Yonsei Medical Journal
Vol. 40, No. 1, pp. 1−8, 1999

☐ Original Article ☐

Early Rehabilitation Program in Postmastectomy Patients: A Prospective Clinical Trial

Young Moo Na[1], Jee Sun Lee[1], Jin Seok Park[1], Seong Woong Kang[1], Hy De Lee[2], and Ja Yun Koo[2]

Abstract

The purpose of this study was to determine whether 20 patients who received an early postmastectomy rehabilitation treatment program showed more improvement in range of shoulder motion and functional activities than 13 patients who received instruction for exercise only. Data were obtained at preoperatively, three days after operation, at discharge and at postdischarge one month for each patient on parameters such as range of motion of the ipsilateral shoulder joint, upper extremity circumferential measurements, as well as 10 elements of shoulder function. Postoperatively, both groups showed an increased range of motion of the shoulder joint and improved functional activities, but the group that received postoperative rehabilitation management had a better range of shoulder motion and less difficulty in five items for functional assessment. This study also showed that an early rehabilitation program did not increase postoperative complications. We concluded that an early rehabilitation program or intensive instruction program only by a well-trained physical therapist or physiatrist was beneficial to postmastectomy patients in regaining the function and range of shoulder motion, and significantly better in a rehabilitation group.

Key Words: Rehabilitation, mastectomy, breast cancer

INTRODUCTION

Breast cancer is the third most common cancer in Korean women. As increasingly more women are diagnosed at an early stage of the disease, the number of cases requiring surgical intervention will grow correspondingly.

The rehabilitation of patients with breast cancer has taken on an increasing importance, together with importance of quality of life for patients with cancer. Specific exercise programs tend to vary. Some begin one day after operation.[1] Others demonstrated that early motion following mastectomy with axillary dissection was associated with an increased incidence of postoperative complications.[2] However, the benefits of early postoperative physical therapy have been shown in several studies.[3,4] In the immediate postoperative period, many problems might occur, such as the limitation of shoulder motion, edematous arm, numbness of chest wall and arm, depression, etc. Many physicians have been concerned about the potential complications and increased hospital stay which have been reported to be associated with physical therapy immediately after surgery.

The purposes of this prospective study were: 1) to determine whether patients who received an early postmastectomy rehabilitation program showed an improved range of shoulder motion and functional activities compared to a group of patients who received instruction for exercise only, and 2) to determine whether an early rehabilitation program is associated with postoperative complications.

MATERIALS AND METHODS

Patients

Thirty-three patients scheduled for mastectomy participated in this study. After confirmation of breast cancer by biopsy, patients under the care of one breast surgeon were approached for entry into this study. Some patients were scheduled for axillary dissection for modified radical mastectomy.

Assessments

Patients were assigned to either the group enrolled in a postmastectomy rehabilitative program (rehabilitation group), or to the control group with no

Received September 9, 1997

Departments of [1]Rehabilitation Medicine and [2]General Surgery, Yonsei University College of Medicine, Seoul, Korea

This study was supported by a Faculty Research Grant (94-32) Yonsei University College of Medicine and by a Basic Medical Research Fund, Ministry of Education (1995-1996).

Address reprint request to Dr. Y.M. Na, Department of Rehabilitaion Medicine, Yongdong Severance Hospital, Yonsei University College of Medicine, Yongdong P.O. Box 1217, Seoul 135-270, Korea. Tel: 82-2-3497-3490, Fax: 82-2-3463-7585, E-mail: nym@yumc.yonsei.ac.kr

rehabilitative treatment, but with instruction alone for range of motion exercises pertaining to the affected shoulder and postural exercise. We compared the parameters listed below in 33 patients who underwent modified radical mastectomy or partial mastectomy.

The SCL-90-R (Symptom CheckList 90 Revision), a psychopathologic self-report inventory, was used. This inventory, developed at the Johns Hopkins Medical Center, has been extensively used with cancer patients and has been validated.[5] A preoperative assessment of the following three variables was made on the ipsilateral side by a physiatrist.

