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THE IMPACT OF COMBINED MENISCUS TEAR ON QUALITY OF LIFE AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

UTICAJ UDRUŽENE POVREDE MENISKUSA NA KVALITET ŽIVOTA POSLE REKONSTRUKCIJE PREDNJEG UKRŠTENOG LIGAMENTA

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Summary

Introduction. An anterior cruciate ligament injury represents a significant epidemiological problem worldwide, especially due to involving young, sporty and active working-age population. This study has been conducted in order to compare the quality of life of patients who had isolated anterior cruciate ligament tear and of those who suffered from an associated meniscal injury. **Material and Methods.** This study included 185 patients who had undergone reconstruction of the anterior cruciate ligament at the Department of Orthopedic Surgery and Traumatology in Novi Sad from January 1st, 2012 to December 31st, 2012. The patients were divided into 2 groups: group A consisted of patients who had anterior cruciate ligament reconstruction only, and group B consisted of patients who had partial meniscectomy in addition to the anterior cruciate ligament reconstruction. The follow-up period was 12 months. **Results.** Distribution of patients by gender was significantly in favor of men. In our study, 146 patients were male and 39 patients were female. The average age of patients was 26.1 years overall (16-55 years), being 26.9 years for men, and 23.3 years for female patients. Out of 185 patients, 110 had an isolated anterior cruciate ligament injury, while 75 suffered both meniscus, internal or external, and anterior cruciate ligament injury. **Conclusion.** The comparison of the quality of life of patients in both groups showed no statistically significant difference. Therefore, we were not able to prove the hypothesis about the superior quality of life of those patients who had suffered from a ruptured anterior cruciate ligament only.

Key words: Quality of Life; Anterior Cruciate Ligament Reconstruction; Menisci; Tibial; Knee Injuries; Questionnaires; Lysholm Knee Score; Joint Instability; Age Factors; Sex Factors; Multiple Trauma

Introduction

An anterior cruciate ligament (ACL) injury is an epidemiological problem in the world because it af-

Sažetak

Uvod. Povrede prednjeg ukrštenog ligamenta predstavljaju značajan epidemiološki problem širom sveta, posebno zbog najveće učestalosti među mladom, sportski i radno aktivnom populacijom. Ova studija je sprovedena sa ciljem ispitivanja kvaliteta života pacijenata koji su imali izolovanu povredu prednjeg ukrštenog ligamenta, u poređenju sa onima koji su imali udruženu povredu meniskusa. **Materijal i metode.** Istraživanjem je obuhvaćeno 185 pacijenata koji su podvrgnuti rekonstrukciji prednjeg ukrštenog ligamenta na Klinici za ortopedsku hirurgiju i traumatologiju u Novom Sadu od 1. januara do 31. decembra 2012. godine. Ispitanici su podeljeni u dve grupe: grupa A se sastojala od pacijenata koji su imali samo rekonstrukciju prednjeg ukrštenog ligamenta, a grupa B od pacijenata koji su osim rekonstrukcije prednjeg ukrštenog ligamenta imali i parcijalnu meniscektomiju. Period praćenja iznosio je 12 meseci. **Rezultati.** Distribucija pacijenata prema polu bila je značajno u „korist“ muškaraca. U našoj studiji 146 pacijenata su bili muškarci, a 39 pacijenata bile su žene. Prosečna starost ispitanika bila je 26,1 godina (16–55 godina), za muškarce 26,9 godina, i 23,3 godine za žene. Od ukupno 185 ispitanih pacijenata, 110 je imalo izolovanu povredu prednje ukrštene veze, dok je preostalih 75 imalo i udruženu povredu unutrašnjeg ili spoljašnjeg meniskusa. **Zaključak.** Upoređujući kvalitet života pacijenata u obe grupe, nije bilo statistički značajne razlike. Stoga nismo bili u mogućnosti da dokažemo hipotezu o boljem kvalitetu života onih pacijenata koji su imali izolovanu povredu prednjeg ukrštenog ligamenta.

