction was performed through the transtibial tunnel technique. The fixation of the autograft was done on tibial tunnel with bioabsorbable interference screw and at the femoral level the placement of Endobutton® fixation device (Smith and Nephew®). Hospitalization was performed according to hospital protocol. An early range of motion was encouraged.

Results:

Twenty-seven patients were identified, and three patients were excluded because they had performed an initial imaging study in a private health institution. The sample (24 patients) is composed of 23 male patients (88.5%) and one (11.5%) female patient. All were active amateur athletes before the ligament injury. The median age in the sample is 26.5 years (IQR 17.3-33.5). The control group (26 patients) is composed of fifteen (57.7%) male patients and eleven (42.3%) female patients. The median age in the control group is 30.5 years (IQR 26.8-37.3 years). The median age of the sample is not significantly different from the median of the control group ($p>0.05$).
Complete ACL injury occurred on the right knee in 13 patients (54.2%) and on the left knee in 11 patients (45.8%). The control group presented, with respect to laterality, an equal distribution of the treated knees ($p <0.05$).
Group 1 presented a median preoperative PCL index of 4.9 (IQR 3.9-6.0). This value is lower than that of the control group [8.8 (IQR 7.8-9.7)] ($p<0.001$). After the surgical procedure (Group 2), the preoperative PCL index increased to 7.4 (IQR 6.5-8.1), approaching the value of the control group ($p<0.001$). However, the difference in medians between group 2 and the control group remains and is statistically significant ($p=0.044$).
The subjective preoperative IKDC assessment presented a score of 47.1% (IQR 40.8-50.3%) and increased after surgical reconstruction to a score of 93.7% (IQR 92.0-96.3 %) ($p<0.001$).
Regarding joint function, the knee score presents a median preoperative partial score of 50% (45.0-55.0%) and in the postoperative period of 95.0% (90.0-95.0%). According to the categorization proposed by Asif and Choon[26], patients were mostly distributed at the weak level (91.7%) before surgery and at the excellent postoperative level (95.8%). The functional capacity increased, likewise, from 50.0% in the preoperative period to 100% in the postoperative period. The IKS global score also showed a preoperative increase of 101.5% (95.0-110.0%) for a postoperative score of 195.0% (190.0-195.0%). The difference was statistically significant ($p<0.001$).
The median PCL score, preoperative and postoperative IKDC and IKS scores were 2.1 (IQR 1.1-2.9), 46.6% (IQR 38.5-51.4%) and 90.0% (IQR 78.5-97.3%), respectively. The correlation between the variation of the PCL index and the variation of the IKDC and IKS score is not significant ($p> 0.05$).

Discussion:

The PCL plays a role as the primary restraint against posterior tibial translation[27]. The ACL is the main static stabilizer against anterior translation of the tibia[28] and has a small contribution to the internal rotation stability[29]. The impairment of ligament tension imposed by ACL injury causes abnormal tibiofemoral incongruity, conditioning tibiofemoral translation and rotation. The PCL index is the result of the anterior translation of the tibia causing a loss of tension and an arching of the PCL. The improvement of this index has as hypothesis that the ligament reconstruction is associated with a fitting of the ligament tension, improvement of the joint congruence and functional improvement. However, the correlation between the PCL index, anatomic reconstruction and functional improvement is unclear in patients submitted to ACL reconstruction with HT allograft. There is no previous study describing the PCL index as anatomic or functional marker in patients submitted to HT allograft reconstruction.
The studies that evaluate the relation between PCL variation and ACL reconstruction were with bone-patellar tendon-bone autograft (BPTB). The restoration of this index resulted in a better control of the rotational kinematics [22] but not the anterior translational kinematics. The rotational kinematics was correlated with functional improvement [30]. Some authors have reported the importance of the

hamstrings muscles in knee rotational stability[31-33]. Thus, Zampelli et al [22,30] using BPTB did not lesion the hamstrings tendon not causing residual rotational instability. Then, the association between the control of rotational kinematics and better functional scores emphasizes that the rotational component is the most relevant in the biomechanics of the knee undergoing ACL reconstruction[34] and goes in favour of the fact that hamstrings tendon provides rotational stability.