1) Goniometric measurements were made of the range of motion (ROM) for flexion, abduction, internal rotation and external rotation of ipsilateral shoulder. Goniometric reliability in a clinical setting for shoulder measurement was confirmed in another study.[6]

2) Functional evaluation of the ipsilateral shoulder and arm function was made by having patients attempt to duplicate the activities described below and then rating them on a 5-point scale of difficulty from 0 (unable to perform) to 4 (no difficulty). We used 10 items assessing upper-extremity function provided by Wingate.[7]

1. Brush and comb your hair? (brush hair)
2. Pull a T-shirt, blouse that does not unbutton, or tight necked sweater over your head? (sweater overhead)
3. Put on a pair of pants or pantyhose and pull them up? (pull on pants)
4. Close a back-fastening bra? (fasten bra)
5. Completely zip up a dress with a back-fastening zipper? (back zipper)
6. Wash the upper part of your back, ie, shoulder-blade area, on the same side as the operation? (ipsilateral scapula)
7. Wash the upper part of your back, ie, shoulder-blade area, on the opposite side as the operation? (contralateral scapula)
8. Reach into a cupboard over your head? (reach overhead)
9. Make a double bed? (make bed)
10. Carry a grocery bag containing three 1-lb cans, a 3-lb roast, a 3-lb bag of apples, and/or two other items so that the bag weighs approximately 10 lbs? (carry groceries)

3) Upper extremity circumferential measurements were made at three levels. The circumferential measurements were obtained by palpating and marking the most prominent aspect of the olecranon process and then measuring at the points 10 cm proximally and distally. We divided the patients with arm swelling into mild (1.0−2.5 cm difference compared to initial data), moderate (2.6−4.5 cm), and severe lymphedema (>4.5 cm).[8]

All variables were measured preoperatively, three days after operation, at discharge, and again as outpatients one month after discharge.

Postmastectomy treatment protocol

To prevent postoperative pulmonary complications, patients were instructed in deep breathing exercise and effective coughing method during the preoperative period. The postoperative rehabilitation program consisted of 40 minutes of physical therapy and 30 minutes of exercise four times a day with protocol. Beginning on the first postoperative day, motor and sensory status were assessed; postural exercise and assisted range of motion exercise of the shoulder, elbow, wrist, and hands were begun in conjunction with active use of the involved arm for light, functional activities. The patients received physical modalities (percutaneous electrical stimulation, heat therapy, cold therapy, etc.) for the relief of pain or muscle spasm and therapeutic exercise including ROM exercise from the third postoperative day.

The patients with lymphedema received intermittent pneumatic compression. We used this pumping device for 30 minutes to two hours a day. And patients were encouraged to elevate the involved upper extremity on a pillow above the heart level (about 30 to 45 degrees) while sleeping and as often as possible during the day (even sitting in a chair), wrapping the upper extremity with an elastic bandage, and manually massaging the extremity from the distal to proximal along its length. As well, isometric and isotonic pumping exercises of the distal muscles, which enhance venous return and circulation during muscle contraction, were included.

For those patients with myofascial pain or muscle spasm in the posterior neck or shoulder area, we tried trigger-point injection with lidocaine if needed. This was followed by stretching exercise of the neck or shoulder muscles. After removing the drain, subjects were instructed in progressive-resistive exercises of the upper extremities. The number of ordinary functional activities, including dressing, undressing, grooming and weight carrying, were progressively increased.

On discharge, we emphasized the continuence of exercises and a long-term individualized treatment. Instructions with printed materials were provided for self exercise in a hospital room or at home. A home exercise program was prescribed for a minimum of 4 weeks.

In the control group, patients received orientation with printed material about the planned self-exercise program and proper positioning by the physiatrist. The two goups were compared in demographic data, ROM of the shoulder, arm circumferential measurements, and functional assessments.

The changes of ROM after operation were marked compared to initial ROM data. Statistical calculations were performed using a Student's two-sample t-test. P-values were calculated from the two-sided test.

RESULTS

Informations for patients groups

The mean ages of the rehabilatation group and control group were 43.8 and 46.9 years, respectively. A comparison of the groups by demographic variables did not reveal any statistically significant differences. In the rehabilitation group, 75% of patients received a modified radical mastectomy, while 25% received a partial mastectomy. In the control group, 53.9% of patients received a modified radical mastectomy and 46.1% received a partial mastectomy. No statistically significant differences between the two groups were observed for the length of hospitalization after the mastectomy, for the number of days taken with the drain out and for the number of dissected lymph nodes (Table 1). Although differences of mean values for hospital stay and days taken with the drain out were observed between the two groups, they were not significant statistically because the standard deviations were larger in the rehabilitation group than the control group.

