







ORIGINAL PAPER

Joanna Michalik Wolska ^{1(ABDEF)}, Dariusz Wolski ^{2(CDEF)}, Marek Bieńko ^{3(CDE)},
Radosław P. Radzki ^{3(CDE)}

Life quality of patients with the carpal tunnel syndrome

¹ Department of Oncology and Environmental Health, Faculty of Nursing and Health Sciences, Medical University, Lublin, Poland

² Department of Animal Anatomy and Histology, Faculty of Veterinary Medicine, University of Life Sciences, Lublin, Poland

³ Department of Animal Physiology, Faculty of Veterinary Medicine, University of Life Sciences, Lublin, Poland

ABSTRACT

Introduction. Carpal tunnel syndrome (CTS) is a neuropathy caused by pressure on the median nerve taking a course in the carpal tunnel. The characteristic symptoms of CTS are: pain, numbness, and a prickling sensation in the hand usually at night or after the physical effort. Symptoms of the disease affect patient quality of life which is described as a subjective estimation of life situation.

Aim. The aim of this study was to assess the quality of patient life in those who suffer from carpal tunnel syndrome. The studies were aimed to describe the general quality of patient life and the effect of symptoms on individual aspects in the life of the afflicted.

Materials and methods. The study sample was composed of 60 patients from rehabilitation and physiotherapy institutions located in the Lublin Voivodship (Poland). The studies were based on the questionnaires of life quality estimation dependent on health WHOQOL-BREF and EQ-5D-5L as well as on our own poll questionnaire.

Conclusions. Symptoms of carpal tunnel syndrome deteriorate the quality of patient life. Such patients have difficulties with daily activities. Among those examined, as many as 94.12% reported problems performing everyday actions (EQ – 5D – 5L). Difficulties with chores were reported by 86.70% of those examined. The patients with carpal tunnel syndrome are less effective at work. Reduced achievements at work were reported by 73.30% of those examined, and a need for a shorter work day was reported by 60%. For 53.30%, difficulties in doing their jobs were significant; 20% of the examined had to change their profession or work station. The examined patients often experienced pain which deteriorated quality of sleep and disturbed everyday functioning. The patients were presented with serious difficulties in doing professional work.

Keywords. carpal tunnel syndrome, quality of life, neuropathies

Corresponding author: Joanna Michalik Wolska, email: michalik_joanna@wp.pl

Participation of co-authors: A – Author of the concept and objectives of paper; B – collection of data; C – implementation of research; D – elaborate, analysis and interpretation of data; E – statistical analysis; F – preparation of a manuscript; G – working out the literature; H – obtaining funds

Received: 12.06.2018 | Accepted: 11.08.2018

Publication date: September 2018

Introduction

According to the conception of World Health Organization (WHO), life quality is related to all aspects of human functioning. Its essential element is the health condition. Accordingly, the conception health related quality of life (HRQOL) was formulated.^{1,2} It defines the effect of disease and accompanying symptoms on functioning of persons in different spheres. Occurrence of pain and disturbances of organ functions are often connected with life style and limitations in performing some actions. In order to determine the effects of disease on a person's functioning, studies on life quality of patients there are carried out in those suffering from some illnesses or dysfunction.^{1,2} The most popular questionnaires for life quality evaluation are WHOQOL-BREF and EQ-5D.²

Carpal tunnel syndrome is the most frequently occurring pressure mononeuropathy of the peripheral nerve innervating the man's upper limb.^{3,4} This relates to the median nerve which is the main nerve supplying the man's upper limb. Coming to the palm surface of the hand, it is divided into terminal branches i.e. the muscle branch to the wave of muscles and sensorial branches to the skin of palm surface three and half fingers on the radius side.⁵ The carpal tunnel is one of neuralgic sites where the median nerve can undergo excessive compression and lose its function. The carpal tunnel syndrome is caused by narrowing of the carpal tunnel or swelling of tendons or their capsules. Narrowing in the tunnel strike the median nerve causing symptoms of paraesthesia. Such syndrome is affected also by diseases of the entire system, inflammatory state as well as overwork e.g. in the computer operator, hairdresser, mechanic.^{6,7,8} This illness is arduous due to the night and post endeavour pain. Parasthesia, feeling disturbance and arm motorial disfunction render carrying on work and everyday activities render difficult. The carpal tunnel syndrome is one of the most frequent reasons for the sick – leave. According to the epidemiological data, in well developed countries this syndrome is found in about 10% of women and 5% of men professionally active. About 50 year old women are the most frequent group suffering from it. Due to profession, however, it is more frequent in men. Another reason for this diseases in female are hormonal changes during menopausal period.⁷

