

Causes of Shoulder Pain in Women with Breast Cancer-Related Lymphedema: A Pilot Study

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Purpose: To inform on shoulder pathology and to identify the disabilities and level of quality of life (QOL) associated with shoulder pain in patients with breast cancer-related lymphedema (BCRL). **Materials and Methods:** Using patient history, physical examination, and ultrasound (US), we classified patients with BCRL into the following three groups: no pain with normal ultrasound (US), pain with normal US, and pain with abnormal US. We evaluated shoulder pathology using US, pain intensity using a visual analogue scale (VAS), and functional disability using the Korean version of the Disabilities of Arm, Shoulder, and Hand (DASH) questionnaire. For assessment of QOL, we used the Korean version of the brief form of the World Health Organization Quality of Life Assessment Instrument (WHO-QOL-BREF). **Results:** 28.9% of patients had no pain and normal US, 31.6% had pain with normal US, and 39.5% had pain with abnormal US. The US findings for those with pain and abnormal US revealed the following: 53.3% had a supraspinatus tear, 13.3% had biceps tenosynovitis, 13.3% had acromioclavicular arthritis, 13.3% had subdeltoid bursitis, and 53.3% had adhesive capsulitis. Patients with shoulder pain and abnormal US findings had significantly higher mean DASH and pain scores. Pain scores were positively correlated with DASH scores and negatively correlated with QOL. **Conclusion:** We found that BCRL with shoulder pain and evidence of shoulder pathology on US was associated with reduced QOL and increased disability. Proper diagnosis and treatment of shoulder pain are necessary to improve QOL and decrease disability in patients with BCRL.

Key Words: Lymphedema, shoulder pain, ultrasound

INTRODUCTION

Breast cancer-related lymphedema (BCRL) is a very common and serious condition that affects patients receiving breast cancer treatment. It affects approximately one-third of all breast cancer survivors.¹ Patients receiving breast cancer treatment may develop lymphatic damage related to surgical removal of the nodes and breast tissue that can result in problems with lymph drainage caused by damaged lymph vessels, radiation-induced scarring, fibrosis of lymph structures and the surrounding tissues, as well as postoperative infection.² BCRL occurs when the transport

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capacity of the lymphatic system is obstructed and may cause deformity, functional disability, pain, and recurrent infections within the edematous limb. When chronic BCRL develops, many patients have symptoms that involve the upper extremities, such as poor range of arm motion, pain, stiffness, weakness, and numbness, as well as general poor upper body function.³ They may also experience anxiety, depression, social isolation, and sexual problems.^{4,5}

Previous studies have shown that breast cancer survivors with and without lymphedema experience disability, a poor quality of life (QOL), and psychological distress.^{4,6} However, these results did not show a specific correlation between QOL or disability and shoulder pain. Also the results did not suggest an etiology for the disability, poor QOL, and psychological distress. Therefore, the goal of this study was to provide information on shoulder pathology related to shoulder pain in patients with BCRL and to investigate levels of QOL and disabilities that are associated with shoulder pain in the setting of BCRL.

MATERIALS AND METHODS

Subject Recruitment

This study used a prospective cross-sectional design. A physician consecutively selected patients from the outpatient clinic of the department of rehabilitation medicine. The inclusion criteria were: 1) patients with lymphedema, confirmed using lymphoscintigraphy of the upper limb and 2) patients with a history of breast cancer surgery. The exclusion criteria were: 1) patients with shoulder pain prior to their BCRL diagnosis; 2) patients with a history of trauma of the neck and/or upper extremities; 3) patients with bilateral breast cancer surgery; 4) patients with bilateral shoulder pain; 5) patients that declined an ultrasound (US) of the shoulder; 6) patients that did not complete the questionnaire; 7) patients with neurological findings, such as decreased motor power, sensory changes, and decreased deep tendon reflexes; and 8) patients with neck pain. We also obtained demographic and health related information. The Ethics Committee of Kosin University Gospel Hospital approved this study.

We enrolled a total of 39 women with and without shoulder pain among patients with BCRL from the outpatient clinic of the department of rehabilitation medicine at Kosin University Gospel Hospital, Korea, from June 2009 through September 2009.

