International Journal of Bio-Science and Bio-Technology
Vol.8, No.5 (2016), pp. 23-32
http://dx.doi.org/10.14257/ijbsbt.2016.8.5.03

Appropriate Information System to Improve Physical Condition after Carpal Tunnel Release

Seong-Ran Lee

Department of Medical Information, Kongju National University
leesr@kongju.ac.kr

Abstract

This study aimed to develop appropriate information systems to improve physical condition after carpal tunnel release. This survey was conducted with 136 patients who have visited orthopedic surgery of a university hospital located in Chungnam area from December 8, 2014 to March 27, 2015. Analysis of data revealed that skill was the highest value of Cronbach's alpha=0.86 for internal consistency, Cronbach's alpha=0.81 in physical condition, Cronbach's alpha=0.83 in psychiatric condition. The results of this study are as follows. Firstly, for marital status, the proportion of single(28.4%) of the experimental group were significantly a lower rate than the proportion(39.5%) of control group(X^2=8.35, p=.04). for carpal tunnel syndrome, the carpal status in subjects who have suffered from hand tingling decreased after the system application(t=4.05, p=.027). Therefore, this system will contribute to improve efficient operation strategies to apply the guidelines to improve physical function after carpal tunnel release in patients with carpal tunnel syndrome

Keywords: *Appropriate, Information systems, Physical condition, Carpal tunnel release, Paresthesia*

1. Introduction

Carpal tunnel disease(CTD) is a health condition in which the middle nerve is compressed as it travels through the hand at the carpal tunnel and causes hand's pain, numbness and tingling in the part of the wrist that receives feeling from the middle tissue [1-3]. The feeling often first appear in one or both wrist during the evening, since many patients sleep with flexed hand. A person with carpal tunnel syndrome may wake up feeling the need to shake out the hand or wrist. When hand's pain is not good, patients might feel tingling during the night. Decreased grip strength may make it difficult to form a fist, grasp small objects, or performs hand's works. For continuous injury, the muscles at the base of the thumb may waste away. Some patients can't tell between hot and cold by touch [4-6].

The CTD is very serious level in some people than in others. Other contributing factors include wound or pain to the hand that cause edema, such as rupture or injury. Overmovement of the hyperneurosis, degenerative arthritis, other disorders in the wrist ligament, activity stress, repeated use of vibrating wrist tools, fluid retention during delivery, frozen shoulder or the formation of a cyst or cancer in the canal. For some patients no cause can be identified. There is little health data to prove whether repetitive and forceful movement of the hand and finger during activity or leisure work can cause CTD. Other diseases such as inflammation of ligament and bone have been associated with repeated activities performed in the course of normal movement or other movement [7-8].

Carpal tunnel surgery is recommended when there is severe sensation disorder, muscle weakness, or atrophy, and when evening-splinting or other conservative interventions no longer control moderate disorders. The operation may be done with wrist

ISSN: 2233-7849 IJBSBT

anesthesia with or without sedation, or under IV or IM anesthesia. In general, some cases can be controlled for 2 months to 3 years, but moderate patients are unrelenting symptomatically and are likely to result in carpal tunnel release surgery. In rare cases, the disorders of hand and pain may return the most common problem, or there may be temporary loss of movement when pinching or gripping materials, due to the cutting of internal oblique carpal aponeurosis [9-11].

Therefore, the supply through the construction of information system is one of the most important services that can provide to patients after carpal tunnel release. Thus, the purpose of this paper is to develop appropriate information systems to improve physical condition after carpal tunnel release.

2. Materials and Methods

2.1. Construction of Database System

The study is to conduct effectively system model by making effect of application contents. Firstly, the first stage of the program development is to identify a disorder related system and need-assessment of the patients. Secondly, it carries out the procedures of conducting disorder analysis and setting a goal of the contents. When all of the above are done properly, the contents is to be implemented. Thirdly, it is to identify the physical elements of successful functional situation and get the information about it. Program formation which will be reflected in effectively system model is designed as part of information achieving and synthesis. Fourthly, an experimental stage which is applied in the field has been implemented by invention effect. In order to evaluate the functional durability, follow-up contents have been done for four months after termination of the test in Figure 1.