One of the symptoms of this illness is lower sleep quality with results in regular life disturbance. Pain and disfunction of hand result in limited men's activity in many areas. This is connected with functioning in somatic, psychological and social spheres.⁹⁻¹¹

Etiology of carpal tunnel syndrome

Injury of the median nerve is caused by the increased of pressure in the carpal tunnel to above the critical level and the decrease of blood flow below that providing sufficient nerve nourishment. Even the increased of

pressure to above 30 mmHg can lead to mild ailments due to the symptoms. However, if the pressure in the tunnel reaches 40 – 50 mmHg severe injury of the median nerve occurs. The histological studies of injured nerves showed demyelination and/or axonal degeneracy. CTS can have primary character when the nerve is injured because of the mechanical conflict (limited space in the carpal tunnel) and processes associated with it, as well as the secondary one, caused by injury or disease.^{12,13}

Its general causes can be, among others, endocrinology diseases (diabetes, thyroid gland hypofunction), connective tissue diseases (rheumatological arthritis) degenerations and arthritis, hemophilia, acromegaly, obesity, amyloidase, boreliosis, sarcoidose, dialyse therapy, pregnancy swelling innate tendency to compression neuropathy.¹⁴ This is connected mainly with the situation of compression of the nerve inside the deformed carpal tunnel caused by the body position during work.¹⁵ This results from repeated flexion and extension and extension of the carpal, particularly connected with necessity of getting hold of something with fingers or closing the hand. In the case of people whose symptoms are connected with doing physical work CTS occurs mostly on one side and refers to the dominant hand.¹⁶ However, the studies by Brhel et al. Proved that despite subjective or clinical occurrence of symptoms in one limb, bilateral injury was found in 81,4% of the patients by electromyography (EMG) examination.^{10,17}

Symptoms of carpal tunnel syndrome

Due to the fact that the sensory fibre of the median nerve are injured first, the initial symptoms of the carpal tunnel syndrome are parastheses in the hand. First they occur in the finger bulbs and then the palm surface of the hand. The characteristic subjective symptoms are pain and prickling sensation after the effort and at night resulting in awakening.¹⁸ The second – sided manifestation of symptoms is more common than the one – sided (60%). However, it is more frequent or stronger in the dominant hand.¹⁹ Pain and feeling disturbances inflict first of all the thumb, the index finger, finger III and half of finger IV. These symptoms are often accompanied by the feeling of hand swelling and stiffness. In the further phase muscles in this area are weakened. Pains and numbness appear not only at night but also during the day. The carpal pains can be accompanied by ailments in the forearm being so called distant or transfer pain. The advance stage of the carpal tunnel syndrome is associated with loss symptoms: muscle obliteration, weakening sense of touch, sweating disturbance in the area provided by the median nerve. Muscle weakening leads to motorial precision handicap. Moreover, there occur some difficulties in grasping small objects (disturbance of thumb opposition function). In the objective studies loss of thumb muscles wave is evident. This results in

the position of the first finger in the palm place which gives the picture of so called „monkey hand”¹²

Aim of the paper

The aim of the paper was to determine life quality of patients with the carpal tunnel syndrome. The paper includes the information about the declared and real quality of life studied by means of questionnaires. Moreover, the investigations are aimed at revealing the data about intensification of symptoms of carpal tunnel syndrome and their effect on quality of sleep, doing work, and every activities. They also estimated the effect of pain on emotions and social relations.

Material and methods

60 patients from local rehabilitation and physiotherapy insitutions in the Lublin Voivodship were subjected to the study. They were not operated on the carpal tunnel syndrome. The main group were 50 – 65 years old patients. The investigations were carried out at the beginning of 2016 and participation was anonymous. The research tools were three questionnaires: the own questionnaire, the World Health Organization (WHOQOL – BREF) and the questionnaire EQ-5D-5L.

Characteristics of the studied group

The study group was 60 patients, 44 women (73.30%) and 16 men (26.70%). The patients were divided into three group : < 35, 35 - 49, 50 - 65 years old. The largest number was at the age 50 – 65 (34 people : 24 women and 10 men). The average age was 47 years old. Most of them lived in the village (42 people – 70%), the others lived in towns up to 100 thousand inhabitants (18 people – 30%). In most of them the ailments connected with the carpal tunnel syndrome lasted for 4 – 12 months. In the examined group there were 8 pensioners (13.33%) and 52 professionally active people (86.67%). Most of them were manual workers (40 people – 66.67%).