Ključne reči: kvalitet života; rekonstrukcija prednjeg ukrštenog ligament; meniskusi; povrede kolena; upitnici; Lysholm skala; nestabilnost zgloba; uzrast; pol; udružene povrede

fects young, sporty and working population [1,2]. In the last five years the annual number of reported cases and the number of completed reconstruction of the ACL has doubled [3]. The primary goal of

Abbreviations

ACL	– Anterior Cruciate Ligament
QOL	– Quality of Life
WHO	– World Health Organization
OA	– Osteoarthritis
HRQOL	– Health Related Quality of Life
ACL R	– Anterior cruciate ligament rehabilitation
KCV	– Clinical Center of Vojvodina

ACL reconstruction is to regain stability as well as to maintain the range of motion, increase the quality of life (QOL), and thus prevent early degenerative changes in the cartilage and possible new ones.

According to the World Health Organization (WHO), the QOL is a personal perception of their own life plan in the context of culture and value systems in which the person lives according to their goals, expectations, standards and interests [4]. It consists of the physical health, psychological status, material independence, social relationships and relationship to the major characteristics of the environment [5]. The concept of QOL has recently been given a great significance and important role in the analysis of various clinical situations in modern medical practice [6]. There are two aspects of the QOL: the subjective or personal evaluation and the objective evaluation made by an observer. A scale was designed to assess the extent of personal QOL satisfaction [6].

Ten years after the ACL reconstruction [7], 13% of people with an isolated rupture of the ACL and 48% of people with the accompanying meniscus develop knee osteoarthritis (OA). Since the data on QOL after ACL rupture and its surgical treatment are scarce, the aim of this study has been to determine whether there is a difference in QOL between the patients with isolated ACL rupture and those who had an associated injury especially meniscal tear.

Material and Methods

With the permission of the Ethics Committee, the study was conducted at the Department of Orthopedic Surgery and Traumatology, Clinical Center of Vojvodina, and it included 185 patients from the register of patients who had undergone surgery during the period from January 1st to December 31st 2012.

Group A consisted of 110 patients with an isolated ACL injury while group B included 75 patients who had both ACL and meniscal tear (**Graph 1**).

The study was designed as a retrospective-prospective study. When collecting data from patients, the “KOOS” questionnaire was used [8], fully translated from English and adapted to the study. The original questionnaire was not changed, and only added to the issues important for our research. The questionnaire “KOOS” is an extension of osteoarthritis index Western Ontario and McMaster University (WOMAC) and the most commonly used instrument for the assessment of relevant effects of therapy in patients with OA. The questionnaire designed to assess the short-and long-term results after a knee injury is divided into five sections: the

first covers the QOL following surgery for ACL, the second part includes information related to pain in different activities, the third unit of the questionnaire is related to daily activities that a patient can perform during the day, the fourth part is related to the level of physical activity, Lysholm score, and the final fifth part focuses on the very consciousness of the patients’ QOL and how they perceive their injury. Prior to surgery, all patients completed a questionnaire about the details of the injury and subjective scores. The questionnaire also represents the register of injuries of the ACL at the Department of Orthopedic Surgery and Traumatology in Novi Sad, where it is publicly available.

The questionnaire on the QOL, which was sent by electronic mail (e-mail) to all patients a year after surgery, explained its own purpose and asked the participants to give the consent so that their replies could be used for scientific purpose. The patients who were not willing to take part in the research or those who failed to respond to email or phone call were excluded from this study.

The standard scoring system as per “KOOS” questionnaire was used in the QOL evaluation [8]. According to the “KOOS” scoring scale, a higher score means better QOL and a better condition of the participants.

Within the descriptive statistic the parametric characteristics were determined by size: middle, standard deviation, minimum and maximum. For nonparametric characteristics, the frequency of the presence of certain categories was examined. Student’s t-test was used to calculate the differences in the middle values of attributes between the groups. For non-parametric characteristics, Pearson’s χ^2 -test was used to compare the differences in the intensity of the observed groups. All data were presented either in tables or graphs for each group.