2.2. Analysis and Design of Information System

This study is to develop predictive technology by making application of mediating system. The first phase of the system is to analyze the necessity of a new modeling technology for patients after wrist tunnel release. The secondary phase obtained the structure elements of a modeling technology. In the third step, modeling technology that is provided by mediating technology presents the assessment as the effect of results. The four method in the phase of modeling analysis and follow-up test. The five phase is to evaluate the effect of modeling technology and build up the constructure in Figure 2.

2.3. Materials

This survey was conducted with 136 patients who have visited orthopedic surgery of a university hospital located in Chungnam area from December 8, 2014 to March 27, 2015. The application effect was estimated for reduction of carpal tunnel syndrome after application and compared with before and after information system application. In this work, the reduced percent of carpal tunnel syndrome after the information application was showed as an element of time elapsed after application : 25, 45, 65 and 85 days.

2.4. Study Methods

Basic information of study subjects was measured descriptive statistics by percentage and number. The pairwise t-test was done to compare the before and after intervention effect for physical condition rate of medical information. The collected data were examined the distribution of characteristics and physical function for patients after carpal tunnel release by using SPSS 17.0. Reliability verification through the internal consistency. Analysis of data revealed that skill was the highest value of Cronbach's

alpha=0.86 for internal consistency, Cronbach's alpha=0.81 in physical condition, Cronbach's alpha=0.83 in psychiatric condition.