Results

General quality of life of the people suffering from the carpal tunnel syndrome estimated by means of the questionnaire WHOQOL – BREF was on the average 3.23 ±0.77. No significant statistical differences were found regarding quality of life between men and women as well as place of living. Considering the age, the estimation of life quality was the lowest in the case of 50 – 65 years old (53.85% in this group described it as bad). The best estimation of life quality came from 35 – 49 year old

Table 1. Classification of replies about life quality depending on pain intensification and time of disease symptoms duration (n – the numer of the people beig examined)

		Bad	Neither bad nor good	Good	Statistical analysis
		n % of the given feature % of the total	n% of the given feature % of the total	n % of the given feature % of the total	
Intensification of pain in the scale VAS	1-3	0	2	8	df=23, p=0,002750
		-	20 %	80%	
	-	3.33%	13.33%		
	4-6	0	6	10	
		-	37.5%	62.5%	
	-	10%	16.67%		
7-10	14	12	8		
	41.18%	35.29%	23.53%		
		23.33%	13.33%		
How long have the symptoms lasted	< 3 months	0	0	6	df=23, p=0,000367
		-	-	100%	
	-	-	10%		
	4-12 months	2	8	14	
		8.33%	33.33%	58.33%	
	3.33%	13.33%	23.33%		
	2-3 years	2	4	6	
		16.67%	33.33%	50%	
	3.33%	6.67%	10%		
	4-5 years	4	6	0	
40%		60%	-		
6.67%	10%	-			
> 5 years	4	4	0		
	50%	50%	-		
6.67%	6.67%	-			
Age	< 35	0	4	8	df=23, p≤ 0,01
		-	33.33%	66.67%	
	-	6.67%	13.33%		
	35-49	2	2	18	
		9.1%	9.1%	81.82%	
	3.33%	3.33%	30%		
	50-65	14	4	8	
		53.85%	15.38%	30.77%	
23.33%	6.67%	13.33%			

people (81.82% estimated it as good). These dependences were statistically significant ($p \leq 0.01$).

Statistically significant dependences between the estimation of life quality and degree of pain intensification as well as time of illness symptoms ($p \leq 0.05$). The higher the pain intensification measured using the scale VAS, the worse estimation of life quality. Taking into consideration the time of ailment, the estimation of life quality decreased with the increasing time of symptoms occurrence. All patients with the symptoms lasting over 4 years did not estimate their life quality positively.

Despite relatively good estimation of life quality, most of those being examined were dissatisfied with their health condition (22 persons – 36.7%). The average estimation in the scale 1-5 of questionnaire WHOQOL-BREF was 2.80 +/- 0.96. The statistically significant dependence was found between the satisfaction with the health state and pain intensification as well as the time of duration of the carpal tunnel syndrome symptoms ($p \leq 0.05$ and $p \leq 0.01$ respectively). The patients' dissatisfaction with their own health condition grew with the length of disease occurrence.

The questionnaire WHOQOL – BREF included the questions referring to four areas of human life: somatic, psychological social and environmental. The social area was estimated the most highly.

The reply to the question in the own questionnaire: „Do you think that health condition affects negatively you and your life?” - most of the examined person replied – „Yes” (34 women – 77,30% of the group and 10 men – 62.50% of the group). The dependence of the reply about the negative effect of health condition on life on age was statistically significant ($p \leq 0.01$). There was significant statistical correlation between the reply to the question about the negative effect of health condition on life and the question about satisfaction with the health condition ($p \leq 0.05$). With the increase of dissatisfaction with the own health condition, the increasing number of replies confirming the negative effect of health condition on life was obtained.