Results

The rupture of the ACL was combined with the meniscal injury in 75 patients, whereas the ACL rupture was isolated in the remaining group of 110 patients.

According to the analysis of data by gender, age, type of sports activity, sports activity level, and the parameters based on the right or left knee injury, the difference between group A patients who had only damaged ACL and group B patients who had both the ACL damage and torn knee meniscus was not statistically significant (**Tabela 1**). A significant difference was observed only regarding the time elapsed from the time of injury to the time of surgery; namely, the patients from group A underwent earlier reconstruction of the ACL than those in group B.

Preoperative and postoperative Lysholm score was compared between these two groups. Preoperative Lysholm score was 79.5 and 71.9 for group A and group B, respectively; whereas postoperative score was 90.38 and 88.7 for group A and group B, respectively. There was no statistically significant difference

between two groups before and after surgery. However, according to the comparison of each of the two groups before and after surgery, there was a significantly better postoperative Lysholm score (**Table 2**).

When assessing the QOL, scoring was done according to the „KOOS” questionnaire [14]. The comparison of all sections of “KOOS” scale showed better QOL in the group of patients who had an isolated ACL injury than those with combined meniscal tear but the difference was not significant (**Table 3**).

Discussion

The instability of the knee caused by the ACL rupture has been attracting attention for more than a hundred years [9]. The main reason for the ACL

reconstruction is to enable people to return to sports without any limitations, as well as to their daily activities, and to prevent early development of secondary degenerative changes [1].

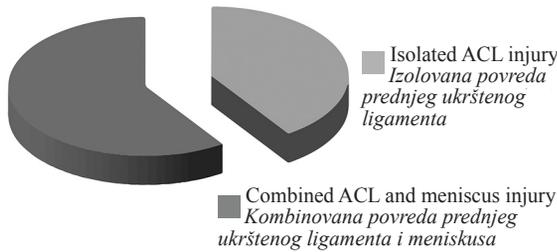
The ACL rupture is more likely to occur in male population [9]. Our study sample consisted of 146 male and 39 female patients. In the study of La Prade [10] there were 16 men out of 20 participants. A significantly higher prevalence of male population is attributed to the greater involvement of men in sports [3].

In our study the average age of patients was 26.1 years (ranging from 16 to 55 years), whereas the average age of men was 26.9 years and 23.3 years for women. The average age of the participants in the study conducted by Rios and Leger [11] was 24

Table 1. A comparison of different parameters in group A and group B
Tabela 1. Poređenje različitih parametara između grupe A i grupe B

		Group A (ACL) <i>Grupa A (ACL)</i>	Group B (ACL + meniscus tear) <i>Grupa B (ACL + lezija meniskusa)</i>
Sex/ <i>Pol</i>	Men/ <i>Muški</i>	87	59
	Women/ <i>Ženski</i>	23	16
Age/ <i>Uzrast</i>	Arithmetic mean (AM) <i>Aritmetička sredina (AS)</i>	25.7	26.7
	Standard deviation (SD) <i>Standardna devijacija (SD)</i>	7.5	8
	min./ <i>min.</i>	16	15
	max./ <i>max.</i>	55	45
Place of injury <i>Mesto povređivanja</i>	Sport/ <i>Sport</i>	106	72
	Walking/ <i>Hodanje</i>	4	1
	Training/ <i>Trening</i>	0	1
	Traffic accident <i>Saobraćajna nezgoda</i>	0	1
Sports activity <i>Vrsta sportske aktivnosti</i>	Recreational activities <i>Rekreativne aktivnosti</i>	51	44
	Professional sports <i>Profesionalni sport</i>	53	31
	Other activities/ <i>Ostalo</i>	6	0
Sports activity level <i>Nivo sportske aktivnosti</i>	Recreation/ <i>Rekreativan</i>	42	40
	Regional/ <i>Regionalan</i>	16	12
	Republic/ <i>Republički</i>	28	15
	International/ <i>Međunarodni</i>	18	8
Damaged knee <i>Strana povrede</i>	Other activities <i>Van sportske aktivnosti</i>	6	0
	Right/ <i>Desno</i>	70	42
Time elapsed from injury to operation (in months) <i>Vreme proteklo od povrede do operacije (u mesecima)</i>	Left/ <i>Levo</i>	40	33
	Arithmetic mean (AM) <i>Aritmetička sredina (AS)</i>	6.5	11.8
	Standard deviation (SD) <i>Aritmetička sredina (AS)</i>	1.3	21.9
	min./ <i>min.</i>	1	1
	max./ <i>max.</i>	24	99