Measurements

We classified the patients into three groups: group I (no pain with normal US) did not have shoulder pain; group II (pain with normal US) had shoulder pain and normal structural findings of the tendons, ligaments and joint on US examination; group III (pain with abnormal US findings) had shoulder pain and abnormal structural findings by US examination. In group I, patients underwent US at a follow-up visit and confirmed that they had not had any pain during the follow-up period. In group I, one patient had supraspinatus tendinopathy without shoulder pain and was not included. Therefore, the final number of enrolled patients was 38.

The date of diagnosis, age, stage of tumor, type of surgery, number of lymph nodes dissected, and presence of metastasis were obtained from the medical history. Shoulder symptoms related to BCRL were evaluated, including shoulder pain and limitation of range of motion. We measured the circumference of the upper limbs. Pain intensity was measured using a 100 mm Visual Analogue Scale (VAS). Patients were asked to indicate the intensity of their shoulder pain. Range of motion was measured using a goniometer, and the difference in circumference between the upper limbs was measured using measuring tape. The same investigator performed all pain, range of motion, and arm circumference assessments. Functional disability was measured using the Korean version of the Disabilities of Arm, Shoulder and Hand (DASH) questionnaire. In addition, the DASH-global, DASH-work, and DASH-sports questionnaires were used. The DASH-work and DASH-sports assessments were not completed by many patients; therefore, only the DASH-global was analyzed in this study. On this questionnaire, low scores indicate less disability.

For the assessment of QOL, the Korean version of the World Health Organization Quality of Life Assessment Instrument's brief form (WHOQOL-BREF) was used. The WHOQOL-BREF contains a total of 26 questions and is self-administered. It is composed of four domain scores including physical health, psychological health, social relationships, and environment. The four domain scores denote the individual's perception of QOL in each particular domain. Domain scores are scaled in a positive direction with QOL. The mean score of items within each domain was used to calculate the domain score.

The interview and measurement of circumference were conducted by a physician who was blinded to the patient characteristics, and we tried to avoid any other circumstances in which the values were influenced by the interviewer.

For assessment of shoulder pain, real-time US (Envisor, Philips, Andover, MA, USA) was performed in all groups. The US examination was conducted by a physician who had six years of experience with US examination. The US was performed with a 10-MHz commercially available linear-array transducer using a standardized study protocol.⁷ The US findings were classified as the following: intact rotator cuff, rotator cuff disease (partial-thickness, full-thickness rotator cuff tears, and tendinosis), subacromial bursitis, and adhesive capsulitis or thickening of the rotator cuff interval.⁸

Data analysis

SPSS for Windows 12.0 was used for statistical analysis of associations among groups I (no pain with normal US), II (pain with normal US) and III (pain with abnormal US) by

the Mann-Whitney U analysis ($p < 0.05$). Correlation analysis was completed using Spearman's correlation coefficient. Data is presented as mean with standard deviation and percentage. p values of less than 0.05 were considered significant.

RESULTS

Demographic and health-related data

The age range of the patients was 36 to 76 (mean age 49.71 ± 2.45). The mean duration of lymphedema was 17.66 ± 8.65 months. There were 11 patients (28.9%) in group I (no pain with normal US), 12 patients (31.6%) in group II (pain with normal US), and 15 patients (39.5%) in group III (pain with abnormal US). The mean duration of shoulder pain was 4.20 ± 3.26 months in groups II and III. Thirty-one patients

Table 1. Demographic and Health-Related Parameters for Groups I, II, and III

	Group I (n=11) MS	Group II (n=12) MS	Group III (n=15) MS	<i>p</i> value
Demographic data				
Age (\pm SD; range)	46.09 (\pm 8.0; 36-61)	46.92 (\pm 5.35; 39-57)	54.60 (\pm 9.53; 41-76)	0.02*
Duration of lymphedema (\pm SD; range)	15.91 (\pm 10.90; 5-37)	17.33 (\pm 5.58; 6-30)	19.20 (\pm 9.17; 7-42)	0.64
Health-related data				
BMI (\pm SD; range)	23.42 (\pm 2.42; 19.59-28.76)	23.95 (3.20; 19.68-30.46)	24.64 (3.80; 18.99-33.74)	0.64
Type of surgery				
MRM	90.9%	66.7%	93.3%	0.13
Partial mastectomy	9.1%	33.3%	6.7%	
Side of lymphedema				
Right	63.6%	33.3%	26.7%	0.14
Left	36.4%	66.7%	73.3%	
Radiotherapy				
Yes	72.7%	33.3%	53.3%	0.17
No	27.3%	66.7%	46.7%	
Differences in circumference				
≤ 2 cm	9.1%	25.0%	33.3%	0.59
2-4 cm	63.6%	50.0%	26.7%	
> 4 cm	27.3%	25.0%	40.0%	
Infection history				
Yes	9.1%	25.0%	0%	0.11
No	90.0%	75.0%	100%	
Stage of breast cancer				
Stage I	45.5%	25.0%	33.3%	0.53
Stage II	45.5%	75.0%	53.3%	
Stage III	9.1%	0%	13.3%	