The importance of this study is to evaluate the direct relationship between the PCL index, its variation and postoperative joint function in patients undergoing ACL reconstruction with HT autograft. In spite of the sample being small (24 patients) and the need to use a less robust non-parametric tests (Mann-Whitney U test) we achieved a significant difference ($p<0.05$) for the PCL index before and after surgical procedure. However, even though the PCL index increased to a higher value after the surgical procedure (7.4), it was inferior to that of the sample group (8.8). We hypothesize that the graft position variability on each knee – lower point of fixation in the femoral condyle edge – could cause high tension in extension[35] which is the patient position on MR evaluation. This could shorten the distance between the tibial and femoral insertion of the PCL reducing the PCL index in the sample after the procedure.

Despite IKDC and IKS scores (global and partial) also having a significant improvement, with nearly all patients reaching the maximum punctuation for IKDC, IKS partial and total, there is no direct correlation between PCL index variation and functional score variation. A non-parametric correlation test (Spearman´s Rank Order Correlation) was used because the small sample of this series. As IKDC and IKS questionnaires are based on translational activities, their test–retest reliability is slightly below adequate[36] and their discrimination is reduced - nearly all patients reached the maximum scores - the reliability of these tests on the functional evaluation could be impaired. Possibly the hamstring native tendons contribute to justify this absence of correlation because they have an antagonizing function causing tension medially in the PCL [37,29]. Different studies suggest a regeneration of hamstrings within two years from surgery[38,39], but the functional impact of hamstring regeneration is not described. We hypothesize that injury to the hamstrings, which impairs rotational support to the knee, conditions a predominance in residual rotational instability, biasing the relationship between the PCL index and functional improvement. In favour of this hypothesis, Heije[31] describes a significant difference in the torque of the hamstrings, at 2 years postoperatively, in support of patients undergoing BPTB reconstruction rather than HT reconstruction. Other reports have shown that BPTB reconstruction is able to restore knee stability more closely[32,33] and is associated with better rotational stability[30,33] than HT reconstruction.

These data reveal a significant improvement in the PCL index and establishes it as a marker of anatomic reconstruction in HT autograft. This suggests that, in clinical practice, the orthopaedic surgeon can use this index as a marker to evaluate post-operatively if the ACL reconstruction was appropriately done, to predict eventual revision surgery or to manage the rehabilitation programme. However, the correlation between the PCL index and functional scores was not achieved most likely due to the reduced discrimination of functional scores and rotational instability created by the hamstrings lesion after the harvesting.

Limitations:

The number of patients treated is small, decreasing the strength of the conclusions. The results of ACL reconstruction did not differ between male and female in other studies [40], the sample and control groups differ in the predominance of male patients in the sample ($p<0.001$), not providing external validity for a homogeneous population. The allograft position on the femoral condyle and autograph strain should have been evaluated to control the bias over the conclusions. However, the internal validity of this study is guaranteed by a correct statistical analysis with significant differences.

Future directions:

We intend to test the relation between the PCL index, rotational/translational kinematics and functional outcomes to provide further validity to these results. The functional impact of hamstring regeneration and the relative importance of these tendons in rotational or translational control is to be investigated to validate these hypotheses. Criteria are to be created to reproduce intra-operatively the normal PCL index to achieve a better anatomic reconstruction.

Conclusion:

In contrast to other studies which evaluate patients undergoing ACL reconstruction with BPTB autograft, the use of the PCL index has been shown to be a poor predictor of clinical improvement in patients undergoing HT autograft reconstruction. This study provides evidence supporting the use of the PCL index as an anatomic reconstructive marker, but suggests that the effective restoration of tibiofemoral alignment after ACL reconstruction - reflected in the PCL index - does not translate into better functional outcomes as measured by IKDC and IKS. All in all, the PCL index is a effective anatomic reconstructive marker in the postoperative period of ACL reconstruction with HT autograft.