Goniometric measurements

Shoulder flexion: There was no statistically significant difference between the rehabilitation group and control group for initial flexion ROM and postoperative 3 days ROM measured at the third postoperative day compared to preoperative data. However, statistically significant differences were found between the two groups for an improvement at discharge ($p<0.05$) and at one month follow-up ($p<0.05$) (Table 2).

Shoulder abduction: The postoperative difference of ROM between the two groups was not significant. At discharge ($p<0.05$) and follow-up at one month ($p<0.01$), the rehabilitation group showed greater improvement (Table 3).

Shoulder internal rotation: After treatment, the rehabilitation group showed greater improvement at one month follow-up ($p<0.05$) (Table 4).

Shoulder external rotation: After treatment, the patients in the rehabilitation group showed greater improvement than the control group, significantly at

Table 1. Informations for Patients Groups

	No. of cases (%) or mean±S.D.	
	Rehab. group (N=20)	Control group (N=13)
Previous history of neck or shoulder pain	9 (45.0)	6 (46.2)
Age (years)	43.8± 2.1	46.9±9.8
Postop. hospital stay (days)	18.4±12.0	12.1±4.0
Days taken drain out (days)	12.5± 5.1	10.6±2.5
No. of dissected LN	14.8± 4.1	13.9±3.2

Rehab., rehabilitation; LN, lymph nodes.

Table 2. Comparison of ROM-Shoulder Flexion (Degrees)

Assessment time	Rehab. group (N=20)	Control group (N=13)
Preop. ROM	178.9± 3.3	178.0± 4.2
Postop. 3 days ROM	125.6±21.9	136.0±23.1
At discharge ROM	160.6±13.8*	150.0±25.8
Postdischarge 1 month ROM	178.9± 3.3*	167.0±16.4

Values are mean±S.D.
ROM, range of motion; Preop., preoperative; Postop., postoperative.
*$p<0.05$.

Table 3. Comparison of ROM-Shoulder Abduction (Degrees)

Assessment time	Rehab. group (N=20)	Control group (N=13)
Preop. ROM	168.9± 3.3	170.0± 0.2
Postop. 3 days ROM	91.1±16.2	105.5±18.5
At discharge ROM	128.9±19.7*	110.0±17.0
Postdischarge 1 month ROM	166.7± 7.1†	119.0±23.5

Values are mean±S.D.
*$p<0.05$.
†$p<0.01$.

Table 4. Comparison of ROM-Shoulder Internal Rotation (Degrees)

Assessment time	Rehab. group (N=20)	Control group (N=13)
Preop. ROM	68.9± 3.3	70.0± 8.0
Postop. 3 days ROM	64.4± 7.3	66.0± 8.4
At discharge ROM	66.7± 7.1	68.0± 6.3
Postdischarge 1 month ROM	68.9± 3.3*	65.0±10.8

Values are mean±S.D.
*$p<0.05$.

Table 5. Comparison of ROM-Shoulder External Rotation (Degrees)

Assessment time	Rehab. group (N=20)	Control group (N=13)
Preop. ROM	87.8± 6.7	88.0± 6.3
Postop. 3 days ROM	75.0±22.1	65.0±23.6
At discharge ROM	84.4±11.3*	68.5±19.7
Postdischarge 1 month ROM	87.8± 6.7	74.5±18.0

Values are mean±S.D.
*$p<0.05$.

discharge, but the difference was not statistically significant at one month follow-up (Table 5).

Functional assessments

Postoperative 3 days. Most patients had difficulties in all items of the functional evaluation variables at postoperative 3 days, but statistically significant differences were found in five items: "contralateral scapula", "ipsilateral scapula", "sweater overhead", "reach overhead", and "back zipper" between preoperative and postoperative third day data in both groups (Fig. 1−5).