MS, mean score. Group I, no pain with normal ultrasound findings; Group II, pain with normal US findings; Group III, pain with abnormal US findings.

* $p < 0.05$.

(81.6%) had a history of modified radical mastectomy, and seven patients (18.4%) had a history of partial mastectomy. Thirty-five patients (92.1%) had a history of axillary lymphadenectomy. The demographic data for the groups are summarized in Table 1. The only significant difference between the groups at baseline was in mean age.

Pain and US findings

The mean pain scores using the VAS were 3.00±1.95 and 4.60±1.80 in groups II (pain with normal US) and III (pain with abnormal US), respectively. The mean pain score of group II was significantly lower than that of group III. The following findings were observed on the US of patients in group III: supraspinatus tear (8 patients, 53.3%) (partial thickness tear 75%/full thickness tear 25%), tenosynovitis (2 patients, 13.3%), acromioclavicular arthritis (2 patients, 13.3%), subdeltoid bursitis (2 patients, 13.3%) and adhesive capsulitis (8 patients, 53.3%).

Disability

The mean DASH score for group I (no pain with normal US) was significantly lower than those of both group III (pain with abnormal US) and group II (pain with normal US). Group II also had a significantly lower mean DASH score than group III (Table 2).

Quality of life

Group I (no pain with normal US) had a significantly higher mean WHOQOL score, including the physical health domain, psychological health domain, and overall score, as compared to group II (pain with normal US findings). Group II had a significantly higher mean WHOQOL score, including the physical health domain and overall score, as compared to group III (pain with abnormal US findings). Group I had a significantly higher mean WHOQOL score, including the physical health domain, psychological health

domain, environmental, and overall score, as compared to group III (Table 2).

Comparison of pain, quality of life, and disability

Pain scores were positively correlated with DASH scores ($\gamma=0.558, p<0.05$) and negatively correlated with WHO-QOL scores, including the physical health domain ($\gamma=-0.56, p<0.05$), psychological health domain ($\gamma=-0.41, p<0.05$), environmental domain ($\gamma=-3.76, p<0.05$), and overall score ($\gamma=-5.05, p<0.05$), with the exception of the social relationships domain ($\gamma=-1.71, p=0.30$) (Figs. 1 and 2).

DISCUSSION

In this study, we observed more disability and decreased QOL among patients with BCRL and shoulder pain than in patients with BCRL without shoulder pain. Furthermore, this study revealed that shoulder pain and the nature of the pathologic abnormality were the most important factors associated with upper limb dysfunction (ULD) and decreased quality of life in patients with BCRL. A previous study of

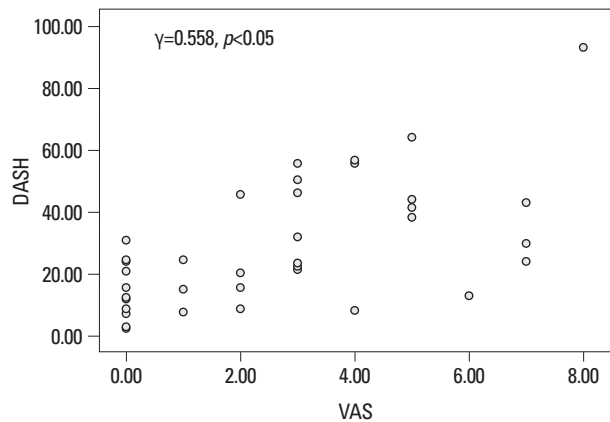


Fig. 1. Correlation between Disabilities of Arm, Shoulder, and Hand (DASH) and pain scores in breast cancer-related lymphedema.