Bibliography:

1. Kannus P, Jarvinen M (1989) Incidence of knee injuries and the need for further care. A one-year prospective follow-up study. The Journal of sports medicine and physical fitness 29 (4):321-325
2. Nordenvall R, Bahmanyar S, Adami J, Stenros C, Wredmark T, Fellander-Tsai L (2012) A population-based nationwide study of cruciate ligament injury in Sweden, 2001-2009: incidence, treatment, and sex differences. The American journal of sports medicine 40 (8):1808-1813. doi:10.1177/0363546512449306
3. Kuikka PI, Pihlajamaki HK, Mattila VM (2013) Knee injuries related to sports in young adult males during military service - incidence and risk factors. Scandinavian journal of medicine & science in sports 23 (3):281-287. doi:10.1111/j.1600-0838.2011.01397.x
4. Peat G, Bergknut C, Frobell R, Joud A, Englund M (2014) Population-wide incidence estimates for soft tissue knee injuries presenting to healthcare in southern Sweden: data from the Skane Healthcare Register. Arthritis research & therapy 16 (4):R162. doi:10.1186/ar4678
5. Geraets SE, Meuffels DE, van Meer BL, Breedveldt Boer HP, Bierma-Zeinstra SM, Reijman M (2015) Diagnostic value of medical history and physical examination of anterior cruciate ligament injury: comparison between primary care physician and orthopaedic surgeon. Knee surgery, sports traumatology, arthroscopy : official journal of the ESSKA 23 (4):968-974
6. Leblanc MC, Kowalczuk M, Andruszkiewicz N, Simunovic N, Farrokhyar F, Turnbull TL, Debski RE, Ayeni OR (2015) Diagnostic accuracy of physical examination for anterior knee instability: a systematic review. Knee surgery, sports traumatology, arthroscopy : official journal of the ESSKA. doi:10.1007/s00167-015-3563-2
7. van Eck CF, Loopik M, van den Bekerom MP, Fu FH, Kerkhoffs GM (2013) Methods to diagnose acute anterior cruciate ligament rupture: a meta-analysis of instrumented knee laxity tests. Knee surgery, sports traumatology, arthroscopy : official journal of the ESSKA 21 (9):1989-1997. doi:10.1007/s00167-012-2246-5
8. Ostrowski JA (2006) Accuracy of 3 diagnostic tests for anterior cruciate ligament tears. Journal of athletic training 41 (1):120-121
9. Benjaminse A, Gokeler A, van der Schans CP (2006) Clinical diagnosis of an anterior cruciate ligament rupture: a meta-analysis. The Journal of orthopaedic and sports physical therapy 36 (5):267-288. doi:10.2519/jospt.2006.2011
10. Navali AM, Bazavar M, Mohseni MA, Safari B, Tabrizi A (2013) Arthroscopic evaluation of the accuracy of clinical examination versus MRI in diagnosing meniscus tears and cruciate ligament ruptures. Archives of Iranian medicine 16 (4):229-232. doi:013164/aim.008
11. Duthon VB, Barea C, Abrassart S, Fasel JH, Fritschy D, Menetrey J (2006) Anatomy of the anterior cruciate ligament. Knee surgery, sports traumatology, arthroscopy : official journal of the ESSKA 14 (3):204-213. doi:10.1007/s00167-005-0679-9
12. Bollen S (2006) (i) The crucial ligaments. Current Orthopaedics 20 (2):77-84. doi:http://dx.doi.org/10.1016/j.cuor.2006.02.012
13. Zantop T, Petersen W, Fu FH (2005) Anatomy of the anterior cruciate ligament. Operative Techniques in Orthopaedics 15 (1):20-28. doi:http://dx.doi.org/10.1053/j.oto.2004.11.011
14. Nielsen S, Ovesen J, Rasmussen O (1984) The anterior cruciate ligament of the knee: an experimental study of its importance in rotatory knee instability. Archives of orthopaedic and trauma surgery 103 (3):170-174
15. Marshall JL, Wang JB, Furman W, Girgis FG, Warren R (1975) The anterior drawer sign: what is it? The Journal of sports medicine 3 (4):152-158
16. Mink JH, Levy T, Crues JV, 3rd (1988) Tears of the anterior cruciate ligament and menisci of the knee: MR imaging evaluation. Radiology 167 (3):769-774. doi:10.1148/radiology.167.3.3363138
17. Boeree NR, Ackroyd CE (1992) Magnetic resonance imaging of anterior cruciate ligament rupture. A new diagnostic sign. The Journal of bone and joint surgery British volume 74 (4):614-616

