



Anna Jarosz<sup>1</sup>, Wojciech Dubaj<sup>2</sup>,  
Waldemar Hładki<sup>3,4</sup>,  
Stanisław Mariusz Kruk<sup>5</sup>

<sup>1</sup> Instytut Fizjoterapii, Wydział Nauk  
o Zdrowiu, Uniwersytet Jagielloński  
Collegium Medicum w Krakowie

<sup>2</sup> Krakowska Wyższa Szkoła Promocji  
Zdrowia

<sup>3</sup> Instytut Ratownictwa Medycznego,  
Podhalańska Państwowa Wyższa Szkoła  
Zawodowa w Nowym Targu

<sup>4</sup> Klinika Medycyny Ratunkowej  
i Obrazów Wielonarządowych, Uniwer-  
sytet Jagielloński Collegium Medicum  
w Krakowie

<sup>5</sup> Szpital Ortopedyczny Ortopedicum  
w Krakowie

Address for correspondence/  
Adres do korespondencji:  
Mgr Anna Jarosz  
tel: 502270420, email: ajarosz@vp.pl

Received: 29.05.2013

Accepted: 14.06.2013

Published: 02.09.2013

#### STATISTIC STATYSTYKA

Word count Liczba słów	3846
Tables Tabele	7
Figures Ryciny	6
References Piśmiennictwo	27

# Assessment of the influence of the results of orthopedic examination on the quality of life in people undergoing reconstruction of the anterior cruciate ligament of a knee and post-surgery rehabilitation

Original article/Artykuł oryginalny

© J ORTHOP TRAUMA SURG REL RES 3 (33) 2013

## Summary

**Introduction.** The rupture of knee ACL is on the third position of all ligament ruptures in the knee and on the first position of which is healed by operation. The clinical status tested by orthopedic test (history, knee stabilization, goniometrical range of motion) is the main reason to choose the type of healing procedure. The evaluation of the clinical status is convergent to subjective feeling of quality of life and low level of pain.

**The aim** of the paper was to determine whether the improvement of physical fitness and stabilization of the knee will have influence on the quality of life of the patients.

**Materials.** The aim of the paper was carried out based on the clinical material, collected in the years from 2008 to 2010. For the study there were classified 201 patients with the diagnosed broken front knee ligament. All these people were treated surgically. After the operation the patients underwent the rehabilitation clinic Reha-probatus in Cracow.

**Methods.** The patients were examined twice, before the surgery and after the surgery followed by post-surgery rehabilitation. To observe the changes in the parameters of quality of life, we used the following tests and questionnaires: 1) The SF-36 questionnaire to evaluate the patients quality of life; 2) Clinical tests (ROM of knee joint, Lachman test, Pivot shift test and symptoms evaluation test – part of the questionnaire IKDC).

**Results.** Evaluations of range of motion ROM of the knee joint have an influence on psychological health, pain and patients health at all. Additionally increasing knee ROM have an influence on physical health. The rest of statistically significant influences are applying rotation stability of knee joint on social life, pain and health at all and anterior stability on physical and psychological health.

**Conclusions.** The improvement in the areas of life quality, especially mental, physical, social and pain depends on the improvement of the orthopaedic test results concerning the stability and scopes of mobility of the treated knee joint after the break of the anterior cruciate ligament. Decrease of experiencing the symptoms of the broken ACL ligament of the knee joint has impact on the improvement in experiencing in terms of physical and mental health.

The improvement of the scope of extension of the treated knee joint has impact on the widest range of areas of life quality improving them in the greatest number of percentage of the examined patients due to the broken ACL ligament.

**Key words:** Knee ligaments, quality of life, anterior cruciate ligament, clinical examination

## Streszczenie

**Wprowadzenie.** Zerwanie więzadła ACL jest trzecim co do częstości urazem więzadłowym stawu kolanowego i pierwszym wśród operacyjnych rekonstrukcji. Kwalifikacje co do wyboru sposobu leczenia jak i postęp rekonwalescencji opiera się przede wszystkim na wynikach klinicznego badania ortopedycznego (wywiadzie, testach stabilności i zakresach ruchomości stawu kolanowego). Stan kliniczny operowanego więzadła powinien być zbieżny z odczuciami pacjenta co konieczności podejmowania takich a nie innych środków zaradczych. Celem artykułu jest ocena wpływu ewaluacji wyników klinicznego badania stawu kolanowego poddane rekonstrukcji ACL oraz rehabilitacji na samoocenę jakości życia.

**Material.** Badania przeprowadzono na 201 pacjentach zakwalifikowanych do leczenia zerwanego ACL w latach 2008-2010. Wszyscy pacjenci zostali poddani leczeniu operacyjnemu i rehabilitacji pooperacyjnej 6 w gabinecie Reha-probatus w Krakowie.

**Metoda.** Wszyscy pacjenci byli dwukrotnie badani (przed i po leczeniu). Do porównania zmian w obserwowanych parametrach zastosowano: 1) Kwestionariusz SF-36 do oceny jakości życia; 2) Badanie ortopedyczne: Lachman test, Pivot shift, ROM zgięcia i wyprostu stawu kolanowego, kwestionariusz dolegliwości (część IKDC)

**Wyniki.** Zmiana zakresu ruchomości stawu kolanowego wiąże się istotnie w całej grupie ze zdrowiem psychicznym, bólem i zdrowiem ogólnym. Poprawa zakresu ruchomości wyprostu stawu kolanowego wiąże się z poprawą w zakresie zdrowia fizycznego. Pozostałe istotne korelacje w całej grupie dotyczą stabilności rotacyjnej oraz życia społecznego, bólu, zdrowia ogólnego. Wykazano wpływ stabilności przedniej na zdrowie fizyczne i zdrowie psychiczne.