At discharge and postdischarge follow-up. In both groups, patients showed improvement in functional assessment compared to the 3-day postoperative assessments. Especially, 5 of 10 items showed statistically significant improvement in the rehabilitation group compared to the control group ($p<0.05$) at discharge and postdischarge 1 month (Fig. 1−5).

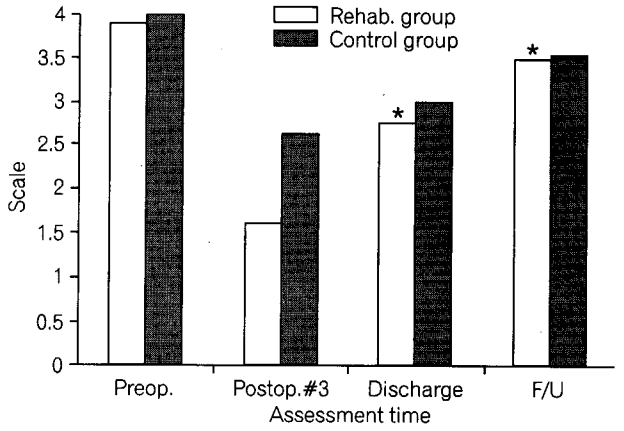

*Fig. 1. For contralateral scapula, patients in both groups showed improvements compared to postoperative loss of function, more in the rehabilitation group at discharge and postdischarge follow-up. *$p<0.05$.*

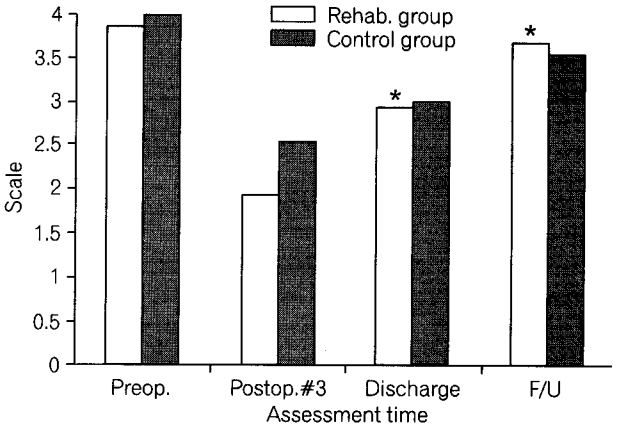

*Fig. 2. For ipsilateral scapula, both groups showed significant improvement compared to postoperative loss of function, more in the rehabilitation group at discharge and postdischarge follow-up. *$p<0.05$.*

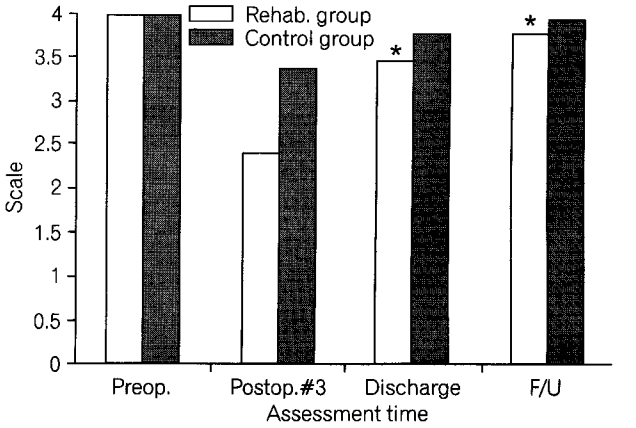

*Fig. 3. For reach overhead, both groups showed significant improvement compared to postoperative loss of function, more in the rehabilitation group at discharge and postdischarge follow-up. *$p<0.05$.*

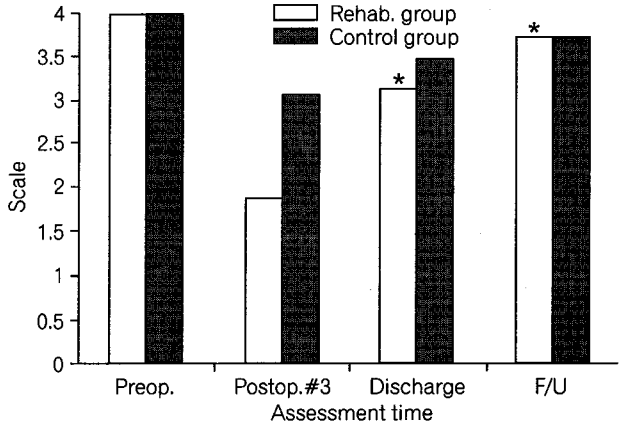

*Fig. 4. For sweat overhead, both groups showed significant improvement compared to postoperative loss of function, more in the rehabilitation group at discharge and postdischarge follow-up. *p < 0.05.*