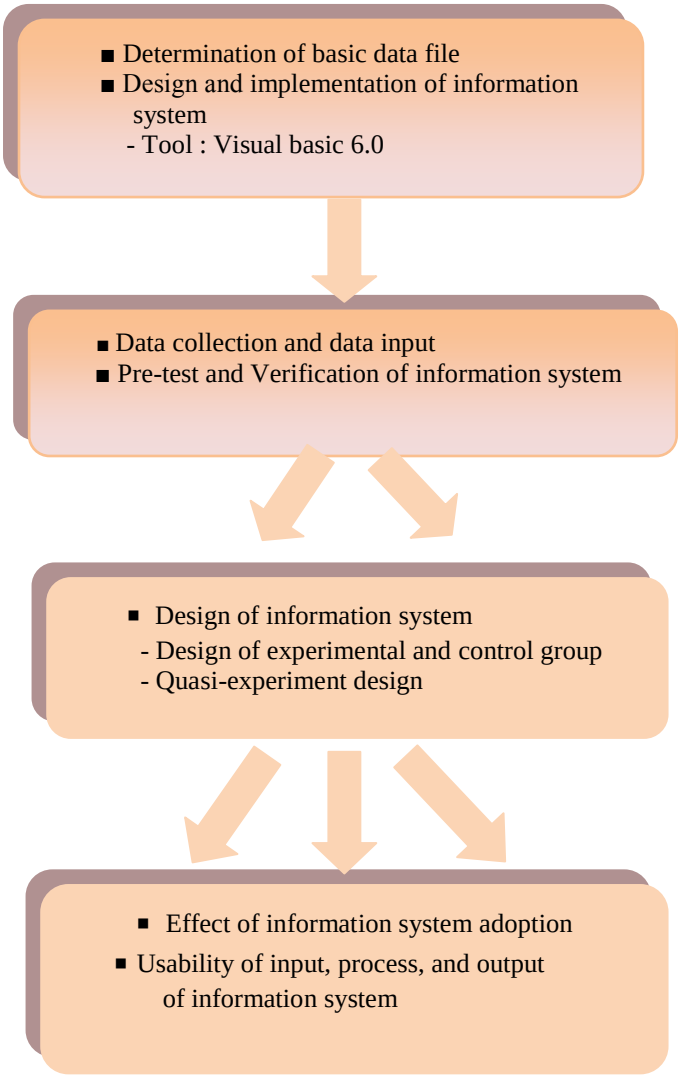

Figure 1. Operating System Structure for Patients after Carpal Tunnel Release

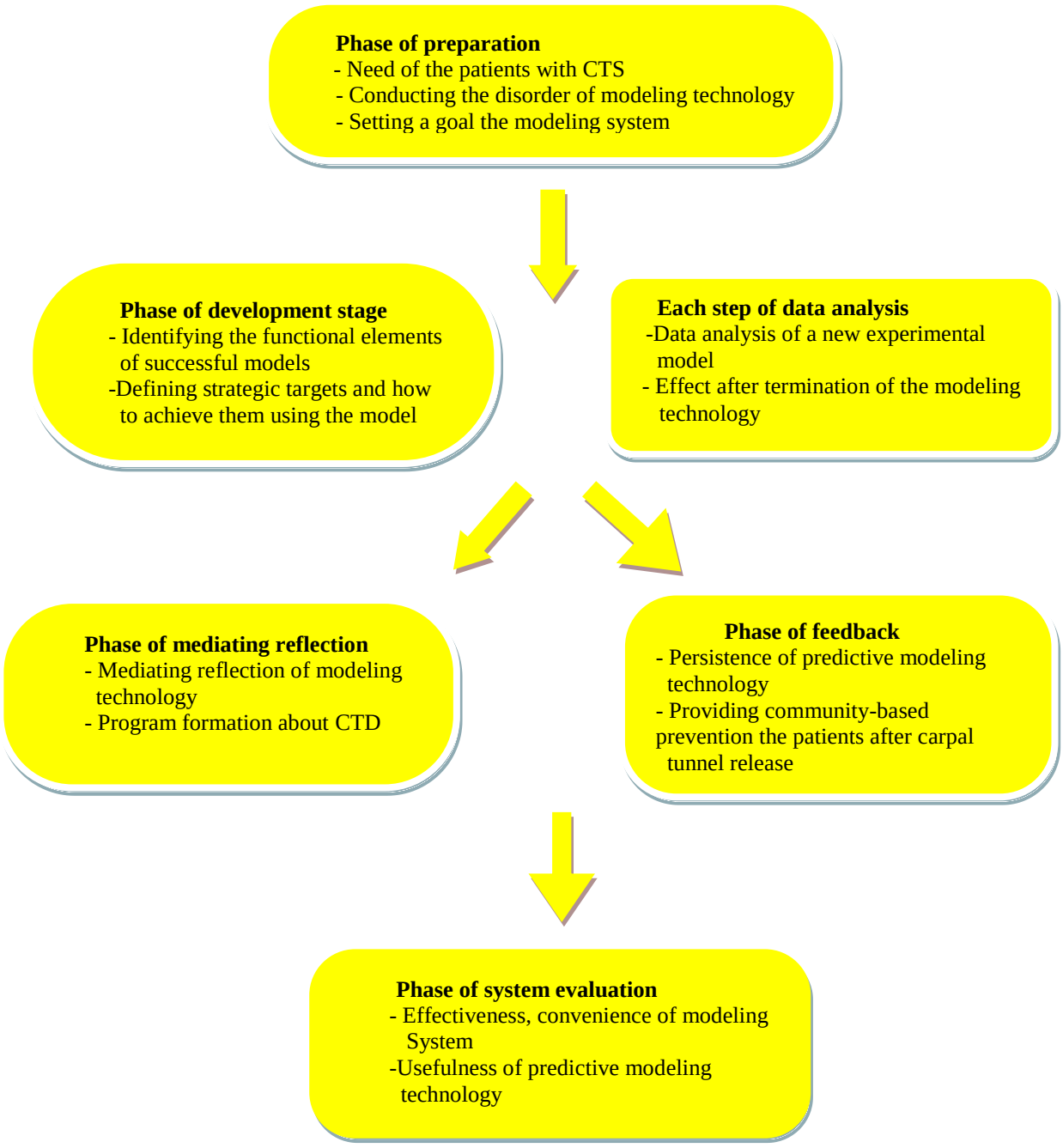

Figure 2. Design of an Information System to Improve Physical Condition

3. Results

3.1. Basic Information of Subjects in This Study

Table 1 presents general characteristics of subjects in this study. For gender, female(51.5%) of the control group showed a higher rate than female(45.6%) of the experimental group(X^2=7.51, $p<0.05$). Age groups were divided into four groups for two groups. That is, it divided less than 39 years, 40 to 49 years, 50-59 years, 60 years or more. It was higher in experimental group(39.7%) than in control group(29.4%) among

those aged 50-59 years. In a marital status, married respondents(75.0%) of the experimental group were significantly higher rate than respondents(61.8%) of the control group(X^2=4.52, $p<0.05$).