W przypadku poprawy zdrowia psychicznego w ponad 1/3 to osoby z poprawą zakresu ruchomości. Zmniejszenie bólu dotyczyło ponad połowy osób z poprawą zakresu ruchomości stawu kolanowego i 2/3 z poprawą stabilności rotacyjnej. Poprawa zdrowia ogólnego dotyczyła ponad 60% osób z poprawą zakresu ruchomości i około 2/3 z poprawą stabilności rotacyjnej. Poprawa życia społecznego wiązała się u wszystkich z poprawą stabilności rotacyjnej. *Wnioski.* Poprawa w sferach jakości życia zwłaszcza psychicznej, fizycznej, społecznej i bólowej jest zależna od poprawy wyników badania ortopedycznego, dotyczącego stabilności oraz zakresów ruchomości stawu kolanowego leczonego po zerwaniu więzadła krzyżowego przedniego. Zmniejszenie odczuwania objawów zerwanego więzadła ACL stawu kolanowego ma wpływ na poprawę w odczuciu co do zdrowia fizycznego i psychicznego. Poprawa zakresu wyprostu stawu kolanowego leczonego ma wpływ na najszerszy wachlarz sfer jakości życia poprawiając je u największego odsetka badanych leczonych ze względu na zerwane więzadło ACL.

**Słowa kluczowe:** więzadła kolana, jakość życia, więzadło krzyżowe przednie stawu kolanowego, badanie kliniczne.

**INTRODUCTION**

Quality of life is a concept comprising most of all the subjective feeling of the unit to the abilities of coping with situations encountered every day [1-5] and objective perception of elements of physical fitness [4-6]. A sense of quality of life is shaped throughout the whole human life. Therefore, the condition from before the sickness (trauma) is a benchmark for the quality of life in the situation after the trauma, e.g., the lack of the anterior cruciate ligament (ACL) [1,5-7]. Quality of life is also assessed by the factors disrupting the “normal” functioning. The assessed elements of the quality of life in post-surgery patients includes such areas as [6,8-11]:

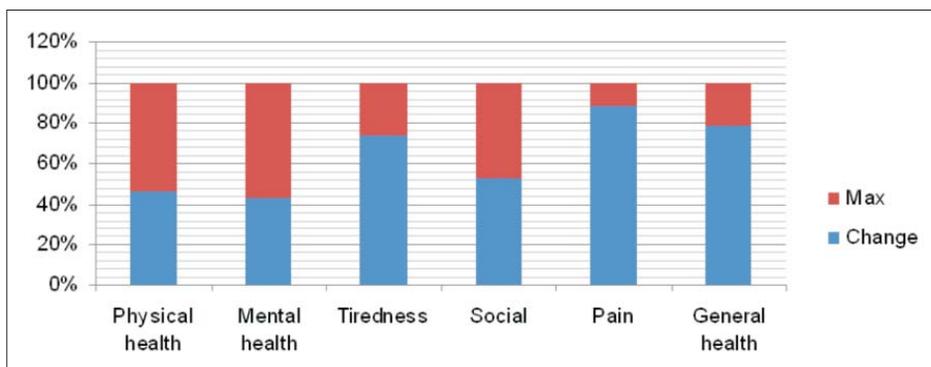
- a sense of fear,
- pain ailments and other clinical symptoms (ailments with which the patient comes to the doctor),

- weakness and physical and mental fatigue during activities of everyday life.

Patients with the broken ACL usually report to the doctor noticing irregularities in functioning of the knee. The most common irregularities include pain, large reduction of physical fitness or feeling of instability of the knee. The severity of these symptoms is the reason why these people decide as a diagnostic consequence for a radical solution of their problem, meaning the reconstructive surgery [12,13].

The aim of the post-surgery rehabilitation is to obtain by the patient a better physical fitness and to stabilize the knee. The prevention of the secondary breaking of ACL used in patients during post-surgery rehabilitation allows to increase the effects of treatment of the operated ACL also within the mental and emo-

**Fig. 1.** Graphic image of the number of the examined with the correct results in both studies (Max) and results varying in both studies for the whole group



**Tab. 1.** Coefficient p for the influence of gender on the change of results of life quality of the treated patients due to the ACL break (chi-square Pearson test)

	Physical health	Mental health	Social	Pain	General health
Coefficient p	0,658	0,227	0,331	0,545	0,340
* p < 0,05					

**Tab. 2.** Coefficient p for the influence of gender on the change of results of orthopaedic test of the treated knee (chi-square Pearson test)

	ROM knee flexion	ROM knee extension	Experienced knee ailments	Lachman test	Pivot shift
Coefficient p	0,053	0,051	0,170	0,229	0,180

tional well-being [13-15]. Mental and emotional well-being is understood as the condition, in which the patient does not react to the stress factors with excessive aggression or in everyday activities does not react with excessive apathy [15].

The pain which the patients with ACL injury experience is the ailment derived from periarticular structures further damaged. The very ligament rarely reacts with pain due to low blood supply and innervations, additionally reduced by its injury. In case of injuries of knee ligament structures we should also mention the feeling of unstable knee, which causes discomfort to the patient. It appears temporarily and always during the performance of everyday activities or sport activities [14,15]. Undertaking the surgical treatment of the broken ACL causes the decrease of both of these symptoms (pain and instability) [12-15].

The aim of the paper was to determine whether the improvement of physical fitness and stabilization of the knee will have influence on the quality of life of the patients.

**MATERIAL AND METHODS**

The goal of the paper was carried out based on the clinical material derived from the St. Raphael Hospital Scanned in Cracow, collected in the years from 2008 to 2010. For the study there were initially classified 201

patients with the diagnosed broken front knee ligament. In the detailed qualification there were excluded patients, who in the first and second test had the normal results of particular elements of the life quality (maximal) [Figure 1].

The factor p for the analysis of all patients was 0,224 and for patients, who noted the change of results it was 0,047. The statistical analysis did not take into consideration the influence of gender (coefficient  $p > 0,05$ ) on the result of the orthopedic examination [Table 2] and the change in the quality of life [Table 1]

The group of subjects with rotational instability higher in the operated lower limb in relation to the not operated lower limb was 141 (70,1% of all examined). There were 57 patients qualified to the test, with rotational stability comparable in both lower limbs (28,3%). Three patients had the rotational instability higher in the not operated lower limb and constituted 1,5% [Table 3].