ACL - prednja ukrštena veza



Graph 1. The structure of the sample by the type of injury
Grafikon 1. Struktura uzorka prema tipu povrede

years (ranging from 16 to 54 years), 34 and 29 years for men and women, respectively. The reason for these results could be the fact that younger people, both males and females, take up more extreme physical activities than older people.

The reason for finding ACL injuries in people of varying age during the research may lie in the fact that more and more people of different age are involved in strenuous activities, both professionally and recreationally and because of higher incidence of the traffic accidents in recent years [3].

Concomitant intraarticular injuries are more frequently found in patients with a ruptured ACL. Approximately half of all patients who have torn the ACL suffer from meniscus and cartilage damage as well [12]. Among these patients, 35% of diagnosed meniscus injuries were treated operatively during the same procedure [13]. Mechanical symptoms such as knee locking, decreased range of motion, crackle and periodical effusion are indicative of the meniscus tear. Clefs of the outer meniscus occur slightly more often than the inner meniscus splits with acute ACL injuries (56 % and 44 %, respectively), and internal rifts meniscus is more commonly found in patients with chronic ACL injury [13]. A delay in the ACL reconstruction for more than six months after the injury increases the risk of damaging the interior of the meniscus and it is therefore important to treat them in a timely manner [14]. Associated injuries of the meniscus and ACL lead to a greater prevalence of development of degenerative changes in the knee compared with isolated ACL injury [15]. OA occurs in 8% to 35 % patients after surgeries on the meniscus [16]. Losing the meniscus leads to the increased anterior laxity of the knee joint which becomes particularly rele-

vant in situations associated with the insufficient ACL. Other important functions of the meniscus include shock absorption, and the fact that they help in the lubrication and nutrition of articular cartilage. Meniscus includes mechanoreceptors and nociceptors, which are located in the outer zone, and thus perform an important function in the proprioception [17]. The reported literature rates of recovery after meniscus repair range from 65% to 96% [18-20] which is very important in comparison with the rate of early degenerative changes after partial and especially total meniscectomy.

The incidence of overall combined injury of the meniscus and ACL in the study done by Michalitsis et al. [21] was 63% (29% of the medial meniscus, 19% of the lateral and of both in 15% of cases), which is consistent with the data from other studies [22,23]. The overall incidence of violation of one or both menisci was greater in the knees that had undergone a reconstruction of ACL more than 12 months after the injury. The rate of meniscus and ACL injury varies from 3.5% to 80% in the literature [21-23]. Papastergiou et al. [23] found a frequency of 55.7% (25% for the inner meniscus, 17% for the outer, and of both in 14%). There were 6 groups in our study sample formed according to the time of reconstruction, i.e. 1.5, 3, 6, 12 and 24 months after the injury. It was observed that significantly higher incidence of meniscus injury occurred in the patients who had undergone the ACL reconstruction more than 3 months after the injury, that being different from Michalitsis et al. study [21]. Tandogan et al. [24] and Church and Keating [25] reported an increased incidence of meniscus injuries in the patients who had undergone the ACL reconstruction 12 months after the injury. In case of 12 months being the time point, the incidence of injuries of the meniscus was 55% and 74% in "0-12 months" group and in "more than 12 months" group, respectively.

These findings are consistent with the published results. The study of Michalitsis et al. [21] documented a higher incidence of medial meniscus, which coincides with the results of Tandogan et al. [24] but not with those of Cipolla et al. [26], where the external meniscus injury was significantly more frequent.