Table 1. General Characteristics of Subjects in This Study

Variables	Experimental group N(%)	Control group N(%)	X^2
Gender			
Male	31(45.6)	35(51.5)	7.51
Female	37(54.4)	33(48.5)	
Age			
≤39	5(7.4)	8(11.8)	12.49
40-49	14(20.6)	16(23.5)	
50-59	27(39.7)	20(29.4)	
≥60	22(32.4)	24(35.3)	
Monthly income			
≤99	12(17.6)	8(11.8)	8.4*
100-200	9(13.2)	15(22.1)	
201-299	26(38.2)	34(50.0)	
≥300	21(30.9)	11(16.2)	
Marital status			
Single	17(25.0)	26(38.2)	4.52*
Married	51(75.0)	42(61.8)	
Education			
Under middle	19(27.9)	21(30.9)	10.6
High school	26(38.2)	29(42.6.)	
Over college	23(33.8)	18(26.5)	
Total	68(100.0)	68(100.0)	

$p<0.05$

3.2. Comparison of Physical Condition before and After Information System Application

Table 2 shows the comparison of physical condition before and after information system application. The result verified the significance of physical function on the carpal tunnel syndrome after intervention as compared before intervention. For carpal tunnel syndrome, the carpal status in subjects who have suffered from hand tingling decreased after the system application (t=4.05, p=.027).

Table 2. Comparison of Physical Condition before and After Information Application

Items	Before	After	t	P
	Mean±S.D	Mean±S.D		
Onion intake	29.65±0.73	42.82±0.75	-1.72	.000
Garglic intake	32.62±1.47	44.69±0.52	-2.84	.047
Quince intake	16.91±3.25	31.07±2.19	-5.39	.000
Stretching	25.73±0.28	40.57±1.82	-6.27	.000
Warm abdomen.	31.49±4.15	38.62±3.92	-1.83	.513
Hand pressure	15.27±1.38	32.05±0.68	3.16	.000
Paresthesia	44.63±5.15	26.19±4.92	1.73	.000
Egg intake	27.18±2.64	40.38±3.24	-4.51	.000
Blood disorder	42.51±0.74	31.72±1.37	5.29	.138
Depression	31.48±0.94	29.17±2.86	0.82	.621
Shoulder pressure	16.25±0.18	44.35±0.27	-4.39	.000
Hand tingling	44.92±3.28	31.62±0.79	4.05	.027
Itching numbness	35.13±0.75	26.14±1.85	1.94	.045
Pain of hand	42.68±1.74	38.95±1.46	3.59	.268
Insomnia	39.73±2.58	26.59±4.13	2.04	.076

The t-test assess whether the means of two group are statistically different from each other[1]. This analysis presents whenever you want to compare the means of two groups, and especially appreciate as the analysis for the posttest-only two-group randomized experimental design. This illustrates formula for the standard error of the difference between the means[2].

T-value=(Difference between group means) / (variability of groups) (1)

$$= \frac{\overline{X_T} - \overline{X_C}}{SE(\overline{X_T} - \overline{Xc})} \quad (2)$$

The paired t-test is actually a test that the differences between the two observations is 0. So, if D represents the difference between observations, the hypotheses are: p-value associated with it is low($p<0.05$). There is evidence to reject the null hypothesis. Thus, this would have evidence that there is a difference in means across the paired observations [3].

Ho : D=0 (the difference between the two observations is 0)

$$Ho : D \neq 0 \text{ (the difference is not 0)} \quad (3)$$

3.3 Change of Carpal Tunnel Status after Information System Application

Figure 3-4 shows the change of carpal tunnel status after information system. For physical function after carpal tunnel release, it was significantly much higher after application in the experimental group as compared to the control group after time elapsed of 45 days ($p<.05$).