Greater front instability of the front knee in the operated limb was stated in 165 patients (82,1%). Front stability compared in both lower limbs was diagnosed in 35 patients (17,4%). One patient (0,5%) was classified with the front instability greater in the lower not operated limb [Table 4].

To the surgery of the broken ACL the patients had the flexion range of the operated knee on the average 143,9° with the standard deviation 23°. Range of motion of the

**Tab. 3.** Percentage and number of results of the clinical test Pivot shift in comparison to the opposite limb before the surgery in the whole group

Pivot shift	Whole group	
	N	%
<b>Bigger</b>	141	70,1
<b>The same</b>	57	28,3
<b>Lower</b>	3	1,5
<b>All</b>	201	100,0

**Tab. 4.** Percentage and number of results of the Lachman clinical test in comparison to the opposite limb before the surgery in the whole group

Lachman test	Whole group	
	N	%
<b>Bigger</b>	165	82,1
<b>The same</b>	35	17,4
<b>Lower</b>	1	0,5
<b>All</b>	201	100,0

**Tab. 5.** Results of the test of the scope of mobility and extension of the knee joint and the degree of ailments of the knee joint of the operated limb before the surgery in the whole group

	$\bar{x} \pm s$	Me	Min – Max
<b>ROM flexion</b>	143,9 ° ± 23,0 °	160,0 °	60,0 ° – 160,0 °
<b>ROM extension</b>	-1,3 ° ± 5,1 °	-5,0 °	-5,0 ° – 20,0 °
<b>Experienced knee ailments</b>	65,7% ± 21,8%	65,5%	7,0% – 100,0%

**Tab. 6.** Values p of the evaluation of co-dependencies of parameters of life quality with SF-36 (omitting the maximal values –Max) and results of the orthopaedic test in patients treated due to the broken ACL (test chi-square by Pearson)

	Physical health	Mental health	Social	Pain	General health
ROM flexion	0,595	<b>0,032*</b>	0,508	<0,001*	<0,001*
ROM extension	0,041*	<b>0,009*</b>	0,296	<0,001*	<0,001*
Pivot shift	0,154	0,147	<b>0,005*</b>	<b>0,005*</b>	<b>0,051*</b>
Lachman test	<b>0,011*</b>	0,346	0,222	0,647	0,998
Experienced knee ailments	<b>0,050*</b>	<b>0,021*</b>	0,132	0,384	0,169

\* p < 0,05

straightening of the knee averaged to  $-1,3^\circ$  (where the minus means the presence of hyperextension) with the standard deviation  $5,1^\circ$ . The evaluation of the severity of the symptom of the damaged ACL was on average 65,7% (where 100% meant the lack of any symptoms of the damaged ligament) with the standard deviation 21,8 percentage points. Some of the examined was qualified with the full scope of the knee joint mobility both in flexion ( $160^\circ$ ), and in extension ( $-5^\circ$ ). Majority of people assessed their ailments due to the broken ACL on the level close to the obtained mean, that is 65,5%. Range of mobility in the knee bend in patients qualified to the examination ranged between  $60^\circ$  and  $160^\circ$ . Scope of mobility of the extension in the knee joint in patients qualified to the examination ranged between the full hyperextension ( $-5^\circ$ ), and flexion contraction of  $20^\circ$ . The severity of the symptom due to the damaged ACL was assessed by the patients in the range between 7% and 100% [Table 5].

Basic patient information was collected based on the IKDC form.

Orthopaedic tests, i.e. Pivot shift, Lachman test, evaluation of the movement scope, level of symptoms connected with the injury of the knee and examination of the quality of the SF-36 have been performed twice (one week before the surgery – the first examination and in the 24<sup>th</sup> week of post-surgery rehabilitation – the second examination).

Tests were performed under the supervision of the physiotherapist leading the process of post-surgery rehabilitation. The patients have completed the questionnaire SF-36 on their own as well as the subjective form of subjective assessment of the development of the symptoms of the knee joint (symptom questionnaire) being the part of the IKDC form. Time to complete the test was unlimited, maintaining silence in the room. Therapist while filling in the questionnaires by the patient was in another room.

The therapist has also filled in a part of the IKDC questionnaire, being the surgical evaluation, using medical records (descriptions of image examinations, discharge from the hospital and other surgical documents) and the clinical examination.

## ORTHOPAEDIC CLINICAL EXAMINATION

**Evaluation of the problem development** (Problem questionnaire) of the knee was scored on a scale from 1 to 4. The maximum number of points (87 points) meant no pain in the knee. Knee ailments are understood as discomfort, or the symptom of disease, which with its intensity forces the patient to go to the doctor. In this questionnaire pain ailments are excluded. The main symptoms of the broken knee joint are the feeling of resorting (front and rotational instability), inflammation of the goosfoot, limping, inability to walk properly (no flexion, extension in the knee). The zero number of points meant the lack of possibility to undertake any activity and the constant, very severe pain even while resting. The num-

ber of points achieved in the first test from this part of IKDC questionnaire was calculated into percentiles (gender and age of the patient were taken into consideration). Results of the first test were compared with the second test, according to the formula:  $d_i = x_{2i} - x_{1i}$  (where  $i$  – patient number,  $x_{1i}$  – measurement before treatment,  $x_{2i}$  – measurement after treatment). There was performed the division into groups:

- “Improvement” – when,  $d_i \geq 0$ ,
- “Deterioration” – when,  $d_i < 0$

For calculations there was used the calculator *IKDC* <Subjective Knee Form Calculator>.