Table 2. Comparison of DASH and QOL Scores among Groups I, II and III

	Group I (n=11) MS (SE)	Group II (n=12) MS (SE)	Group III (n=15) MS (SE)	p value (I vs. II)	p value (I vs. III)	p value (II vs. III)
DASH	14.90 (9.32)	24.58 (16.23)	41.71 (20.88)	0.02*	0.00*	0.03*
Physical	56.45 (16.81)	43.33 (14.40)	39.00 (9.71)	0.04*	0.01*	0.02*
Psychological	61.45 (12.60)	44.83 (18.22)	44.73 (15.40)	0.03*	0.02*	0.84
Social relationships	55.64 (20.10)	48.83 (18.73)	47.74 (17.06)	0.11	0.13	0.84
Environmental	58.09 (17.00)	45.92 (12.95)	44.60 (12.21)	0.09	0.04*	0.80
Overall	73.64 (14.33)	56.67 (14.97)	53.00 (11.83)	0.02*	0.02*	0.04*

DASH, Disabilities of Arm, Shoulder and Hand; QOL, quality of life; vs. versus; MS, mean score; SE, standard deviation. Group I, no pain with normal ultrasound findings; Group II, pain with normal US findings; Group III, pain with abnormal US findings. * $p<0.05$.

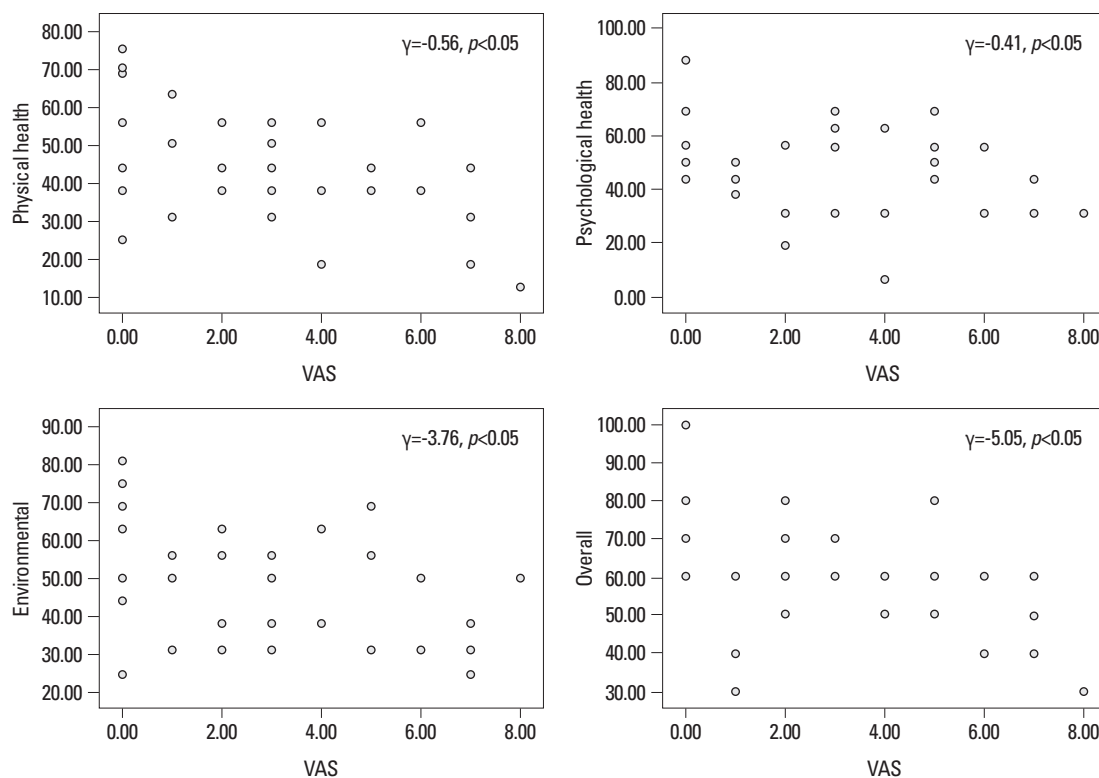


Fig. 2. Correlation of between quality of life (QOL) and pain in breast cancer-related lymphedema.