In the questionnaire EQ- 5D – 5L the patients made the five – scale evaluation in the following categories: locomotive faculty, self – service, common activities (e.g. work, education, housework, family activities leisure ac-

Table 2. Classification of replies to the questions about satisfaction with the own health state depending on pain intensification and duration of disease symptoms (n – the number of subjects)

		Very satisfied	Unsatisfied	Neither satisfied nor unsatisfied	Satisfied	Statistical analysis
		n % of the given feature % of the total	N % of the given feature % of the total	N % of the given feature % of the total	N % of the given feature % of the total	
Pain intensification in the scale VAS	1-3	0	2	0	8	df=23, p=0,005560
		-	20%	-	80%	
		-	3.33%	-	13.33%	
	4-6	0	4	6	6	
		-	25%	37.5%	37.5%	
		-	6.67%	10%	10%	
	7-10	4	16	10	4	
		11.76%	47.06%	29.41%	11.76%	
		6.67%	26.67%	16.67%	6.67%	
How long have the symptoms lasted	<3 months	0	0	2	4	df=23, p=0,001555
		-	-	23.67%	66.67%	
		-	-	3.33%	6.67%	
	4-12 months	0	6	8	10	
		-	25%	33.33%	41.67%	
		-	10%	13.33%	16.67%	
	2-3 years	2	4	2	4	
		16.67%	33.33%	16.67%	33.33%	
		3.33%	6.67%	3.33%	6.67%	
	4-5 years	2	4	4	0	
		20%	40%	40%	-	
		3.33%	6.67%	6.67%	-	
	>5 years	0	8	0	0	
		-	100%	-	-	
		-	13.33%	-	-	

Table 3. Classification of the replies to the question: „Do you think that the health condition affects your life negatively? Depending on the age and answers to the question about satisfaction with the own health condition (n – the number of examined people)

		Yes N % of the given feature % of the total	It is hard to say N% of the givenfeature % of the total	No N % of the given feature % of the total	Statistical analysis
Age	<35	8	4	4	df=23, p≤0,01
		50%	25%	25%	
		13.33%	6.67%	6.67%	
	35-49	6	0	4	
		60%	-	40%	
		10%	-	6.67%	
	50-65	30	4	0	
		88.24%	11.76%	-	
		50%	6.67%	-	
Are you satisfied with your health condition?	Very dissatisfied	4	0	0	df=17, p=0,040437
		100%	-	-	
		6.67%	-	-	
	Dissatisfied	22	0	0	
		100%	-	-	
		36.67%	-	-	
	Neither satisfied nor dissatisfied	10	4	2	
		62.5%	25%	12.5%	
		16.67%	6.67%	3.33%	
	Satisfied	8	4	6	
		44.44%	22.22%	33.33%	
		13.33%	6.67%	10%	

tivities), pain/discomfort, anxiety and low spirits. Problems with the locomotive faculty were reported in the age group 50 – 65.

The dependences between the consciousness of health condition, age and gender were not statistically significant. However, the relations between the estimation of health condition in the scale EQ VAS and the estimation of the own health one by means of the own questionnaire proved to be statistically important.

The subjects had difficulties in doing professional work due to the carpal tunnel syndrome. However, among office workers such difficulties were insignificant or great. These dependences were not statistically significant ($p \leq 0.01$).

The ailments resulting from the carpal disease set bounds to the activities requiring precision e.g. writing, cutting or lacing. They affected not only work but also ways of spending leisure time. As many as 44 people (73.30%) had to give up some jobs and necessity of shortening of work time was reported by 60 % of those examined. 86.70% had difficulties doing chores. Statistically significant dependence was found between the feeling of pain or discomfort (measured by the questionnaire EQ-5D, -5L) and necessity of giving up some

leisure activities ($p \leq 0.05$). All people experiencing acute pain nor discomfort had to rule out some forms of spending free time. A similar statistically significant estimates ($p \leq 0.01$) was found between the symptoms of CTS and pain intensification measured by the VAS scale.

Discussion

Treatment of patients should not be confined only to improvement of clinical indices. Of significant importance is paying attention to subjective symptoms accompanying diseases which affect greatly patients' life and its quality.²⁰ Getting to know the problems particularly arduous for the patient and the illness oriented treatment improve communication with the patient and results in greater engagement of the sick in the treatment proces. This leads to more effective therapy and reduction of its costs.⁵

Life quality is particularly affected by chronic and recurring diseases resulting in pain and restriction of function of some organs. The carpal tunnel syndrome is such a disease. It most frequently occurs in 30-60 year old people. Moreover, the numer of women suffering from it is 2-3 times greater than that of men.¹⁴ In

the own investigations most of the 60 – people research group were 50 – 65 year old patients (34 persons – 56.7%). Mostly they were women (44 persons – 73.3%) which is consistent with the literature data.²¹