**Form of the general health and surgical evaluation** included relevant data: for the characteristics of the research group, in the process of qualification of patients to the research program, indications and contraindications to the used physiotherapy techniques. The composition of the surgical evaluation taken to the correlation includes: clinical tests Pivot shift (Pivot) for the assessment of the rotational instability of the knee, Lachman test (Lachman) for the front instability of the knee, scope of movement of the bend (Bend Scope) and extension (Extension Scope) of the knee.

Results of tests of the knee stability presented in the chapter Research material were given in comparison to the stability of the opposite limb as:

- “Higher” – lower operated limb has a greater instability than the lower healthy limb,
- “The same” – test results are compared in both limbs,
- “Smaller” – test results of the not operated limb are weaker than the operated limb.

For the statistical correlation in the chapter Results there were used the quality results calculating according to the formula:  $d_i = x_{2i} - x_{1i}$  (where  $i$  – patient number,  $x_{1i}$  – measurement before treatment,  $x_{2i}$  – measurement after treatment). Results are presented in indices:

- “Improvement” – test results – of the operated were improved (when,  $d_i > 0$ ),
- “No changes” – test results remained unchanged at the level not changed other than “higher” (when,  $d_i = 0$ ).

**Questionnaire SF-36.** The Polish form of the questionnaire of the lie quality SF-36 assesses the sense of the quality of life from the physical, social, pain and mental side of the patient. The analysis of results takes place according to the table *RAND 36-Item Health Survey*. All answers are scored on the scale from 0 to 100, where 100 means the lack of the problem in the tested area. The awarded points are at the same time the percentage reflection of the patient’s condition.

In the SF-36 questionnaire the quality of life is divided into eight areas of functioning: physical functioning, physical health limitations, mental health limitations, fatigue, mental well-being, social life, pain, general health condition. In the examination there was used the test of four main areas [16-19].

**Physical health limitation** (Physical health) evaluates the influence of physical disability, being the result of the anterior cruciate ligament (ACL) of the knee, on the performance of specific activities of daily life (in the test before the surgery) and the influence of the reconstructed ACL on the performance of these activities in the test after six months of treatment. The patient evaluates the ability to perform specific activities accompanying him during his day and the sports ones.

**Mental health limitation** (Mental health) evaluates the influence of disability resulting from the ACL break (in the first test) and the reconstructed ACL (in the second test) on the mental state and emotional coping with activities of everyday, professional and sports life. It assesses the degree of the proper emotional reaction to the stress situations accompanying the everyday functioning.

**Social life** (Social) assesses the degree of involvement of the patient in the field of interpersonal relations in the family and at work and in the realized hobby. The patient in this test evaluates also the social and economic level in which he is currently located (depending on the number of the test). It determines how the ACL break influenced this aspect (in the first test) and whether the surgery and post-surgery rehabilitation had influence on the changes in this area.

**Pain** assesses the level of pain which the patients felt before and after the treatment of the broken ACL during the performance of specific activities of everyday life. The level of pain severity was based on the VAS scale (Visual Analogue System) depending on the performed activity and time of the day.

**General health** (General health), in which the patient assesses the condition of his own health before the treatment of the broken ACL (in the first test) and after 24 weeks from the surgery (in the second test). The assessment takes into consideration the influence of diseases coexisting

on the feeling of the health condition, current physical activity, level of discomfort connected with his health.

For the statistical analysis there were taken into consideration the differences of average results obtained from individual respondents, according to the formula:  $d_i = x_{2i} - x_{1i}$  (where  $i$  – patient number,  $x_{1i}$  – measurement before treatment,  $x_{2i}$  – measurement after treatment).

There was made the division into groups:

- “Improvement” when,  $d_i > 0$ ,
- “No improvement” when,  $d_i \neq 0$  (with the exception of  $d_i = 0$  with maximal values obtained in the test before and after treatment),
- “Max” when,  $d_i = 0$  and patients obtained maximal values in the test before and after treatment.

There was obtained the approval of the Bioethics Committee to carry out the research.

For the surgical treatment patients were qualified by orthopaedic surgeons from the St. Raphael hospital in Cracow. The own study involved people with broken anterior cruciate ligament of the knee (ACL). These people were treated surgically with the arthroscopic reconstruction of the anterior cruciate ligament using the autogenous transplant from the gracilis and semitendinosus muscle with the single-bunch method. To fix the graft there were used bio-absorbable screws, integrating with the patient’s bone after 2,5 years [16]. The surgery did not include additional intra-knee ailments of the knee. After the treatment the patients stayed in the hospital for two days, where after 24 hours after the surgery, every two hours, there were used the exercises of passive motion in the knee joint and *cooltherapy* by using *cryo cuff* (treatment time: 15 minutes).

### POST-SURGERY REHABILITATION OF ACL WITH THE SIX MONTH METHOD

Post-surgery rehabilitation was prepared by the team of physiotherapists from the office “Reha-probatus” in Cracow, specifically for this type of operations treatments based on literature and histology examinations of the graft

**Tab. 7.** Percentage of the examined with the verification of co-dependencies of results of orthopaedic tests with the quality of life in the whole group