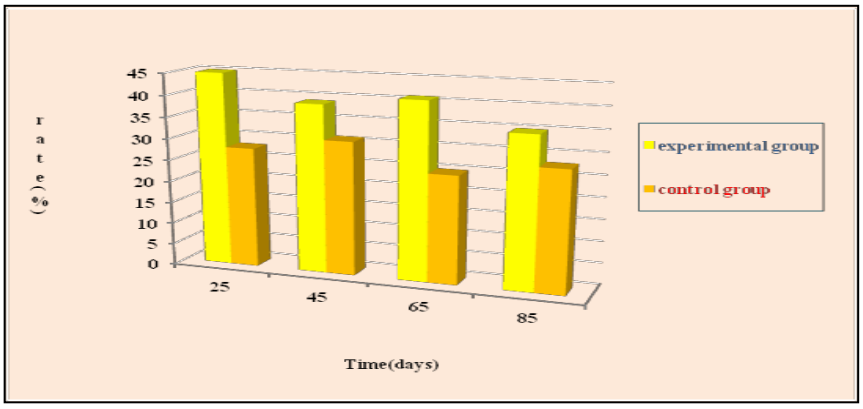

Figure 3. Change of Physical Condition After Carpal Tunnel Release

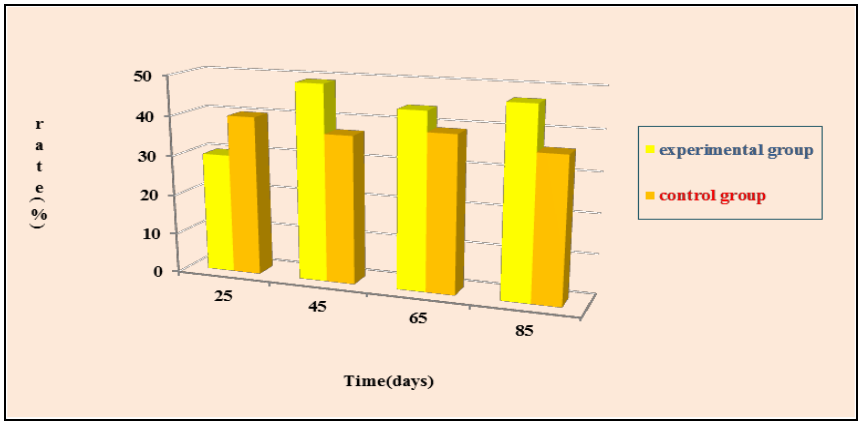

Figure 4. Change of Psychiatric Condition After Carpal Tunnel Release

4. Discussion

This study aimed to develop appropriate information systems to improve physical condition after carpal tunnel release. These results lead us to the conclusion that each group was statistically improved at all physical function. Carpal tunnel status was more statistically improved in the experimental group than control group. Moreover, quince intake of the patients after surgery was significantly higher than before surgery between two groups. Consequently, experimental groups who have eaten the quince would be lead to positive increase of physical function more than control groups.

As a result, tingling of hand was significantly decreased after intervention in respondents compared with before the intervention. In addition, the results showed that information system was significant effect in reducing wrist paresthesia and in increasing life satisfaction of the experimental group. The finding was consistent with the results of earlier researches [12-14]. This finding suggests that it has to perform an information system in integrated information program than single program. In addition, large

intervention studies should be established urgently in order to prove results of this study. Accordingly, in order to maintain the intervention effect, it is very important to determine adequate intervention period. In order to maintain desirable physical condition, a comprehensive information system for patients with carpal tunnel syndrome on physical function is more successful than one program.

The results of this paper, after receiving intervention, there was advanced change for the physical function after intervention than before intervention in the mean score of having itching numbness. The finding was similar with the result of earlier researches [15-16]. Therefore, a comprehensive and systematic adoption of the information system to minimize the damage of wrist will contribute effectively to the rapid disease recovery and prevention. In the future, this experimental study will be used frequently for the prevention of carpal tunnel syndrome and verification of new research.

In this paper, I have proposed an information system for treating of carpal tunnel syndrome. The information systems of patients that support the healthcare environment based on application. The proposed system supports systematization of whole application process and information of physical condition. The model of information systems that participated in an experimental study in patients with carpal tunnel syndrome were carried out through the experimental model which was developed.

This study will contribute to reducing carpal tunnel syndrome. The model of information system is a model composed of patients and computers that processes or interprets information. The model is also used in more restricted senses to refer to only the software used to run a computerized database or to refer to only a computer system.

5. Conclusion

This study is to develop appropriate information systems to improve physical condition after carpal tunnel release. This survey was conducted with 162 patients who have visited orthopedic surgery of a university hospital located in Chungnam area from December 8, 2014 to March 27, 2015. The paired t-test was done to compare the differences of physical condition after carpal tunnel surgery before and after information system application.

The results of this study are as follows. Firstly, for carpal tunnel syndrome, the carpal status in subjects who have suffered from paresthesia decreased after the system application($t=1.73$, $p=.000$). Secondly, for physical symptom after carpal tunnel surgery, it was significantly much lower after application in the experimental group as compared to the control group after time elapsed of 65 days ($p<.05$).