As follows from the investigations the greater injury of the median nerve and degree of disease development, the larger emotional disorder of the patients is. The sick with chronic pain ailments have tendency toward depression and symptoms exaggeration. This affects the feeling of pain and extent of disability. The studies by Pogorzelski showed the correlation between the pain in the hand, feel deterioration, smaller strength in hand disappearance of muscles wave as well as appearance of anxiety and depression. The results obtained by the questionnaire EQ-5D, -5L showed anxiety and depression in 83.33% of the patients. The questionnaire WHOQOL - Bref showed worse results in somatic and psychological areas compared to the other two areas (social and environmental).^{22,23}

Atroschi et.al. carried out investigations on life quality of patients suffering from the carpal tunnel syndrome before and after the capral operation. They estimated, among others, physical functioning, its effect on playing roles, social functioning as well as influence of emotional state on everyday life.²² Similar to the own studies the social functioning category showed the best results.

Despite the fact that self – estimation of life quality and health condition was quite good, a great number of those studied were dissatisfied with their health condition. In the studies by Sanni et al. the value of patients' health with the CTS symptoms estimated using EQ VAS was lower (60 – 80. the average 70) but higher than in the own examination.²⁴

According to the examined patients, the health condition affects negatively their life. Such opinion was most frequently expressed by those in the oldest group. The estimation of health condition effect on life correlated with their own estimation of health condition – the worse health estimation, the more negative its effect on life of the examined. According to the hitherto reports the frequency of CTS occurrence in computer users and in general population is similar.²⁴ The investigations by Lewańska et al. proved that despite patients' expectations and common belief the symptoms connected with the carpal tunnel syndromes have another cause than work with the computer.²⁵

Of five categories estimated by means of the questionnaire EQ-5Dm -5L the largest problems involved pain or discomfort. All examined patients felt pain or discomfort and estimated it as mild. There were frequent statements that pain nor discomfort was strong (30%) – mainly among 35 - 49 year old patients (40% of the group). Of the patients examined by Sauni et al. pain or discomfort was experienced by 85.1 %. Also the studies by Atroschi et al. proved low estimation of pain which

reached the average value 36.9.²⁴

Due to common character and frequent occurrence in the production age people, the carpal tunnel syndrome is a the production age people, the carpal tunnel syndrome is a cause of sick leave.²⁶ All examined patients had difficulties in doing their jobs due to it. For most of them they were serious (32 people – 53.3%). Twelve of them were not able to perform their professional duties (20%) and they were forced to change their jobs or posts. A large part of the examined declared the need to shorten the work time (36 persons – 60%) and smaller achievements at work (44 persons – 73.3%) due to the symptoms of carpal tunnel syndrome. Żyłuk and Puchalski reported in their studies that 39% of professionally active patients experienced arduous pain because of carpal tunnel syndrome which resulted in the three – month sick leave.^{7,8}

References

1. Schünke M, Schulte E, Schumacher U, Voll M, Wesker K. *Atlas anatomii człowieka tom I*. Wrocław: Wyd. Medpharm; 2013:373.
2. Wnuk M, Marcinkowski J. Przegląd koncepcji jakości życia w naukach społecznych. *Hygeia Public Health*. 2013;48(1):10-16.
3. Kunikowska B, Lewandowska M, Glińska J, Puzder A, Szrajber B, Kujawa J. Analiza porównawcza jakości życia chorych z różnymi dysfunkcjami narządu ruchu. *Kwart Ortop*. 2011;4:329-340.
4. Zwolińska J, Kwolek A, Skrzypiec J. Skuteczność wybranych metod fizjoterapii w leczeniu zachowawczym zespołu cieśni nadgarstka (zcn). *Prz Med Uniw Rzesz*. 2007;3:239-244.
5. Turska W, Skowron A. Metodyka oceny jakości życia. *Farm Pol*. 2009;65(8):572-580.
6. Marquardt TL, Evans PJ, Seitz WH Jr, Li ZM. Carpal arch and median nerve changes during radioulnar wrist compression in carpal tunnel syndrome patients. *J Orthop Res*. 2016;34(7):1234-40.
7. Żyłuk A, Puchalski P. Historia naturalna zespołu kanału nadgarstka – przegląd piśmiennictwa. *Chir Narz Ruchu*. 2010;74(4):261-266.
8. Żyłuk A, Puchalski P. Niezdolność do pracy przed i po operacji zespołu kanału nadgarstka. *Chir Narz Ruchu*. 2008;73(5):303-308.
9. Biernawska J, Niemczyk A, Pierzchała K. Udział czynników zawodowych i pozazawodowych w etiopatogenezie zespołu cieśni nadgarstka. *Med Pr*. 2005;56(2): 131-137.
10. Brhel P, Dufek J, Řihová A, Bartnická M. Rozwój zespołu cieśni nadgarstka (ZCN) po stwierdzeniu choroby zawodowej. *Med Pr*. 2003;54(1):17-21.
11. Pilecka-Rybka K, Bułatowicz I, Hagner W, Biesek D, Janowiak-Maciejewska K. Wyniki operacyjno-usprawniającego postępowania w zespole cieśni nadgarstka. *Valetudina - Post. Med Kli. Wojsk*. 2011;16(1):38-41.