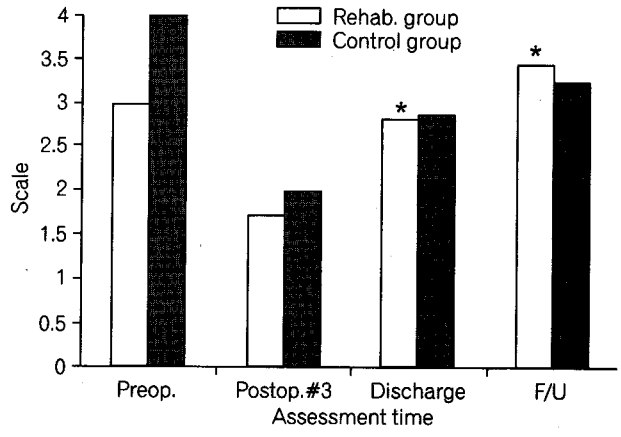

*Fig. 5. For back zipper, both groups showed significant improvement compared to postoperative loss of function, more in the rehabilitation group at discharge and postdischarge follow-up. *p <0.05.*

Table 6. Circumferential Changes Compared with Preoperative Measurements

	On postop. 3 days (cm)		At discharge (cm)		Postdischarge 1 month (cm)	
	Rehab.group (N=20)	Control group (N=13)	Rehab.group (N=20)	Control group (N=13)	Rehab.group (N=20)	Control group (N=13)
10 cm above olecranon	0.38±0.50	0.38±0.41	0.18±0.42	0.31±0.44	0.09±0.26	0.12±0.30
Olecranon	0.76±0.19	0.11±0.22	0.87±0.15	0.12±0.22	0.00±0.00	0.00±0.00
10 cm below olecranon	0.22±0.38	0.38±0.77	0.16±0.34	0.15±0.38	0.00±0.00	0.08±0.29

Values are mean±S.D.
No significant differences.

Circumferential measurements

No patient showed an increment of circumference of more than 1 cm compared to preoperative data on postoperative day 3, at discharge or at postdischarge one month, except for one patient in the rehabilitation group. There were no statistically significant differences between the two groups at three sites; 10 cm above the olecranon level, the olecranon, and 10 cm below the olecranon level (Table 6).

Postoperative complications or problems

In the control group, one patient (7.7%) had wound breakdown, two patients (15.4%) had adhesional bands, and five patients (38.5%) had sensory changes around surgical incisions. However, no one showed significant edema, wound infection, or motor weakness. In the rehabilitation group, one patient (5.0%) had mild edema, one patient (5.0%) had wound breakdown, three patients (15.0%) had adhesional bands from axilla to ipsilateral upper extremity, and nine patients (9.0%) had sensory changes (Table 7).

Table 7. Postoperative Complications or Problems

Comlications or problems	No. of cases (%)	
	Rehab. group (N=20)	Control group (N=13)
Edema (mild)	1 (5.0)	0 (0.0)
Wound breakdown	1 (5.0)	1 (7.7)
Wound infection	0 (0.0)	0 (0.0)
Adhesional band	3 (15.0)	2 (15.4)
Motor weakness	0 (0.0)	0 (0.0)
Sensory impairment	9 (45.0)	5 (38.5)

Psychologic evaluation

The self-reported psychologic status (SCL-90-R;

Table 8. Psychologic Problems by SCL-90-R*

Items	No. of cases (%)
Anxiety	10 (30.3)
Somatization	8 (24.2)
Hostility	7 (21.2)
Phobia	5 (15.2)
Paranoia	5 (15.2)

*Symptom checklist 90 revision.