Based on an analysis of data according to the time between the time of injury and the time of surgery, we found in the present study that considerably

Table 2. Comparison of group A and group B regarding the Lysholm score and type of injury
Tabela 2. Poređenje grupe A i grupe B po pitanju Lišolmove bodovne skale i tipa povrede

	Lysholm and type of injury/Lysholm i tip povrede				
	Preoperational/Preoperativno		Postoperational/Postoperativno		
	t=3.04		t=1.32		
	p=0.002 (<0.05)		p=0.18 (>0.05)		
	\bar{X}	SD	\bar{X}	SD	
Group A/Grupa A	79.5	14.4	Group A/Grupa A	90.4	8.2
Group B/Grupa B	71.9	17.9	Group B/Grupa B	88.7	8.9

Table 3. Descriptive data on the significance of differences in „KOOS” scale questionnaires by the type of injury and gender**Tabela 3.** Deskriptivni podaci značajnosti razlike vrednosti KOOS bodovne skale u odnosu na tip povrede i pol

	Arithmetic mean/Aritmetička sredina				SD/SD			
	Injury/Povreda		Sex/Pol		Injury/Povreda		Sex/Pol	
	ACL ACL	ACL+meniscus damage ACL + povreda meniskusa	M M	F Ž	ACL ACL	ACL+meniscus damage ACL + povreda meniskusa	M M	F Ž
Life Quality Index <i>Indeks kvaliteta života</i>	17	16.3	16.6	17	2.8	2.8	2.7	3.1
Pain Intensity/ <i>Jačina bola</i>	10.5	10.2	10.5	10.2	1.5	1.8	1.7	1.6
Usual activities <i>Uobičajene aktivnosti</i>	19.8	19.4	19.7	19.7	2.9	2.7	2.8	3.2
Sports activities <i>Sportske aktivnosti</i>	47.4	45.8	46.5	47.8	11.4	12.4	11.8	12.1
Life quality awareness <i>Svesnost o kvalitetu života</i>	15.9	14.8	15.3	15.9	3.2	3.7	3.4	3.6

ACL- prednja ukrštena veza

less time had elapsed in group A (6.5 months on average) than in group B (11.8 months on average). This could be due to a lower number of initial injuries of the meniscus and ACL and later acceptance of indicated surgery in group B patients, but this is something that we cannot prove objectively. Michalitsis et al. [21] divided their study sample into three groups: group A consisted of patients who had undergone surgery in the first 3 months after injury, group B – the patients who had undergone surgery from 4 to 12 months, and group C – more than 12 months passed between the injury and surgery. The most important finding of their study was that the incidence of intraarticular cartilage injuries in particular increased with the time elapsed from the time of injury to the time of surgery, and according to them 12 months is a critical landmark for the reconstruction of the ACL.

In our study 110 out of 185 patients had an isolated tear of the ACL, and 75 of them had an associated injury either of internal or external meniscus. The study performed by Michalitsis et al. [21] included 109 patients. The combined injury of ACL and meniscus was present in 69 of them. Ihara et al. [27] reported that 40 out of 65 patients had the associated injury of the ACL and meniscus. The study of Røtterud et al. [28] analyzed 3,674 patients and 1,661 of them (20%) had just an ACL rupture, 1,219 patients (14%) had the associated lesion of medial or lateral meniscus, 657 patients (8%) had injury of both menisci, and 137 patients (2%) had an undiagnosed injury.

The postoperative results were evaluated by means of the Lysholm scoring system and they were higher than the preoperative score in both groups (the increase was from 79.5 to 90.4 and from 71.9 to 88.7 in group A and group B, respectively) with a statistically significant difference. In the analysis of the functional results, Jagodzinski et al. [29] found the Lysholm score to be 92.3 after surgery, whereas it had been 71.6 before treatment. Zhao et al. [30] reported the increase in the value of preoperative Lysholm score from 48.2

to 94.1 twenty-four months after surgery. Hamer et al. [31] found the Lysholm score after reconstruction of the ACL to be at level of 82.1, where 59% were rated as excellent or good. Paxton et al. [20] published an overview of literature in relation to sewing of the meniscus and a partial tear of the ACL. In the long term, sewing of the meniscus showed a higher Lysholm score in comparison with a group of patients who had partial meniscectomy.