12. Bilewicz T, Durmała J, Dzierżęga J, Flak M, Keller A. Metoda mięśniowo-powięziowego rozluźniania (myofascial release) w terapii zespołu cieśni nadgarstka – doniesienie wstępne. *Ann Acad Med Siles.* 2007;61(4):289-293.
13. Mazurczak-Pluta T, Pomianowski S, Szopiński K. Zespół kanału nadgarstka w praktyce lekarza rodzinnego. Znaczenie badania ultrasonograficznego w odniesieniu do elektromiografii. *Ultrasonografia.* 2007;31:73-84.
14. Nawrot P, Nowakowski A, Bartochowski Ł. Współczesne poglądy dotyczące diagnostyki i leczenia zespołu kanału nadgarstka. *Chir Narz Ruchu Ortop Pol.* 2008; 73(2):112-115.
15. Mediouni Z, de Roquemaurel A, Dumontier C. Is carpal tunnel syndrome related to computer exposure at work? A review and meta-analysis. *J Occup Environ Med.* 2014; 56:204–208.
16. Palmer KT, Harris EC, Coggon D. Carpal tunnel syndrome and its relation to occupation: a systematic literature review. *Occup Med.* 2007;57:57–66.
17. Biesek D, Magdzik J, Pilecka K. Elektrofizjologiczna ocena skuteczności kompleksowego leczenia zespołu cieśni nadgarstka u osób zwiększonego ryzyka wystąpienia mononeuropatii z ucisku nerwu pośrodkowego. *Prz Lek.* 2011;68(3):175-178.
18. Georgiew F, Maciejczak A, Otfinowska E. Ocena stopnia nasilenia dolegliwości subiektywnych towarzyszących zespołowi kanału nadgarstka w zależności od nasilenia zmian stwierdzanych badaniem elektroneurograficznym. *Rehabil Med.* 2010;14(2):17-22.
19. Harris-Adamson C, Eisen A, Dale AM, Evanoff B. Personal and workplace psychosocial risk factors for carpal tunnel syndrome: a pooled study cohort. *Occup Environ Med.* 2013;70(8):529–537.
20. Bożek M, Gaździk T.S. Wartość badania klinicznego w diagnostyce zespołu kanału nadgarstka. *Ortop Traumatol Rehabil.* 2001;3(3):357-360.
21. Kroc A, Kroc Ł, Kuliński W. The effects of selected physical procedures on the treatment of unadvanced stage of idiopathic carpal tunnel syndrome and the patient quality of life. *Acta Balneol.* 2013;55(4):249-256.
22. Atroshi I, Gummesson C, Johnsson R, Sprinchorn A. Symptoms, disability, and quality of life in patients with carpal tunnel syndrome. *J Hand Surg.* 1999;24(2):398-404.
23. Pogorzelski R, Kułakowska A, Halicka D, Drozdowski W. Profil neurologiczny i emocjonalny pacjentów z zespołem cieśni nadgarstka. *Prz Lek.* 2011;68(5):269-273.
24. Sauni R, Virtema P, Pääkkönen R, Toppila E, Pyykkö I, Uitti J. Quality of life (EQ-5D) and hand-arm vibration syndrome. *Int Arch Occup Environ Health.* 2010;83:209–216.
25. Lewańska M, Wągrowaska-Koski E, Walusiak-Skorupa J. Analiza czynników etiologicznych zespołu cieśni nadgarstka w populacji osób pracujących zawodowo z użyciem komputera. *Med Pr.* 2013;64(1):37-45.
26. Parot-Schinkel E, Roquelaure Y. Factors Affecting Return to Work After Carpal Tunnel Syndrome Surgery in a Large French Cohort. *Arch Phys Med Rehabil.* 2011;92:1863–1869.