AXILLARY WEB SYNDROME AND ITS ASSOCIATION WITH LYMPHEDEMA AND RANGE OF MOTION REDUCTION IN WOMEN SUBMITTED TO BREAST CANCER SURGERY: A CROSS-SECTIONAL STUDY

SÍNDROME DA REDE AXILAR E SUAS ASSOCIAÇÕES COM LINFEDEMA E DÉFICIT DE AMPLITUDE DE MOVIMENTO EM MULHERES SUBMETIDAS À CIRURGIA DO CÂNCER DE MAMA: ESTUDO TRANSVERSAL

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ABSTRACT

Introduction: Breast cancer is the most frequent neoplasm in Brazilian women and control of post treatment morbidities has stimulated investigations for a better quality of life. **Objectives:** To determine the frequency of axillary web syndrome (AWS) and the association with lymphedema and range of motion (MAD) of the shoulder joint after axillary surgery. **Methods:** Between December 2011 and September 2012, 97 women surgically treated for breast cancer were enrolled at the Cancer Hospital of Pernambuco, Brazil. The search for axillary cords, goniometry of the shoulder joint and perimetry of the ipsilateral and contralateral upper limbs of the affected breast were performed. For comparison between goniometric and perimetric values, Student's t-test and Lévené variance analysis were used. Chi-square and Fisher's exact tests were used to compare proportions. The significance level $p \leq 0.05$ was adopted. The work was approved by Human Research Ethics Committee. **Results:** AWS was diagnosed in 28 (28.86%) women, of whom 15 (53.57%) had lymphedema. There was a significant reduction in most movements in the ipsilateral limb compared to its contralateral limb. **Conclusions:** There were expressive numbers of women diagnosed with AWS and association with early onset of perimetry changes, in addition to a significant reduction in shoulder range of motion.

Keywords: Postoperative complications; Goniometry; Axilla; Lymphadenectomy; Lymphedema

RESUMO

Introdução: O câncer de mama é a neoplasia mais frequente na mulher brasileira, e o controle das morbidades pós-tratamento tem estimulado investigações para melhor qualidade de vida. **Objetivos:** Determinar a frequência da síndrome da rede axilar (SRA) e a associação com linfedema e déficit na amplitude de movimento da articulação do ombro após abordagem cirúrgica da axila. **Métodos:** Entre dezembro de 2011 a setembro de 2012, foram incluídas 97 mulheres tratadas cirurgicamente para câncer de mama no Hospital de Câncer de Pernambuco, Brasil. Foram realizadas busca pelos cordões axilares, goniometria da articulação do ombro e perimetria dos membros superiores ipsilateral e contralateral à mama afetada. Para comparação entre valores goniométricos e perimétricos, usou-se o teste t de Student e análise de variância Levene. Os testes Qui-quadrado e exato de Fisher foram utilizados para comparação de proporções. Adotou-se nível de significância de $p \leq 0.05$. O trabalho foi aprovado pelo Comitê de Ética de Pesquisa em Seres Humanos. **Resultados:** SRA foi diagnosticada em 28 (28,86%) mulheres, destas, 15 (53,57%) apresentavam linfedema. Houve redução significante na maioria das movimentações no membro ipsilateral comparado com o seu contralateral. **Conclusões:** Houve expressivo número de mulheres diagnosticadas com SRA e associação com início precoce de alterações na perimetria, além de redução significativa da amplitude de movimento dos ombros.

Palavras-chave: Complicações pós-operatórias; Goniometria. Axila; Linfadenectomia; Linfedema

INTRODUCTION

Breast cancer is the most frequent neoplasm among women, with an incidence of 55.7 per 100,000 individuals in the United States, 96.0 per 100,000 in Canada, and 52.5 per 100,000 in Brazil[1-3]. Surgical treatment or radiotherapy may cause functional motor deficits, such as reduced range of motion (ROM), pain, lymphedema, seroma, axillary web syndrome (AWS), and intolerance to daily activities[4-6].

AWS is one of the leading causes of pain after axillary dissection and its characterized by a stretched band underneath the skin, often called cord[7] or lymphedema cord[8], which may be localized in the medial upper arm and the anterior elbow. The dissection of axillary or sentinel lymph nodes, tissue damage, or cancer itself may cause the AWS[7].

Many aspects of AWS remain undefined 9 and an adequate guideline for therapeutic interventions is required[10].

This study aimed to determine the frequency of AWS and the association with lymphedema and reduced ROM of the shoulder joint after axillary surgery.