Symptom CheckList 90 Revision) was used at postoperative 3 days. It showed a mood of anxiety in 30.3 per cent of patients, somatization in 24.2 per cent, hostility in 21.2 per cent, etc. (Table 8).

DISCUSSION

There was no significant difference between the rehabilitation group and control group for the initial range of motion of the shoulder joint and the amount of ROM loss after operation. However, there were statistically significant differences between the two groups for ROM improvements at discharge and postdischarge follow-up for shoulder flexion and abduction. And for shoulder external rotation, statistically significant improvement was shown at discharge only, and for shoulder internal rotation at postdischarge follow-up only in the rehabilitation group. In results for functional assessment, patients in the rehabilitation group had more functional loss at postoperative 3 days than the control group in all 5 items, which showed a statistically significant improvement in the rehabilitation group at discharge and postdischarge follow-up. Perhaps this was the result of the fact that there were more modified radical mastectomy patients in the rehabilitation group than there were in the control group. In almost all items, the points checked at postoperative one month did not attain preoperative status. If a longer follow-up was taken, the differences between the two groups became more significant. And, we felt that if the proportion of patients who had taken modified radical mastectomy between the two groups was similar, the results would have been more significant.

There has been much debate about the best time to begin physical therapy or to begin increasing motion. Lotze et al. compared early and delayed physical therapy groups after mastectomy.[2] Patients were assigned to receive a gradual increase in allowed range of motion, either beginning on postoperative day one (early) or day seven (delayed). Wound complications including infection and small areas of skin breakdown occurred more frequently in the early group. And significant differences in the percent of patients achieving functional ROM could not be identified between these two groups. As well, Flew showed that shoulder immobilization did not result in increased shoulder stiffness, although there was an increased incidence of mild lymphedema of the arm.[9]

In contrast, a report by Pollard et al. demonstrated improved abduction scores in patients who had earlier motion after operation.[3] Wingate et al. concluded that early physical therapy intervention made a significant contribution to a return to normal function without increasing the incidence of postoperative complications or prolongation of hospital stay.[4] In our study, we chose the early rehabilitation management program from postoperative day one. On the first postoperative day, we taught postmastectomy patients the techniques of proper positioning and ROM exercise of the upper extremity, and on the third postoperative day patients started to receive physical therapy. This study showed significant improvement of ROM of the ipsilateral shoulder joint and daily activities without increasing postoperative complications including prolonged hospitalization. These results suggested that early rehabilitation intervention was very effective for postmastectomy patients.

We thought that soon after surgery, the rehabilitation of the patients should be continued by way of channeling energy, both emotional and physical, into an active exercise program aimed primarily at preventing limitation of arm motion on the side of the recent mastectomy. A self-exercise program not only prevented shoulder and axillary restriction, but it was also extremely important in allowing the patient direct responsibility for improving her own physical appearance. So we emphasized the importance of motivation for a self ROM exercise program to patients who participated in this study. This study showed a worsening of ROM for internal rotation in the control group at postdischarge one month follow-up, although improvement was noted at discharge in the same group. Only one patient in the control group contributed this result, having had a painful shoulder in the ipsilateral side, so she stopped exercising after discharge. Except for one patient, functional improvement was also shown in the control group patients, although less than in the rehabilitation group. So we suggest that intensive instructional program only by a well-trained physical therapist or physiatrist is beneficial to postmastectomy patients in hospitals without a constructed rehabili-

tation setting. But we thought that the more beneficial result in the rehabilitation group was caused by not only the effects of programmed exercise and physical therapy, but also by the effects of continued monitoring and encouragement by experts.

Most patients may have incisional pain with or without posterior cervical and shoulder girdle pain. Pain and muscle spasm may also occur in the neck and shoulder region as a result of muscle guarding.[10] For some patients in this study, the levator scapulae, teres major and minor, and infraspinatus muscles were often tender with palpation and could restrict active shoulder motion. In these patients, we tried trigger-point injection with lidocaine in the rehabilitation group. After trigger-point injection, we emphasized stretching exercises. Restrictive scarring of the underlying tissue on the chest wall can develop as a result of surgery, radiation fibrosis, or wound infection. Chest wall adhesion can lead to an increased risk of postoperative pulmonary complication, loss of ROM of the shoulder on the involved side and postural dysfunction.[11] We observed the adhesional fibrotic band on the involved upper extremity from the axilla in three patients in the rehabilitation group and two in the control group at one month follow-up. We recommended a manual massage, warm water shower, and more vigorous stretching exercise to the patients, who had adhesional fibrotic bands.