Therefore, this system will contribute to improve efficient performance strategies to apply the guidelines in patients with carpal tunnel syndrome

Acknowledgments

I appreciate to study subjects who had participated in the analysis of invention effect on physical condition in patients after carpal tunnel release. The model will provide effective services in multi-environments to patients and help for improving their physical rehabilitation of patients after carpal tunnel release.

This paper was a revised and expanded version of a paper entitled “Optimum Information Systems to Improve Physical Function after Carpal Tunnel Release”, Workshop on Bioscience and Medical Research 2016 presented at Jeju National University in International Center, April 19-21, 2016.

References

[1] T. F. Smith and M. S. Waterman, "Identification of Common Molecular Subsequences", Journal Mol. Biol., vol. 147, **(2001)**, pp. 195-197.
[2] P. May, H. C. Ehrlich and T. Steinke, "ZIB Structure Prediction Pipeline: Composing a Complex Biological Workflow through Web Services", Springer, Heidelberg, vol. 4128, **(2006)**, pp. 1148-1158.
[3] I. Foster and C. Kesselman, "The Grid: Blueprint for a New Computing Infrastructure", Morgan Kaufmann, San Francisco, **(1999)**.
[4] K. Czajkowski, S. Fitzgerald, I. Foster and C. Kesselman, "Grid Information Services for Distributed Resource Sharing. In: 10th IEEE International Symposium on High Performance Distributed Computing", IEEE Press, New York **(2001)**, pp. 181-184.
[5] I. Foster, C. Kesselman, J. Nick and S. Tuecke, "The Physiology of the Grid: an Open Grid Services Architecture for Distributed Systems Integration. Technical Report", **(2002)**, Global Grid Forum.
[6] J. C. Sterens, "Carpal Tunnel Syndrome in Rochester, Minnesota, 2001 to 2008", Neurology, vol. 38, no. 1, **(2008)**, pp. 134-135.
[7] D. M. Dawson, "Entrapment Neuropathies of the Upper Extremities", NEJM , vol. 329, **(2012)**, pp. 2013-2018.
[8] G. S. Phalen, "Reflections on 21 Years Experience with the Carpal Tunnel Syndrome", JAMA, vol. 212, **(2007)**, pp. 1365-1367.
[9] D. W. Seo, "Clinical Studies on Carpal Tunnel Syndrome", Journal Korean Neurol Association, vol. 12, **(2004)**, pp. 80-86.
[10] D. M. Dawson, "Entrapment Neuropathies of the Upper Extremities", NEJM, vol 329, **(2003)**, pp. 2013-2018.
[11] G. S. Phalen, "Reflections on 21 years' Experience with the Carpal Tunnel Syndrome", JAMA, vol. 212, **(2007)**, pp. 1365-1367.
[12] H. Holmgren and I. Rabow, "Internal Neurolysis or Ligament Division Only in Carpal Tunnel Syndrome : A 3 Year Follow-up with An Evaluation of Various Neurophysiological Parameters for Diagnosis", Acta Neurochir, vol. 87, **(2007)**, pp. 44-47.
[13] E. S. Moon, "Nerve Conduction Studies After Surgical Release of Carpal Tunnel Syndrome", Journal Korean Orthop Association, vol. 31, **(2006)**, pp. 270-276.
[14] T. K. Cobb, "Outcome of Reoperation for Carpal Tunnel Syndrome", Journal Hand Surgery, vol. 21, **(2006)**, pp. 347-356.
[15] R. H. Gelberman, "Results of Treatment of Severe Carpal Tunnel Syndrome Without Internal Neurolysis of Median Nerve", Journal Bone Joint Surgery, vol. 68, **(2007)**, pp. 895-902.
[16] S. R. Lee, "Optimum Information Systems To Improve Physical Function After Carpal Tunnel Release", Proceedings of International Workshop of Bioscience and Medical Research, Jeju Island, Korea, **(2016)**.

Author

Seong-Ran Lee, she received the B.S. degree in consumer science from Seoul National University, Korea in 1987. She received the M.S. degree in health science from Seoul National University, Korea in 1992 and Ph.D in the same area from Catholic Medical College, Seoul, Korea in 2000. Currently, she is a professor in the department of medical information, Kongju National University, Korea. Her present research interest is medical information.