METHODS

This analytical study was conducted between December 2011 and July 2012 in the Mastology Department of the Cancer Hospital of Pernambuco, Brazil. Women, aged 18 or older, treated for unilateral breast cancer and with two or fewer physical therapy sessions were included. Exclusion criteria comprised cases of recurrent breast cancer, missing medical records, and people with physical trauma or conditions preventing adequate movement of the ipsilateral upper limb. The centimeter staging was performed between the perimeters of the contralateral and ipsilateral limbs; the goniometry measured the maximum angles of the shoulder joints in flexion, extension, adduction, abduction, external rotation, and internal rotation 11; detection of reduced ROM in shoulder joint, defined as a reduction of 10º or more in the ipsilateral limb compared to the contralateral limb[12-13]; breast laterality; and identification of AWS (presence of palpable cords with the patient seated during abduction, flexion, and external rotation of the ipsilateral shoulder).

The probabilistic sample included 97 patients, assuming an AWS incidence between 6% and 28.1%[8,14,15].

Student's t-test with Levene's test for variance analysis compared goniometric and perimetric measurements of the ipsilateral and contralateral limbs. Chi-square and Fisher's exact tests were used to compare proportions. Statistical significance was set at $p \leq 0.05$.

RESULTS

Results are presented in Tables 1-4.

Table 1. Distribution of tumor- and treatment-related information in 97 women with breast cancer – Cancer Hospital of Pernambuco, Brazil - December 2011 to July 2012.

Variables related to the tumor	AWS (cords)				Total (n=97)		p-value
	present (n = 28)		absent (n = 69)				
	n	%	n	%	n	%	
Breast laterality							0.701†
Right	13	46.43	35	50.72	48	49.49	
Left	15	53.57	34	49.28	49	50.51	
Clinical staging of breast cancer at diagnosis							0.910†
Initial	19	67.86	46	66.67	65	67.01	
Advanced	9	32.14	23	33.33	32	32.99	

For the variables, only sentinel lymph node biopsy and axillary dissection were considered. AWS: axillary web syndrome.

Table 2. Comparison of goniometric measurements in degrees between ipsilateral and contralateral limbs, according to breast laterality and the presence of AWS (cords) in 97 women with breast cancer– Cancer Hospital of Pernambuco, Brazil – December 2011to July 2012.

	Right breast			Left breast		
Goniometria (degrees)	**Right limb**	**Left limb**	**p-value**	**Right limb**	**Left limb**	**p-value**
Active shoulder flexion goniometry with AWS	112 85±6.98	162.38±4.80	**< 0.001**	162.20±4.23	102.40±9.35	**< 0.001**
No AWS	126.20±4.91	157.14±3.48	**< 0.001**	157.48±3.44	105.21±5.76	**< 0.001**
Active shoulder extension goniometry with AWS	46.08±5.07	50.92±3.17	**0.109**	58.80±3.21	48.80±5.09	**0.058**
No AWS	45.11±1.96	51.11±12.14	**0.004**	52.15±2.05	45.42±2.14	**0.002**
Active shoulder abduction goniometry with AWS	103.84±7.09	152.92±7.94	**< 0.001**	153.47±5.51	94.00±7.89	**< 0.001**
No AWS	122.57±5.57	156.23±3.79	**< 0.001**	154.88±4.02	99.45±5.98	**< 0.001**
Active shoulder adduction goniometry with AWS	27.46±3.70	36.85±2.42	**0.014**	37.07±2.32	27.33±3.54	**0.014**
No AWS	25.34±1.94	34.37±1.74	**< 0.001**	33.39±1.82	26.42±2.69	**0.017**
Active shoulder internal rotation goniometry with AWS	49.84±7.76	69.92±5.66	**0.011**	64.67±5.32	60.53±4.81	**0.268**
No AWS	57.17±3.66	64.20±3.59	**0.008**	60.13±3.61	57.47±4.57	**0.548**
Active shoulder external rotation with AWS	85.38±2.54	92.38±2.19	**0.007**	91.20±2.52	77.87±6.29	**0.048**
No AWS	83.31±2.58	88.20±2.34	0.090	87.91±2.88	78.94±3.76	0.026
Passive shoulder flexion goniometry with AWS	121.31±7.94	166.77±6.07	**< 0.001**	156.80±10.72	108.40±8.58	**0.001**
No AWS	133.69±4.84	165.29±2.46	**< 0.001**	164.85±3.23	117.15±5.69	**< 0.001**
Passive shoulder extension goniometry with AWS	46.31±4.40	54.23±3.06	**0.022**	62.13±3.32	54.40±4.24	**0.066**
No AWS	49.29±2.18	55.20±2.33	**0.001**	57.88±3.86	50.10±2.46	**0.050**
Passive shoulder abduction goniometry with AWS	109.23±8.19	157.92±7.84	**< 0.001**	158.53±11.44	98.07±7.74	**0.004**
No AWS	126.97±5.81	161.86±20.24	**< 0.001**	154.94±5.93	105.06±5.96	**< 0.001**
Passive shoulder adduction with AWS	28.62±3.29	36.00±2.08	**0.025**	39.60±1.91	28.53±3.19	**0.002**
No AWS	29.74±2.00	35.69±1.89	**0.001**	33.94±1.47	26.54±2.53	**0.008**
Passive shoulder internal rotation with AWS	58.38±6.40	74.46±5.56	**0.011**	71.60±4.51	65.87±5.34	**0.359**

Table 3. Comparison of perimetric measurements between ipsilateral and contralateral limbs, according to breast laterality and the presence of AWS, in 97 women with breast cancer – Cancer Hospital of Pernambuco, Brazil – December 2011to July 2012.