Lymphedema of the upper extremity, one of the most significant long-term complications following radical mastectomy, can cause not only cosmetic disfigurement and physical discomfort, but also loss of functional ability of the limb. The incidence of post-mastectomy lymphedema varies in different series, from 8 to 80 percent and is principally affected by the extent of surgery, the type and dose of radiotherapy and the incidence of infection. Post-mastectomy lymphedema usually occurs within one year, although it may occur as late as 15 years after operation. Because of the short-term follow-up of circumferential measurements, there were no clinically significant findings at any levels in this study. So we could not find the incidence of lymphedema at postdischarge one month follow-up. Therefore, long-term follow-up study is needed. Recently we experienced the effects of the early intensive rehabilitation program. It was beneficial to patients after mastectomy for the reduction of physical and psychological complications, and for the acquisition of early functional activities as a result.

Mastectomy patients face emotional problems, particularly in two domains: the fears, anxieties, and angers which accompany most cancers; and the specific adjustment to the loss of a breast. Our study showed that anxiety, somatization, and hostility were the main psychological problems in the postoperative period from breast cancer by SCL-90-R.

Obviously, coping with the loss of a breast may take on various forms, but most patients confront some serious feelings of sexual inadequacy, poor body image, and loss of their sense of femininity. Therefore, it is important that psychologists impart professional care in helping these postmastectomy patients adjust to the preoperative period.

Ganz et al. studied the quality of life in post-mastectomy patients. Quality of life is a multidimensional construct that generally is accepted to include several important domains: functional status, disease and treatment-related symptoms, psychological functioning and social functioning. Additional assessment in the evaluation of quality of life should include spiritual or existential concerns and body image, and satisfaction with health care.[12] So we concluded that when a rehabilitation program is undertaken for cancer patients, the team members must consider all of the above factors and enforce the rehabilitation program. Further studies on postmastectomy rehabilitation and follow-up may be needed.

REFERENCES

1. Wood C, Gerber L. Rehabilitation of the patient with breast cancer. In: Lippman M, Lichter A, Danforth D, editors. Diagnosis and management of breast cancer. Philadelphia: WB Saunders; 1988. p.457-67.
2. Lotze MT, Duncun MA, Gerber LH, Woltering EA, Rosenberg SA. Early vs. delayed shoulder motion following axillary dissection. Ann Surg 1981;193:288-95.
3. Pollard K, Callum KG, Altman DG. Shoulder movement following mastectomy. Clin Oncol 1976;2:343-9.
4. Wingate L, Croghan I, Natarajan N, Michalek AM, Jordan C. Rehabilitation of the mastectomy patient: A randomized, blind, prospective study. Arch Phys Med Rehabil 1989;70:21-4.
5. Derogatis LR, Rickels K, Rock AF. SCL-90 and MMPI: Step in validation of new self-report scale. Br J Psychiatry 1976;128:280-9.
6. Riddle DL, Rothstein JM, Lamb RL. Goniometric reliability in a clinical setting. Phys Ther 1987;67:668-72.
7. Wingate L. Efficacy of physical therapy for patients who have undergone mastectomies. Phys Ther 1985;65:896-900.
8. Brennan MJ, DePompolo RW, Garden FH. Cardiovascular, pulmonary, and cancer rehabilitation. Arch Phys Med Rehabil 1996;77:S52-7.
9. Flew TJ. Wound drainage following radical mastectomy: the effect of restriction of shoulder movement. Br J Surg 1979;66:302-5.
10. Kisner C, Colby LA. Therapeutic exercise: foundations and

techniques. 3rd ed. F.A.: Davis Company; 1986. p.641-8.
11. Beeby J, Broeg PE. Treatment of patients with radical mastectomies. Phys Ther 1970;50:40-3.
12. Ganz PA, Schag CAC, Lee JJ, Polinsky MA, Tan SJ. Breast conservation versus mastectomy. Cancer 1992;69: 1729-38.