18. Tung GA, Davis LM, Wiggins ME, Fadale PD (1993) Tears of the anterior cruciate ligament: primary and secondary signs at MR imaging. Radiology 188 (3):661-667. doi:10.1148/radiology.188.3.8351329
19. Siwinski D, Ziemianski A (1998) Value of posterior cruciate ligament index in the diagnosis of anterior cruciate ligament injuries. Archives of orthopaedic and trauma surgery 118 (1-2):116-118
20. Liu SH, Osti L, Dorey F, Yao L (1994) Anterior cruciate ligament tear. A new diagnostic index on magnetic resonance imaging. Clinical orthopaedics and related research (302):147-150
21. Ng WH, Griffith JF, Hung EH, Paunipagar B, Law BK, Yung PS (2011) Imaging of the anterior cruciate ligament. World journal of orthopedics 2 (8):75-84. doi:10.5312/wjo.v2.i8.75
22. Zampeli F, Ntoulia A, Giotis D, Stavros R, Mitsionis G, Pappas E, Georgoulis AD (2014) The PCL index is correlated with the control of rotational kinematics that is achieved after anatomic anterior cruciate ligament reconstruction. The American journal of sports medicine 42 (3):665-674. doi:10.1177/0363546513512780
23. Nishimori M, Sumen Y, Sakaridani K, Nakamura M (2007) An evaluation of reconstructed ACL impingement on PCL using MRI. Magnetic resonance imaging 25 (5):722-726. doi:10.1016/j.mri.2006.10.002
24. Higgins LD, Taylor MK, Park D, Ghodadra N, Marchant M, Pietrobon R, Cook C (2007) Reliability and validity of the International Knee Documentation Committee (IKDC) Subjective Knee Form. Joint, bone, spine : revue du rhumatisme 74 (6):594-599. doi:10.1016/j.jbspin.2007.01.036
25. Insall JN, Dorr LD, Scott RD, Scott WN (1989) Rationale of the Knee Society clinical rating system. Clinical orthopaedics and related research (248):13-14
26. Asif S, Choon DS (2005) Midterm results of cemented Press Fit Condylar Sigma total knee arthroplasty system. Journal of orthopaedic surgery (Hong Kong) 13 (3):280-284
27. Bowman KF, Jr., Sekiya JK (2010) Anatomy and biomechanics of the posterior cruciate ligament, medial and lateral sides of the knee. Sports medicine and arthroscopy review 18 (4):222-229. doi:10.1097/JSA.0b013e3181f917e2
28. Markatos K, Kaseta MK, Lallos SN, Korres DS, Efstathopoulos N (2013) The anatomy of the ACL and its importance in ACL reconstruction. European Journal of Orthopaedic Surgery & Traumatology 23 (7):747-752. doi:10.1007/s00590-012-1079-8
29. Domnick C, Raschke MJ, Herbort M (2016) Biomechanics of the anterior cruciate ligament: Physiology, rupture and reconstruction techniques. World journal of orthopedics 7 (2):82-93. doi:10.5312/wjo.v7.i2.82
30. Zampeli F, Pappas E, Giotis D, Hantes ME, Georgoulis AD (2012) Kinematic predictors of subjective outcome after anterior cruciate ligament reconstruction: an in vivo motion analysis study. Knee Surgery, Sports Traumatology, Arthroscopy 20 (4):785-792. doi:10.1007/s00167-012-1902-0
31. Heijne A, Hagstromer M, Werner S (2015) A two- and five-year follow-up of clinical outcome after ACL reconstruction using BPTB or hamstring tendon grafts: a prospective intervention outcome study. Knee surgery, sports traumatology, arthroscopy : official journal of the ESSKA 23 (3):799-807. doi:10.1007/s00167-013-2727-1
32. Freedman KB, D'Amato MJ, Nedeff DD, Kaz A, Bach BR, Jr. (2003) Arthroscopic anterior cruciate ligament reconstruction: a metaanalysis comparing patellar tendon and hamstring tendon autografts. The American journal of sports medicine 31 (1):2-11. doi:10.1177/03635465030310011501
33. Xie X, Liu X, Chen Z, Yu Y, Peng S, Li Q (2015) A meta-analysis of bone-patellar tendon-bone autograft versus four-strand hamstring tendon autograft for anterior cruciate ligament reconstruction. The Knee 22 (2):100-110. doi:10.1016/j.knee.2014.11.014
34. Ferretti A, Monaco E, Vadalà A (2014) Rotatory instability of the knee after ACL tear and reconstruction. Journal of Orthopaedics and Traumatology : Official Journal of the Italian Society of Orthopaedics and Traumatology 15 (2):75-79. doi:10.1007/s10195-013-0254-y
35. Paschos NK, Howell SM (2016) Anterior cruciate ligament reconstruction: principles of treatment. EFORT Open Reviews 1 (11):398-408. doi:10.1302/2058-5241.1.160032
36. Collins NJ, Misra D, Felson DT, Crossley KM, Roos EM (2011) Measures of knee function: International Knee Documentation Committee (IKDC) Subjective Knee Evaluation Form, Knee Injury and Osteoarthritis Outcome Score (KOOS), Knee Injury and Osteoarthritis Outcome Score Physical Function Short Form (KOOS-PS), Knee Outcome Survey Activities of Daily Living Scale (KOS-ADL), Lysholm Knee Scoring Scale, Oxford Knee Score (OKS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Activity Rating Scale (ARS), and Tegner Activity Score (TAS). Arthritis care & research 63 Suppl 11:S208-228. doi:10.1002/acr.20632
37. (!!! INVALID CITATION !!! {Flandry, 2011 #148;Domnick, 2016 #218}).
38. Ferretti A, Conteduca F, Morelli F, Masi V (2002) Regeneration of the semitendinosus tendon after its use in anterior cruciate ligament reconstruction: a histologic study of three cases. The American journal of sports medicine 30 (2):204-207. doi:10.1177/03635465020300021001