ULD in breast cancer survivors showed that the prevalence of rotator cuff disease increased with time. However, the study did not report the prevalence of rotator cuff disease in patients with BCRL.⁹ Herrera and Stubblefield¹⁰ with a retrospective case series, found that rotator cuff tendonitis is a complication of lymphedema caused by internal derangement of tendon fibers, which may be subject to impingement, functional overload, and intrinsic tendinopathy. Therefore, we tried to identify the shoulder pathology that causes shoulder pain and dysfunction in patients with BCRL. To this end, we used US to assess pathologic findings in patients with and without shoulder pain in BCRL. We then investigated differences in ULD and QOL according to the pathologic shoulder findings. Although we see patients with shoulder pain in the context of BCRL in the clinical setting, we often do not determine the cause of the shoulder pain and have typically used physical therapy of the shoulder and complex decongestive physiotherapy without specific proper treatment. Some patients improve after complex decongestive physiotherapy (CDT), but other patients do not, and may develop intractable pain. This study showed that shoulder pain was often not simple and could involve definite structural abnormalities, which can lead to ULD and affect QOL.

The rotator cuff stabilizes the shoulder joint and abducts

the shoulder. As BCRL develops, the arm weighs more. Some patients compare the feeling to carrying a heavy load with that arm. This increase in force on the rotator cuff can result in pain, bursitis, and tendonitis. In some cases, it leads to chronic injury with ischemia and tearing of the supraspinatus muscle.^{11,12}

Rotator cuff disease is one of the most common indications for US of the shoulder region. Diagnostic US is the primary imaging technique for soft-tissue injuries of the shoulder; its advantages are dynamic examination with side-to-side comparisons of the focus of interest. Many studies have reported excellent sensitivity and specificity of ultrasound for detecting rotator cuff tears.¹³ Recently, one study reported that US can provide early, accurate diagnosis of adhesive capsulitis by assessing the rotator interval for hypoechoic vascular soft tissue.⁸ In order to achieve an accurate diagnosis, we evaluated patients for adhesive capsulitis using US.

In this study, patients in group III (pain with abnormal US) had more severe pain than those in group II (pain with normal US). Group III patients had the following US findings: supraspinatus tear (8 patients, 53.3%) (partial thickness tear 75%/full thickness tear 25%), bicep tenosynovitis (2 patients, 13.3%), acromioclavicular arthritis (2 patients, 13.3%), subdeltoid bursitis (2 patients, 13.3%), and adhesive capsulitis (8 patients, 53.3%). Group II patients did not have patho-

logic findings on the US despite experiencing shoulder pain. This result showed that some patients with shoulder pain in patients with BCRL did not have pathologic findings by US. The reasons for developing pain without pathologic findings could be several conditions including pectoralis tightness, myofascial pain syndrome, post-mastectomy pain syndrome, axillary web syndrome.¹⁴ Therefore, patients with shoulder pain and pathologic findings including rotator cuff tear, bursitis, acromioclavicular arthritis, and adhesive capsulitis had more severe pain than patients with shoulder pain and no pathologic findings. We concluded that pathologic findings in the shoulder on US are an important factor in development of severe pain in patients with BCRL.

In the Iowa Women's Health Study, both women with diagnosed lymphedema and women with arm symptoms without diagnosed lymphedema had a substantially lower health-related QOL than breast cancer survivors without lymphedema or arm symptoms. Lymphedema had an impact on health-related QOL several years after diagnosis.¹⁵ In our study, QOL and disability were affected in patients with BCRL. Patients with shoulder pain accompanying BCRL, especially those with pathologic findings on US, appeared to have increased ULD and decreased QOL. In our evaluation of disability, patients with severe ULD had significantly more shoulder pain, and the most severe ULD was observed in patients with both shoulder pain and pathologic findings on US. However, QOL evaluation revealed that patients with shoulder pain and pathologic findings on US had significantly lower scores overall and in the physical domain of the QOL questionnaire, but that they did not differ significantly from the other patient groups in the psychological, environmental, and social relationship domains. These results suggest that pathologic shoulder findings on US more easily affect a patient's physical life than their psychological, social, or environmental life. Therefore, patients with shoulder pain and pathologic shoulder findings in the setting of BCRL require proper treatment, including US-guided injection, medication, and appropriate physiotherapy.