		ROM flexion		ROM extension		Pivot shift		Lachman test		Experienced knee ailments	
		Inc.	Not	Inc.	Not	Inc.	Not	Inc.	Not	Inc.	Not
<b>Physical health</b>	<b>Inc.</b>	73,9	26,1	<b>84,8</b>	<b>15,2</b>	78,3	21,7	<b>84,8</b>	<b>15,2</b>	<b>94,6</b>	<b>5,4</b>
	<b>Not</b>	66,7	33,3	<b>58,3</b>	<b>41,7</b>	58,3	41,7	<b>50,0</b>	<b>50,0</b>	<b>75,0</b>	<b>25,0</b>
<b>Mental health</b>	<b>Inc.</b>	<b>38,1</b>	<b>61,9</b>	<b>39,3</b>	<b>60,7</b>	60,7	39,3	82,1	17,9	92,9	7,1
	<b>Not</b>	<b>22,2</b>	<b>77,8</b>	<b>11,1</b>	<b>88,9</b>	88,9	11,1	100,0	0,0	88,9	11,1
<b>Social</b>	<b>Inc.</b>	52,7	47,3	51,4	48,6	<b>100</b>	<b>0,0</b>	77,0	23,0	91,9	8,1
	<b>Not</b>	46,2	53,8	41,0	59,0	<b>87,2</b>	<b>12,8</b>	87,2	12,8	82,1	17,9
<b>Pain</b>	<b>Inc.</b>	<b>56,4</b>	<b>43,6</b>	<b>57,1</b>	<b>42,9</b>	<b>75,7</b>	<b>24,3</b>	82,1	17,9	90,0	10,0
	<b>Not</b>	<b>27,1</b>	<b>72,9</b>	<b>22,9</b>	<b>77,1</b>	<b>54,2</b>	<b>45,8</b>	79,2	20,8	85,4	14,6
<b>General health</b>	<b>Inc.</b>	<b>60,2</b>	<b>39,8</b>	<b>61,8</b>	<b>38,2</b>	<b>73,2</b>	<b>26,8</b>	80,5	19,5	92,7	7,3
	<b>Not</b>	<b>24,0</b>	<b>76,0</b>	<b>22,0</b>	<b>78,0</b>	<b>58,0</b>	<b>42,0</b>	82,0	18,0	86,0	14,0

Bold for  $p \leq 0,05$ ; Inc. – increase; Not – not change

re construction. Rehabilitation program was based on four phases of the physiological reconstruction of the graft. Within the particular phases there was obtained the active stabilization, flexibility of muscle structures, muscle power of the lower limb. Initially there were used safe positions on the closed chain (CKC), gradually moving to exercise in the open chain (OKC). In the final stage of the patient there was reconstructed the proprioception of the knee joint, so that the transplanted anterior cruciate ligament of the knee was protected by the muscle stabilization while healing.

For the description of quantitative traits there was used the arithmetic mean ( $\bar{x}$ ), standard deviation (s), median (Me), the smallest values (Min) and the largest values (Max).

For the description of the quality features there were used multiple tables containing the number of cases of the improvement or the lack of improvement (n) and their percentages (%).

The assessment of differences between women and men of the quantitative features was conducted by the test of t-student or the test of Mann-Whitney.

The assessment of differences between the measurements before and after the rehabilitation was conducted by the test of t-student for dependant trials or the test of Wilcoxon.

Co-dependency of quality features was verified with the test chi-square of Pearson or the precise test of Fisher.

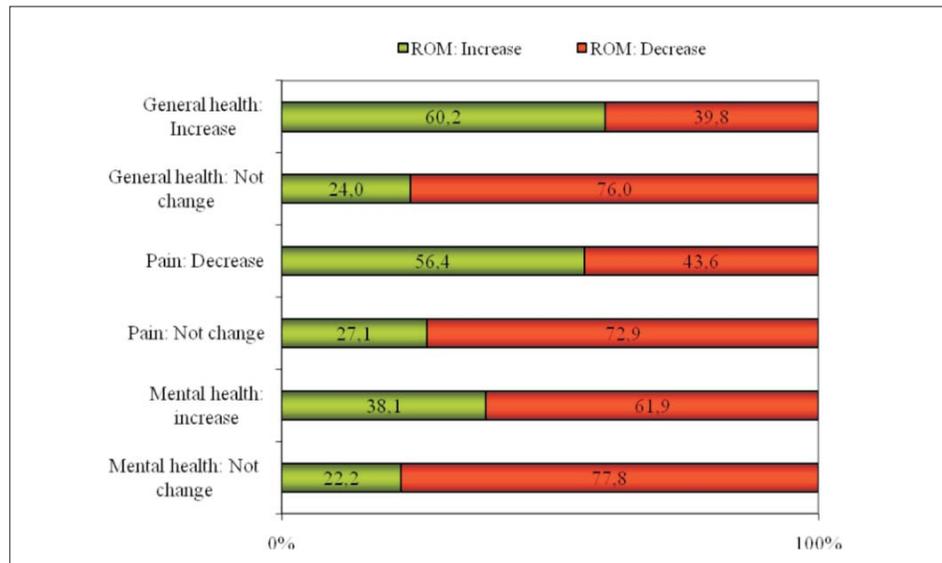
The verification was carried out on the level of significance  $\alpha = 0,05$ .

The calculations were performed by using the package STATISTICA.

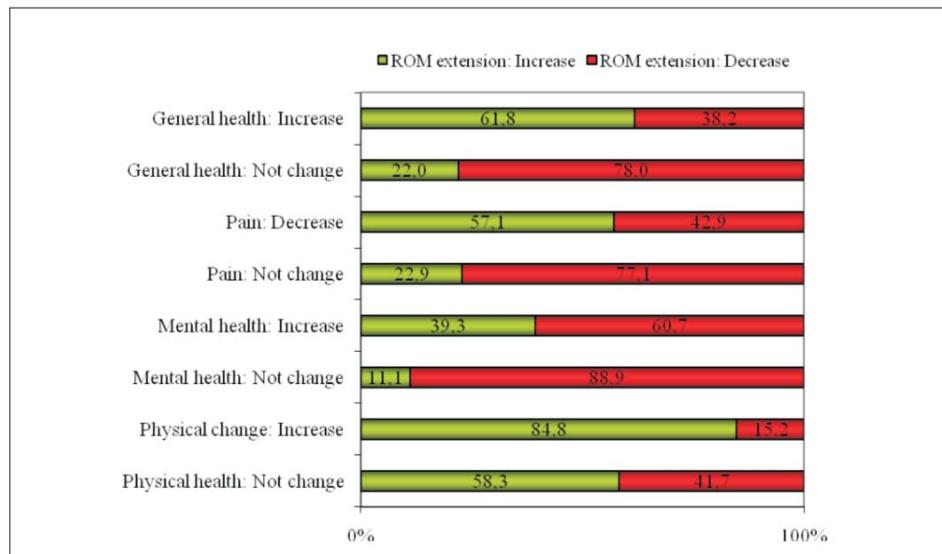
**RESULTS**

The correlation between the quality of life according to the SF-36 questionnaire and the results of the orthopaedic examination was subjected to analysis. In this part

**Fig. 2.** Graphic image of the percentage of the examined with the verification of correlations of test results of the mobility of the treated knee joint bend with general health, pain and mental health



**Fig. 3.** Graphic image of the percentage of the examined with the verification of correlations of test results of the scope of mobility of the extension of the treated knee joint with physical health, mental health, pain and general health



of the statistical analysis there were excluded people, who achieved the maximal result in the measurement of life quality parameters before and after the surgery and rehabilitation (Max).