39. Kartus J, Movin T, Karlsson J (2001) Donor-site morbidity and anterior knee problems after anterior cruciate ligament reconstruction using autografts. Arthroscopy : the journal of arthroscopic & related surgery : official publication of the Arthroscopy Association of North America and the International Arthroscopy Association 17 (9):971-980. doi:10.1053/jars.2001.28979
40. Ryan J, Magnussen RA, Cox CL, Hurbanek JG, Flanigan DC, Kaeding CC (2014) ACL Reconstruction: Do Outcomes Differ by Sex?A Systematic Review. JBJS 96 (6):507-512. doi:10.2106/jbjs.M.00299

Table 1: Distribution of group 1 (sample) and 3 (control group)

	Group 1	Group 3	p (1-3)
n	24	26	-
Sex			
Male, n	23	15	0.002[γ]
Female, n	1	11	
Side			
Right, n	13	13	0.991[α]
Left, n	11	13	
Age, yrs	26.5 (17.3-33.5)	30.5 (26.8-37.3)	0.759[&]
PCL index*	4.9 (3.9-6.0)	8.8 (7.8-9.7)	<0.001[&]

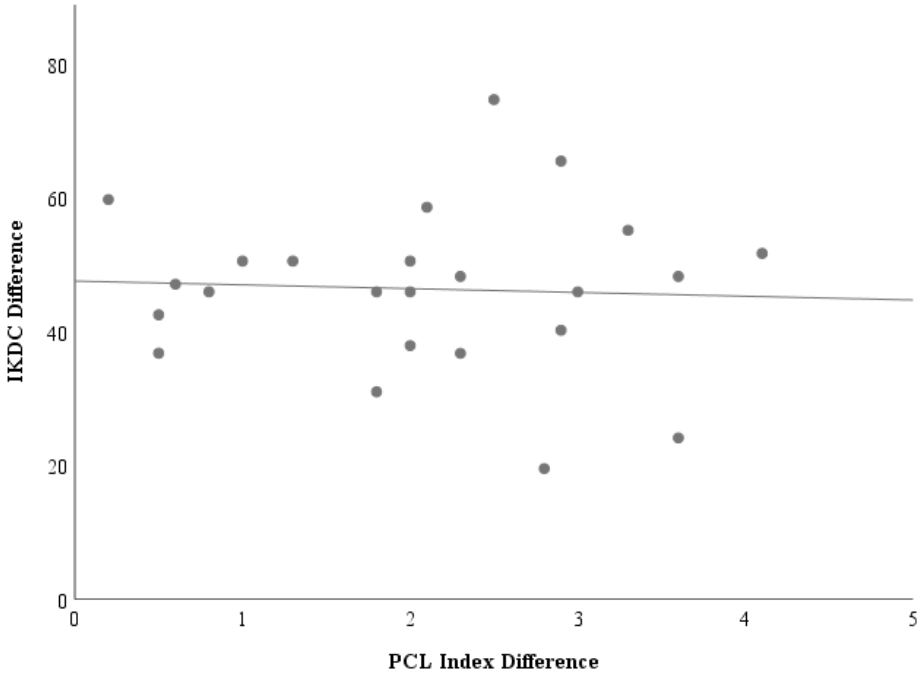
[*] Median (IQR); [γ] Fisher's Exact Test; [α] Chi-Square test; [&] Mann-Whitney U test;