The limitations of this study include the small number of patients and their recruitment from only one hospital. Because of this, the participants may not adequately represent the general population of patients with shoulder pain in the setting of BCRL. In addition, age between groups was different and the patients in group III were older than those in the groups. Generally, older people tend to have less strength in the shoulders and a lower blood supply to the supraspinatus tendon than younger people. Thus, arm swelling and

heaviness in older people would have more of an effect on shoulder pathology in the elderly than in young people. Of course, we could not definitely rule out that only elderly patients had more shoulder pathology regardless of arm swelling and heaviness, because this study was conducted in a small group. This study is the first to evaluate QOL and disability in patients with BCRL-associated shoulder pain evaluated by US, and confirmation of these results is needed with a larger sample and longer follow-up.

The results of this study showed that group III (pain with abnormal US) had more disability and poorer quality of life compared to group I (no pain with normal US) and group II (pain with normal US findings). Pathologic shoulder findings on US in patients with BCRL were associated with more severe pain, more disability, and poorer QOL. Therefore, proper diagnosis and treatment of shoulder pain should be performed early in patients with BCRL and pathologic findings on US of the shoulder in order to improve the quality of life for patients with BCRL.

REFERENCES

1. Logan V. Incidence and prevalence of lymphoedema: a literature review. *J Clin Nurs* 1995;4:213-9.
2. Ridner SH. Breast cancer lymphedema: pathophysiology and risk reduction guidelines. *Oncol Nurs Forum* 2002;29:1285-93.
3. Hayes SC, Janda M, Cornish B, Battistutta D, Newman B. Lymphedema after breast cancer: incidence, risk factors, and effect on upper body function. *J Clin Oncol* 2008;26:3536-42.
4. Pyszel A, Malyszczak K, Pyszel K, Andrzejak R, Szuba A. Disability, psychological distress and quality of life in breast cancer survivors with arm lymphedema. *Lymphology* 2006;39:185-92.
5. McWayne J, Heiney SP. Psychologic and social sequelae of secondary lymphedema: a review. *Cancer* 2005;104:457-66.
6. Chachaj A, Malyszczak K, Pyszel K, Lukas J, Tarkowski R, Pudielko M, et al. Physical and psychological impairments of women with upper limb lymphedema following breast cancer treatment. *Psychooncology* 2010;19:299-305.
7. Soble MG, Kaye AD, Guay RC. Rotator cuff tear: clinical experience with sonographic detection. *Radiology* 1989;173:319-21.
8. Lee JC, Sykes C, Saifuddin A, Connell D. Adhesive capsulitis: sonographic changes in the rotator cuff interval with arthroscopic correlation. *Skeletal Radiol* 2005;34:522-7.
9. Lauridsen MC, Christiansen P, Hessov I. The effect of physiotherapy on shoulder function in patients surgically treated for breast cancer: a randomized study. *Acta Oncol* 2005;44:449-57.
10. Herrera JE, Stubblefield MD. Rotator cuff tendonitis in lymphedema: a retrospective case series. *Arch Phys Med Rehabil* 2004;85:1939-42.
11. Ridner SH. Quality of life and a symptom cluster associated with breast cancer treatment-related lymphedema. *Support Care Cancer* 2005;13:904-11.
12. Avrahami R, Gabbay E, Bsharah B, Haddad M, Koren A, Dahn J,

- et al. Severe lymphedema of the arm as a potential cause of shoulder trauma. *Lymphology* 2004;37:202-5.
13. Lew HL, Chen CP, Wang TG, Chew KT. Introduction to musculoskeletal diagnostic ultrasound: examination of the upper limb. *Am J Phys Med Rehabil* 2007;86:310-21.
 14. Yang EJ, Park WB, Seo KS, Kim SW, Heo CY, Lim JY. Longitudinal change of treatment-related upper limb dysfunction and its impact on late dysfunction in breast cancer survivors: a prospective cohort study. *J Surg Oncol* 2010;101:84-91.
 15. Ahmed RL, Prizment A, Lazovich D, Schmitz KH, Folsom AR. Lymphedema and quality of life in breast cancer survivors: the Iowa Women's Health Study. *J Clin Oncol* 2008;26:5689-96.