

PHYSICAL ACTIVITY, QUALITY OF LIFE AND SPORT-RELATED CONCERNS IN RELATION TO RADIOGRAPHIC KNEE OSTEOARTHRITIS AND KNEE SYMPTOMS 32-37 YEARS AFTER ANTERIOR CRUCIATE LIGAMENT INJURY

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Purpose

Anterior cruciate ligament (ACL) injury most commonly occurs in young individuals taking part in sport and ACL injury is associated with an increased risk of knee osteoarthritis (OA). Individuals with OA after ACL injury may differ from the general OA population regarding desired participation in sport and high-impact activities. Limitations in desired activities can impact QOL and result in an inactive lifestyle with negative impacts on health and OA symptoms. However, it is unknown if sport restrictions remain a key concern for people with ACL injury more than 30 years after injury. The impact of OA and symptoms on QOL and physical activity levels more than 30 years after ACL injury is also unclear.

This study aims to investigate physical activity, QOL and sport-related concerns 32-37 years after acute ACL injury, in individuals i) with or without radiographic OA (ROA), and ii) with or without knee symptoms.

Methods

From 1980-1985, 251 patients with acute ACL rupture were allocated to early surgical (augmented or non-augmented repair within 25 days of injury) or non-surgical ACL management (4-6 months of rehabilitation) based on an odd or even birth year. All patients underwent diagnostic arthroscopy, including grading of concomitant injuries. Concomitant injuries were treated surgically if deemed appropriate by the surgeon. At 32-37 years follow-up, all patients aged 16-40 years at the time of injury were invited to complete a survey and plain weight-bearing knee radiographs. One radiologist, blinded to ACL treatment status, graded all radiographs. We classified tibiofemoral joint ROA as Kellgren & Lawrence \geq Grade 2. We defined knee symptoms as scoring less than the best possible score on \geq 50% of questions on the Knee injury and Osteoarthritis Outcome Score (KOOS) pain and/or symptoms subscales.

We assessed participation in moderate (>150 minutes per week) and vigorous (>60 minutes per week) physical activity using two questions recommended by the Swedish National Board of Welfare. Health-related QOL was assessed with the EQ-5D utility score (0=death, 1=perfect health) and knee-related QOL was assessed with the ACL-QOL (range, 0=worst to 100=best). ACL-QOL items pertaining to sport and enjoyment of life, and three novel questions pertaining to QOL and the importance of sport were selected a priori for inclusion in the analysis (Table 2). Mann-Whitney U tests or Chi-squared tests were used, as appropriate, for between-group comparisons.

Results

Of the 190 people (81% of 234 eligible people) who completed surveys, 11 (6%) were excluded due to knee arthroplasty surgery and 112 (63%) had knee symptoms (mean age 58.3 ± 6.1 , 66% male, BMI 27.4 ± 3.9 kg/m²). Of the 139 (73%) people with radiographs, 85 (61%) people had ROA (mean age 57.8 ± 5.9 , 68% male, BMI 27.4 ± 4.0 kg/m²). The sample characteristics are presented in Table 1.

A similar proportion of individuals performed >150 minutes of moderate physical activity or >60 minutes of vigorous physical activity per week, irrespective of ROA or knee symptom status (Table 2). People with ROA reported worse QOL than those without (EQ-5D 0.78 ± 0.16 vs. 0.86 ± 0.12 ; ACL-QOL 65 ± 21 vs. 73 ± 21), and more difficulty going full out during sport (49 ± 31 vs. 62 ± 33). Other sport-related concerns were similar between those with and without ROA (Table 2).

People with knee symptoms reported worse QOL (EQ-5D, 0.76 ± 0.15 vs. 0.90 ± 0.18 ; ACL-QOL, 57 ± 19 vs. 87 ± 13); ACL influences life to a high degree (42(38%) vs. 1(1.5%)); enjoyment of life limited by knee problem (65 ± 28 vs. 94 ± 15) and greater sport-related concerns on all items compared to those without knee symptoms (Table 2). This included frustration with having to consider their knee during sport (46 ± 31 vs. 88 ± 20), difficulty going full-out during sport (39 ± 27 vs. 81 ± 26), limitation exercising/maintaining fitness due to knee (54 ± 27 vs. 87 ± 19), concern that competitive needs were not being met (62 ± 30 vs. 91 ± 17) and fear of re-injury (52 ± 30 vs. 84 ± 20) (Table 2).

Irrespective of ROA or knee symptoms, most individuals would not have chosen to give up their sport to prevent ACL injury (ROA 83%; no ROA 85%; symptoms 78%; no symptoms 86%) and most people reported that past participation and accomplishments in sport contributed to current QOL (ROA 66%; no ROA 72%; symptoms 74%; no symptoms 63%).