The ACL reconstruction is a successful operation with rare complications which allows faster return of patients to everyday living, working and sports activities. It also reduces the total cost of treatment of these injuries [32]. Surgical reconstruction of the ACL is “quality of life” surgery, which allows young people to return to professional life and sports activities, and protects the knee against early irreversible degenerative problems. The overall objective is to restore the biomechanics of the knee, allow the continuation of activities that existed before the injury and perform optimization of HRQOL [33]. Psychological factors, such as fear of re-injury, can contribute to the limitation of participation in sports and poorer QOL 2-4 years after the injury of the ACL [34]. Other factors such as the persistent pain and post-traumatic OA [7] can be associated with each other and can influence the QOL. Any changes that occur after damage to the ACL lead to a difficulty in walking, running and jumping, especially when changing the direction of movement and significantly reduce the QOL of patients, particularly of those who have not given up sports activities after the injury [1]. In addition, the ability of the athlete to cope with stress shows the result in the recovery and progress of the rehabilitation program. The inadequate psychological response can be harmful and adversely affect the ability of the athlete to return to the previous level of sports participation and competition. This can eventually affect the sports perform-

ance as well and therefore increase the risk of re-injury [35].

Statistical analysis of our data showed a significant difference only in one chapter of „KOOS” questionnaire in terms of reduced QOL. Group A (ACL reconstruction only, 110 patients) showed a greater awareness of the QOL in comparison with group B (ACL reconstruction with partial meniscectomy, 75 patients). These results include all five sub-scales of the “KOOS” questionnaire. Ahlden et al. [33] in their study reported that the patients who had associated injuries, such as damage of the meniscus, had nearly the same QOL as those with an isolated rupture of ACL, and after 5 years the same study showed no significant difference between these two groups within the sub-scales related to sports and recreation. Barenius et al. [34] in their eight-year study observed that the patients who had had only ACL injury had higher scores in all five sub-scales of the “KOOS” questionnaire in comparison with the patients who had had associated injuries. Røtterud et al. [28] concluded in their two-year study that associated injuries with tearing the anterior cruciate ligament were not as common. They also stated that the results in all “KOOS” questionnaire sub-scales were approximately the same, and that there was no difference in quality of life observed among these groups.

According to the assessment done one year after the ACL reconstruction there was no difference in QOL, which did not mean that it may not change later in life. Several studies [15, 16] showed the development of degenerative changes after meniscectomy and with prolonged follow-up a lower QOL was observed when damaged meniscus had been removed. However, one of the values of our study is that it shows the direction of future research to be done on this issue and its implications on QOL.

The limitation of this study is a relatively small number of patients and short follow-up period; therefore, the long-term follow-up should provide a true picture of the QOL of these patients. Since the Department of Orthopedic Surgery and Traumatology in Novi Sad regularly keeps update to a register of these patients, it will be possible to continue this research in the coming years with an increased number of participants and a longer follow-up period.

Conclusion

A register of operated patients and questionnaires about quality of life a year after surgery, in which patients express their opinion and assessment of response to treatment and quality of life, provide basic and initial information about the effectiveness of treatment.

The patients with isolated rupture of the anterior cruciate ligament compared with the group of the patients with combined meniscus tear had a shorter period from injury to operation. There are statistically significant differences in the Lysholm score in both groups of patients before and after surgery, while no statistically significant differences were found when comparing these groups. When analyzing the data obtained in our study we found no statistically significant difference in quality of life between the patients who had only ruptured anterior cruciate ligament and those who in addition to injury of the anterior cruciate ligament had a damaged meniscus after 1-year follow-up. The difference was observed in terms of raising the quality of life where group A had significantly better awareness of quality of life compared to group B. This result could be due to a short follow-up and this was the main weakness of this study.

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