Table 2: Distribution of PCL index, IKDC and IKS

	Group 1	Group 2	p
PCL index*	4.9 (3.9-6.0)	7.4 (6.5-8.1)	<0.001[£]
IKDC, %*	47.1 (40.8-50.3)	93.7 (92.0-96.3)	<0.001[£]
IKS, %*	101.5 (95.0-110.0)	195.0 (190.0-195.0)	<0.001[£]
Knee Score, %*	50.0 (45.0-55.0)	95.0 (90.0-95.0)	<0.001[£]
Excelent, n (%)[α]	0	23 (95.8)	-
Good, n (%)[α]	0	0	-
Fair, n (%)[α]	22 (91.7)	1 (4.2)	
Bad, n (%)[α]	2 (8.3)	0	-
Funcional Capacity, %*	50.0 (50.0-60.0)	100 (100-100)	<0.001[£]

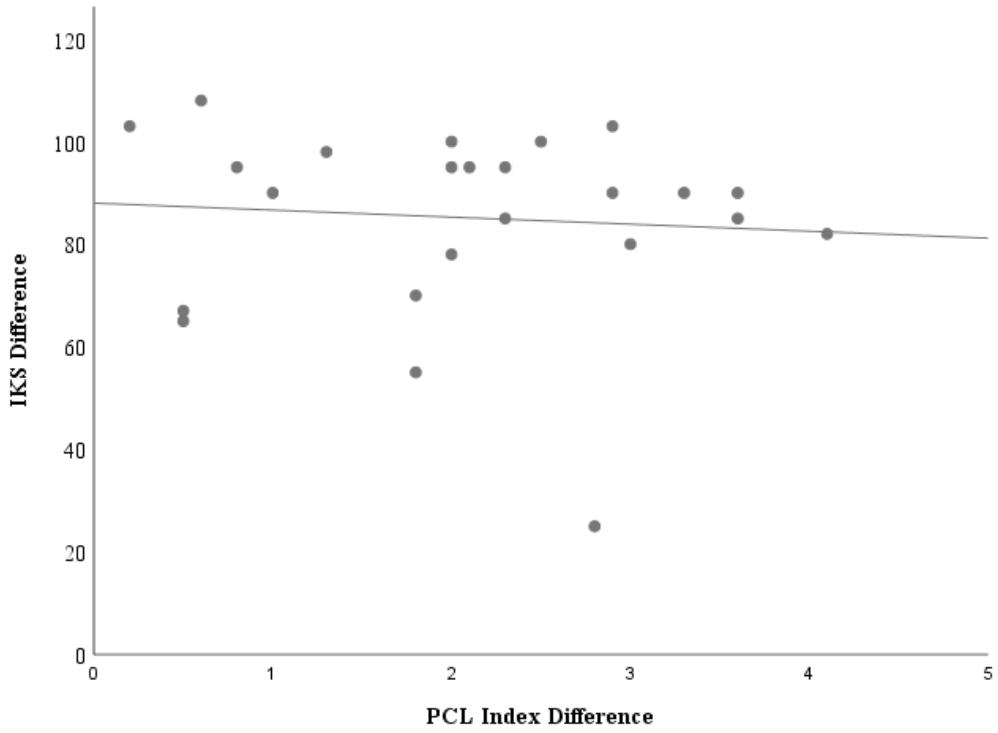
* Median (IQR); [£] Wilcoxon Signed Rank Test

Graph 1: Correlation between the PCL index and IKDC difference (pre-operative versus post-operative)



Spearman´s Rank Order Correlation (Adjusted R^2: 0.003, p:0.650)

Graph 2: Correlation between the PCL index and IKS difference (pre-operative versus post-operative)



Spearman´s Rank Order Correlation (Adjusted R^2: 0.007, p:0.813)