Conclusions

At 32-37 years following ACL injury, QOL was impaired in people with ROA, and to a greater extent in people with knee symptoms. Physical activity participation was similar irrespective of ROA or symptom status. People with knee symptoms reported substantial sport-related concerns. These findings highlight the need for strategies to address sport-related concerns, improve QOL and reduce the burden of knee OA after ACL injury.

Table 1. Participant characteristics

	Tibiofemoral radiographic OA			Knee symptoms	
	Yes (n=85)	No (n=54)	Knee arthroplasty (n=11)	Yes (n=112)	No (n=67)
Age at injury (years)	24 ± 6	23 ± 6	29 ± 5	24 ± 6	24 ± 7
Age at follow-up (years)	57.8 ± 5.9	57.6 ± 6.1	63.1 ± 5.4	58.3 ± 6.1	58.5 ± 6.5
Gender (% male)	58 (68%)	38 (70%)	8 (73%)	74 (66%)	53 (79%)
Body mass index (kg/m ²)	27.4 ± 4.0	26.1 ± 3.6	28.5 ± 3.7	27.4 ± 3.9	26.3 ± 3.4
Baseline cartilage injury	14(17%)	6 (11%)	4 (36%)	17 (15%)	9 (13%)
Baseline meniscus injury	59 (69%)	24 (44%)	7 (64%)	67 (60%)	39 (58%)
No ACL surgery	38 (45%)	11 (20%)	3 (27%)	37 (33%)	27 (40%)
Early ACL repair	37 (44%)	40 (74%)	8 (73%)	63 (56%)	37 (55%)
Delayed ACL repair/reconstruction	10 (12%)	3 (6%)	0 (0%)	12 (11%)	3 (5%)

All data are mean (standard deviation); or count (%); ACL, anterior cruciate ligament; OA, osteoarthritis

Table 2. Physical activity, QOL and sport-related concerns 32-37 years after acute ACL injury, in individuals with or without ROA, and with or without knee symptoms

	Tibiofemoral radiographic OA			Knee symptoms		
	Yes (n=85)	No (n=54)	p value*	Yes (n=112)	No (n=67)	p value*
Physical activity levels						
>150 min of weekly moderate physical activity	36(42%)	26(48%)	0.50	53(47%)	27(40%)	0.36
>60 min of weekly vigorous physical activity	34(40%)	19(35%)	0.57	47 (42%)	26(39%)	0.68
Quality of life						
EQ-5D	0.78 ± 0.16	0.86 ± 0.12	0.002	0.76 ± 0.15	0.90 ± 0.18	<0.001
ACL-QOL	65±21	73±21	0.03	57±19	87±13	<0.001
How much has your enjoyment of life been limited by your knee problem?	74±25	83±25	0.009	65±28	94±15	<0.001
ACL injury still influences life to a high degree ^a	22(26%)	7(13%)	0.009	42(38%)	1(1.5%)	<0.001
Sport and exercise related concerns						
Frustration with having to consider the knee with respect to recreation or sport	58±33	67±33	0.08	46±31	88±20	<0.001
How difficult is it for you to "go full out" at your recreation or sport	49±31	62±33	0.03	39±27	81±26	<0.001
How much has your ability to exercise/ maintain fitness been limited by your knee problem?	65±26	72±29	0.08	54±27	87±19	<0.001
Concern that your competitive needs are no longer being met because of your knee problem	72±27	77±27	0.26	62±30	91±17	<0.001
How fearful are you of re-injuring your knee	61±30	66±28	0.47	52±30	84±20	<0.001
Importance of sport						
If given a second chance, would have given up sport to prevent ACL injury ^b	14(17%)	8(15%)	0.82	24(22%)	9(14%)	0.20
Past participation and accomplishments in sport contributes to current QOL ^c	55(66%)	36(72%)	0.43	80(74%)	40(63%)	0.11

p values were calculated using Chi-squared Test or Mann-Whitney U Test, as appropriate;

All data are mean (standard deviation) or count (%);

Tibiofemoral radiographic OA defined as Kellgren & Lawrence Grade ≥ 2 vs. Kellgren & Lawrence Grade < 2 ;

Knee symptoms was defined as scoring less than the best possible score on $\geq 50\%$ of questions on the Knee injury and Osteoarthritis Outcome Score (KOOS) pain and/or symptoms subscales;

EQ-5D scores typically range from 0 (represents death) to 1 (represents perfect health) (scoring for the EQ-5D permits scores less than 0);

All other continuous measured are extracted from the ACL-QOL and range from 0 (worst) to 100 (best);

^a ‘Do you think that your ACL injury more than 30 years ago, influences your life today? (not at all /influences to a small degree vs. influences to a high degree);

^b Considering how your knee is today, if you could go back in time, would you choose to give up your sport in order to prevent ACL injury (yes vs. no);

^c My past participation and accomplishments in sport contributes to my current QOL (disagree strongly/ disagree/ neither disagree or agree vs. agree/ strongly agree);

ACL, anterior cruciate ligament; OA, osteoarthritis;