Perimetry measurements (centimeters)	Right breast			Left breast		
	Right limb	Left limb	p-value	Right limb	Left limb	p-value
Palmar crease perimetry AWS						
AWS	18,71±0,27	18,45±0,17	0,176	18,94±0,32	18,64±0,29	0,300
no AWS	18,90±0,20	18,63±0,21	0,071	18,24±0,34	18,24±0,40	0,984
Wrist perimetry						
AWS	15,58±0,22	15,35±0,22	0,021	16,05±0,31	16,06±0,32	0,958
no AWS	15,68±0,21	15,61±0,17	0,589	15,50±0,38	15,40±0,38	0,248
Forearm perimetry, 7 cm from the elbow crease						
AWS	23,51±0,54	23,32±0,50	0,338	24,19±0,82	23,97±0,86	0,453
no AWS	23,25±0,55	22,89±0,56	0,069	23,51±0,44	23,24±0,44	0,100
Forearm perimetry, 14 cm from the elbow crease						
AWS	18,11±0,38	18,19±0,39	0,658	19,74±0,78	19,67±0,75	0,799
no AWS	18,57±0,64	18,32±0,63	0,146	19,40±0,44	19,16±0,45	0,230
Upper arm perimetry, 7 cm from the elbow crease						
AWS	26,81±0,62	26,40±0,67	0,143	27,28±1,27	27,89±1,29	0,131
no AWS	27,95±0,70	27,28±0,68	0,069	27,36±0,58	27,68±0,60	0,137
Upper arm perimetry, 14 cm from the elbow crease						
AWS	30,58±1,53	30,38±1,45	0,549	30,02±1,78	30,48±1,82	0,386
no AWS	30,68±0,82	30,35±0,82	0,109	30,05±0,73	30,33±0,73	0,199
axilla perimetry						
AWS	41,75±1,40	41,21±1,49	0,464	40,83±1,50	40,84±1,82	1,000
no AWS	41,62±0,88	41,02±0,70	0,217	42,04±0,95	42,71±1,04	0,148

Table 4. Association between lymphedema topography in the upper limb and AWS diagnosis (cords) in 97 patients with breast cancer – Cancer Hospital of Pernambuco, Brazil – December 2011to July 2012.

Lymphedema topography	AWS (cords)				p-value
	Present		Absent		
	n	%	n	%	
Palmar crease					0,319
No	25	92,6	66	97,0	
Yes	2	7,4	2	3,0	
Wrist					0,716
No	27	100,0	67	98,5	
Yes	-	-	1	1,5	
Forearm, 7 cm from the elbow crease					0,592
No	25	92,6	62	91,1	
Yes	2	7,4	6	8,9	
Forearm, 14 cm from the elbow crease					0,042
No	27	100,0	59	86,8	
Yes	-	-	9	13,2	
Arm 7 cm from the elbow crease					0,173
No	25	92,6	56	82,4	
Yes	2	7,4	12	17,6	
Arm 14 cm from the elbow crease					0,429
No	22	81,5	58	85,2	
Yes	5	18,5	10	14,8	
Axilla					0,083
No	13	48,1	45	66,2	
Yes	14	51,9	23	33,8	

Loss of two samples with AWS. AWS: axillary web syndrome.

DISCUSSION

AWS frequency was 28.8%, consistent with literature, which varies from 6% to 48.3%, due to variability in the definition criteria and methodological differences across studies[8,14,17-18].

Significant decreases in ROM might be related to the post-surgery convalescence, as these limitations were observed regardless of AWS presence.

Considering breast laterality in relation to active and passive shoulder ROM, a greater reduction was observed when the left breast was affected, reflecting the predominance of right-handed patients. Muscles associated with hand dominance are more used in daily activities that require strength and more developed, leading to morphophysiological adaptations, such as muscle hypertrophy and greater motor unit recruitment[19].

Regarding bilateral involvement, the frequency observed in this study corroborated previous literature, although differences were observed in the ipsilateral limb topography. These differences were attributed to the time interval between surgery and measurements[21].

A limitation of this study was the cross-sectional design and the lack of preoperative evaluation of patients[17,22-24], which may have restricted the detection of preexisting ROM reductions or upper-limb circumference differences before surgery[25].

The early onset of perimetric alterations in AWS highlights the need for appropriate treatment in the immediate post-operative period. Currently, literature lacks standardized therapeutic approaches for AWS and management strategies focusing on addressing associated morbidities.

CONCLUSIONS

A significant number of women diagnosed with AWS were associated with early onset of pe-

rimetric alterations and a significant reduction of shoulder ROM.

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