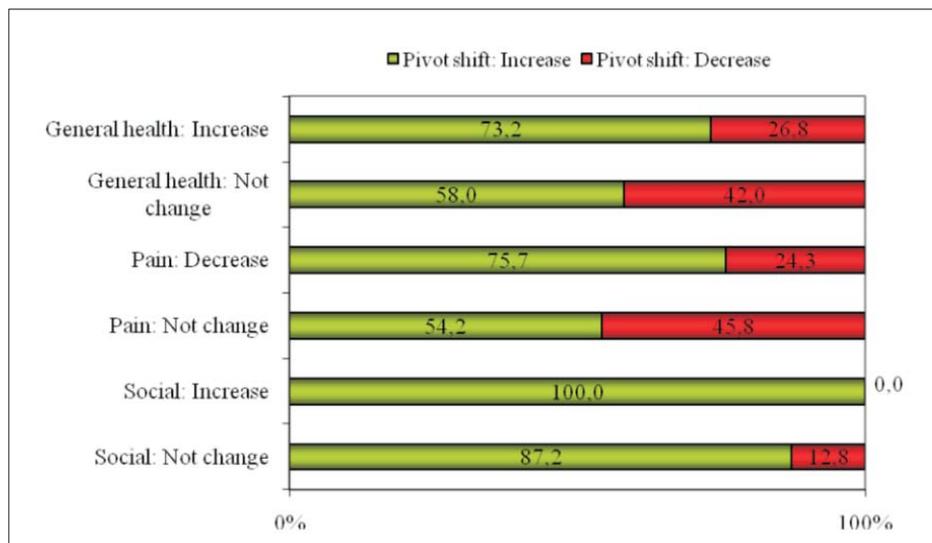
In the whole group of the patients (without Max) there was stated the statistically relevant correlation, with the chi-square Pearson test, between the scope of movement of the knee bend and the mental health ( $p=0,032$ ), pain ( $p=0,001$ ) and general health ( $p<0,001$ ). In case of the change of the movement scope of extension in the knee there was stated the statistically relevant correlation with the physical health ( $p=0,041$ ), mental health ( $p=0,009$ ), pain ( $p<0,001$ ) and general health ( $p<0,001$ ). Rotational stability of the treated knee joint (pivot shift) correlates relevantly with the social functioning ( $p=0,005$ ), pain ( $p=0,005$ ) and general health ( $p=0,051$ ). Results of the Lachman test (front stability of the knee joint) are essentially connected with the results of the physical health ( $p=0,011$ ). Feeling pain correlates with the physical health ( $p=0,050$ ) and mental health ( $p=0,021$ ) [Table 6].

In the group of patients, who improved the scope of movement of the bend there were 38,1% of the respondents experiencing the improvement of the mental health, while 22,2% patients felt the deterioration of the mental health. The remaining percentage with the improvement and deterioration in terms of mental health belonged to

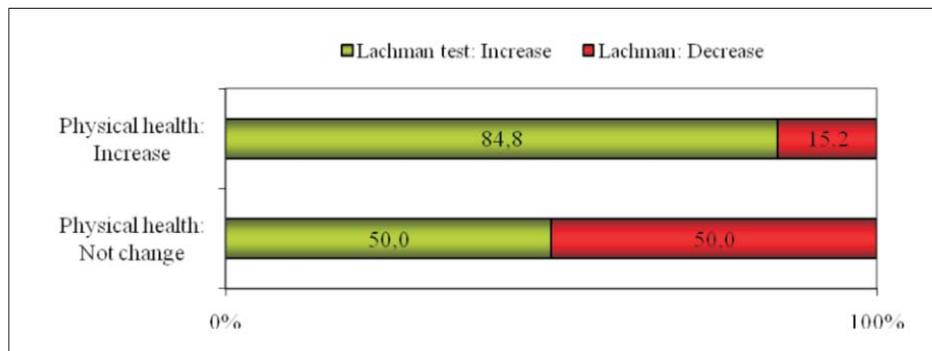
the group with the lack of improvement of the movement of the knee joint bend. In the group of people, who improved the scope of bend in the operated knee joint 56,4% were the patients, who experienced the deteriorated level of pain, 27,1% are the patients with the increased feeling of pain. 60,2% of patients experienced the improvement of the general health, and 24% patients had evaluated their health worse after the surgery. The remaining percentage with the deterioration and improvement of pain after the surgery and evaluating their general health better and worse belonged to the group with the lack of improvement within the movement of the knee joint bend [Figure 2].

The increase of the extension of the knee joint had influence on the improvement of the experienced physical health, mental health, pain and general health in the percentage, respectively: 84,8%; 39,3%; 57,1%; 61,8%. It was also related with people, who experienced the improvement in the same areas of life in percentages, respectively: 58,3%; 11,1%; 22,9%; 22,0%. In the group of patients who did not experience the improvement of the scope of movement, physical health improved in 15,2% and deteriorated in 41,7%; mental health improved in 60,7% and deteriorated in 88,9%; pain decreased in 42,9% and increased in 77,1%; general health improved in 38,2% and deteriorated in 78%. 12,8% of the

**Fig. 4.** Graphic image of the percentage of examined with the verification of correlations of the rotational stability of the treated knee joint with social life, pain and general health



**Fig. 5.** Graphic image of the percentage of the examined with the verification of correlations of the frontal stability of the treated knee joint with physical health



patients are people who experienced the improvement of the scope of mobility of the treated knee joint while their feelings in the social area did not improve [Figure 3].

The increase of the rotational stability concerned in 100% patients, who declared the improvement of feelings in the social life and 87,2% of patients, who did not experience this improvement in the social life. Rotational stability had also influence on the improvement of the percentage of patients, who evaluated better than before the surgery: pain (75,7%), general health (73,2%). The lack of improvement in the above-mentioned areas concerned more than a half of patients from the group with the improvement of results in the test Pivot shift. For people, who did not show improvement in the rotational stability, 24,3% are the patients with the experiencing of smaller pain ailments and 45,8% with the increased pain ailments. 26,8% declared the improvement of feelings in general health and 42,0% the deterioration in this area [Figure 4].

Frontal stability and complaints from the treated knee joint were significantly associated with the physical and mental health. More than 90% of patients with the improvement of the physical health belonged to the group with the decrease of ailments from the knee joint and more than 80% belonged to the group with the improvement of the frontal stability. The group with the improvement and lack of improvement in the physical health was half in half in the group with the improvement and lack of improvement in the Lachman test [Figure 5].

In the group of the patients with the reduced knee pain sensations there were 2/3 of patients with the lack of a sense of improvement in the physical health. The remaining percentage belonged to the group with the lack of reduction of knee pains [Figure 6].

## DISCUSSION

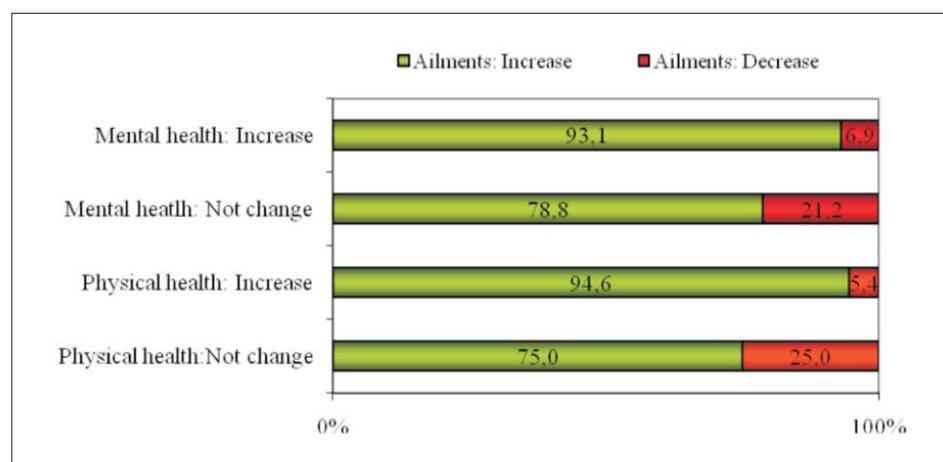
In the own study there was observed the dependence of clinical tests in the process of treatment of the broken ACL with the improvement of most areas of life quality. For example, the feeling of improvement in physical health related to more than 80% of patients with the

improvement of the scope of knee bend, frontal stability of the knee and knee ailments. In the improvement of social life all patients obtained the improvement of the rotational stability. Results of studies conducted by other researchers, including Anders and Galway, not only confirm the results obtained in the own studies, but also allow the marking of the direction of dependencies. They argue that well-being (quality of life) of the patient is influenced by the improvement of results in orthopaedic tests, which depend on the results of the surgery and the operating surgeon and the initial condition of the patient [20-24]. This concept is critically referred to in the conclusions by Feagin and Steadman claiming that the results of the properly conducted treatment have no specific translation into the patient's feelings when it comes to own health. They say that the patient shapes his posture during the injury and he strengthens it until he undertaken treatment, also maintaining it after the treatment [17].

Frontal stability of the knee joint, due to single-surface, is effectively supported by the muscles, especially groups of ischio-tibial muscles. According to Ombregt the disorder of the frontal stabilization has no influence of the feeling of decreasing the mental and physical fitness, especially if we base it on the passive stability (Lachman test) [25]. To fully get the answer to this dependency we should take into consideration also the active stability.

In the study of Klein and his colleagues, the rotational instability is described as difficult to actively stabilize (muscle), thus the patients on the level of the everyday function experience it as "knee escape" <giving away> [26]. This also influence the deterioration of results in the questionnaire study of the ailments. More often the patients with the reduced rotational stability evaluate their physical fitness lower (physical health). In the detailed analysis of parameters of the quality of life in the own study we do not observe the significant correlation of the influence of the rotational stability and the frontal one of the knee joint on the studied mental areas of the patient. In the studies of Sanchis-Alfonso, Magnus-

**Fig. 6.** Graphic image of the percentage of the examined with the verification of correlations of the experienced ailments of the treated knee joint with physical health and mental well-being



son and Shelbourne the restoration of the mental sphere to the condition from before the injury was slower from the restoration of physical aspects of the quality of life [6,8,27], thus the six-month observation may be too short to observe the significant changes of the mental area and correlations with the clinical test results. In the study we also observed that from all examined clinical results the greatest influence on the improvement of the quality of life had the increase of rotational stability. It influenced the pain, general health and social life. In manuals for diagnosis of the broken ACL next to pain, the lack of the rotational stability is the main cause of the patient reporting to the orthopaedic surgeon. The intensity of these feelings is also often the main reason of consent to perform the reconstructive surgery [20,25].

## CONCLUSIONS

1. The improvement in the areas of life quality, especially mental, physical, social and pain depends on the improvement of the orthopaedic test results concerning the stability and scopes of mobility of the treated knee joint after the break of the anterior cruciate ligament.
2. Decrease of experiencing the symptoms of the broken ACL ligament of the knee joint has impact on the improvement in experiencing in terms of physical and mental health.
3. The improvement of the scope of extension of the treated knee joint has impact on the widest range of areas of life quality improving them in the greatest number of percentage of the examined patients due to the broken ACL ligament.

## References/Piśmiennictwo:

1. Kozłowski R. 2002. Techniki stymulacji sensorycznej stosowane w zaburzeniach kontroli motorycznej, *Terapia manualna w modelu holistycznym*, 3:54-59.
2. Aronson E., Wilson T. D., Akert R. M. 1997. *Psychologia społeczna. Serce i umysł. Zysk i S-ka*, 74.
3. Bańka A. 1994. Jakość życia w psychologicznych koncepcjach człowieka i pracy. Bańka A., Derbis R. (red.). *Psychologiczne i pedagogiczne wymiary jakości życia, „Gemini” S.C.*, 19-40.
4. Brzezińska A., Stolarska M., Zielińska J. 2001. Poczucie jakości życia w okresie wczesnej, średniej i późnej dorosłości. W: Appelt K., Wojciechowska J. (red.). *Zadania i role społeczne w okresie dorosłości*, Wydawnictwo Fundacji Humaniora, 103-126.
5. Stolarska M., Zielińska J. 2000. Jakość życia – przegląd koncepcji, *Instytut Psychologii U.A.M. (maszynopis niepublikowany)*.
6. Kalfos M., Jaracz K. 2001. Radzenie sobie ze stresem i zachowania zdrowotne w kontekście pielęgnowania. W: Wołowicka L. (red.), *Jakość życia w naukach medycznych*, Dział Wydawnictw U.A.M., 42-53.
7. Trzebińska E., Luszczynska A. 2002. *Psychologia Jakości Życia*. W: Jurkowlanec Z. (red.). *Psychologia Jakości Życia*, Wydawnictwo Szkoły Wyższej Psychologii Społecznej, 5-8.
8. Czerwińska N. 2002. Kształtowanie jakości życia w okresie dorastania. W: Brzezińska A. (red.). *Szanse rozwoju w okresie dorastania*, Wydawnictwo Fundacji Humaniora, 11-25.
9. Derbis R., Bańka A. 1998. Poczucie jakości życia a swoboda działania i odpowiedzialność, *Stowarzyszenie Psychologia i Architektura*, 25-34.
10. Ruszczak K. 2000. *Teorie osobowości – podejście psychodynamicznej humanistycznej*. W: Strelau J. (red.). *Psychologia. Podręcznik akademicki. Tom 2: Psychologia ogólna*. Gdańskie Wydawnictwo Psychologiczne, 601-652.
11. Tylka J. 2003. Czy badanie jakości życia jest dobrym kryterium oceny skuteczności rehabilitacji, *Rehabilitacja Medyczna*, 4:50-53.
12. Harden R.N., Bruehl S., Stanos S. i wsp. 2003. Prospective examination of pain-related and psychological predictors of CRPS-like phenomena following total knee arthroplasty: a preliminary study, *Pain*, 106(3):393-400.
13. Langford J.L., Webster K.E., Feller J.A. 2008. A prospective longitudinal study to assess psychological changes following anterior cruciate ligament reconstruction surgery, *Knee*, 15:368-372.
14. Muschalla B., Linden M., Olbrich D. 2010. The relationship between job-anxiety and trait-anxiety-a differential diagnostic investigation with the Job-Anxiety-Scale and the State-Trait-Anxiety-Inventory, *J. Clin. Psychol. Med. Settings*, 17:31-37.
15. Wood R.L., Maclean L., Pallister I. 2010. Psychological factors contributing to perceptions pain intensity after acute orthopaedic injury, *Injury*, 42(11):1214-1218.
16. Clasby L., Young M.A. 1997. Management of sports-related anterior cruciate ligament injuries, *A.O.R.N. J.*, 66(4):609-625, 628,630.
17. Feagin J.A., Steadman J.R. 2010. *The crucial Principles in Care of the knee*, *Knee Surg.*, 23-45.
18. Miller M.D., Wiesel S.W. 2010. *Operative Techniques in Sports Medicine Surgery*, Lippincott Williams&Wilkins, 33:253-255.
19. Fousekis K., Tsepis E., Vagenas G. 2010. Multivariate isokinetic strength asymmetries of the knee and ankle in professional soccer players, *J. Sports Med. Phys. Fitness*, 50(4):465-474.
20. Reinking M.F. 2001. *Knee anatomy and biomechanics*, Home Study Course Orthopaedic Section A.P.T.A., 13-17.
21. Lattanzio P.J., Petrella R.J., Sproule J.R. i wsp. 1997. Effects of fatigue on knee proprioception, *Clin. J. Sports Med.*, 7(1):22-27.
22. Zamorra G., Fisher M.B., Woo S.L. i wsp. 2010. Biomechanical evaluation of using one hamstrings tendon for ACL reconstruction: a human cadaveric study, *Knee Surg. Sports Traumatol. Arthrosc.*, 18(1):11-19.
23. Andersen H.N., Dyhre-Poulsen P. 1997. The anterior cruciate ligament does play a role in controlling axial rotation in the knee, *Knee Surg. Sports Traumatol. Arthrosc.*, 5(3):145-149.
24. Galway R.D., Beaupre A., Macintosh D.L. 1972. Pivot shift: a clinical sign of symptomatic anterior cruciate insufficiency, *J. Bone Joint Surg.*, 54.
25. Ombregt L., Bisschop P., J ter Veer Herman, 2003. *A system of orthopaedic medicine*, Churchill Livingstone, 13:1053-1153.
26. Klein P., Sommerfeld P. 2004. *Biomechanik der menschlichen Gelenke: Grundlagen, Becken, untere Extremität*, Urban & Fischer, 3:7-36.
27. Shelbourne K.D., Johnson G.E. 1994. Outpatient surgical management of arthrofibrosis after anterior cruciate ligament surgery, *Am. J. Sports Med.*, 22(2):192-197.