SHORT REPORT

Correlation of kinesiophobia and upper extremity parameters in post mastectomy patients

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Abstract

Breast cancer, if diagnosed at advanced stages, often leads to surgical intervention, i.e. mastectomy, which later presents complications that add to morbidity. A cross-sectional analytical study was conducted to determine pain, upper limb ROM, grip strength, lymphoedema, and their co-relation with kinesiophobia in post mastectomy patients. A sample of 55 female patients was selected via non-probability purposive sampling. Kinesiophobia was assessed using Tampa Scale of kinesiophobia (TSK-11) and pain via Numeric Pain Rating Scale. Upper extremity ROM was measured using a plastic goniometer, grip strength by Jamar Hydraulic dynamometer, and limb volumes were calculated by summed truncated cone volume via circumferential tape measurements. Wilcoxon signed rank test and Spearman co-relation test was used for analysis. Significant difference between the limb volumes was noted (p=0.02) and a reduction in overall upper extremity ranges was seen (p<0.05). A positive significant co-relation between pain and TSK score (r= 0.300, p=0.026) was observed.

Keywords: Grip strength, Kinesiophobia, Lymphedema, Mastectomy, Pain, Range of motion.

DOI: https://doi.org/10.47391/JPMA.7170
Submission completion date: 18-06-2022
Acceptance date: 21-02-2023

Introduction

Breast cancer is a type of cancer that emerges from the breast tissue and usually presents as a lump in the breast.[1] It is the most prevalent form of cancer accounting for 23% of all the newly diagnosed cancers with an estimated 5-year prevalence of 119,710 cases, 34,038 newly diagnosed cases, and 16,232 deaths in 2012.[2] Risk factors associated with breast cancer include increasing age, family history, geographical variation, the age of menarche, previous benign diseases of the breast, radiation, use of oral contraceptives, and lifestyle.[3,4] Lifestyle including dietary intake, physical activity, obesity, smoking, and alcohol use too has an influence on breast cancer.[1,4] Some of the main reasons of such high prevalence rates, especially noted in low and middle-income countries, is lack of awareness regarding risk factors and early detection, inattention to self-inspection and clinical breast examination, cultural taboos, and barriers to health services.[5,6]

On these grounds, despite being the most prevalent cancer among females globally, breast cancer still remains undiagnosed until its advanced stages after which conservative management becomes ineffective. Since in Pakistan the cases aren't usually reported and diagnosed until they have reached a catastrophic stage, the most common approach of treatment is surgery.[7] Surgery for treating breast cancer can either be Breast Conserving Surgery (BCS), also called Lumpectomy, that conserves major portion of the breast tissue, or Mastectomy, that is the excision of complete tissue of breast, which is the most frequently performed procedure. Survivors of breast cancer often develop significant fear of movement that results in avoidance of movement,[8] called Kinesiophobia.[9]

On account of this psychological behaviour, post-mastectomy patients tend to avoid physical activity involving upper limb and keep their arm in guarded positions for long hours.[10] Unfortunately, there is no available data in Pakistan regarding grip strength, lymphoedema, and ranges of upper extremity in post mastectomy patients in acute healing phase. The purpose of the current study was to assess how kinesiophobia correlates with upper extremity mobility and lymphoedema in the immediate post- mastectomy period and provide baseline data to establish better oncological rehabilitation regimens on account of early psychological and physical complications.

Methods and Results

A cross sectional analytical study was conducted from January 2019 to May 2019 on a convenient sample of 55 post-mastectomy female patients admitted in surgery department of Fauji Foundation and Holy Family Hospital Rawalpindi who recently underwent some form of mastectomy. Patients between the ages of 30-70 years were recruited via non probability purposive sampling; the inclusion criteria was being conscious and well-oriented at

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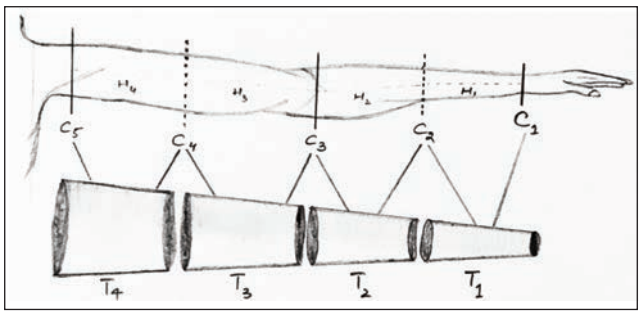

Figure: : Truncated cone indicating the landmarks of circumferential measurements in upper limb.

acute post-mastectomy stage, no more than two weeks post-op. Patients who were haemodynamically unstable, had a prior upper limb dysfunction, undergoing physiotherapy, or had undergone bilateral mastectomy were excluded from the study. Data collection tools included Numeric Pain Rating Scale (NPRS) to assess the intensity of pain, Tampa Scale of Kinesiophobia (TSK-11) to evaluate kinesiophobia, universal goniometer to measure range of motion of both upper extremities, Jamar Hydraulic Dynamometer to measure grip strength and plastic inch tape to take circumferential measurements for evaluating lymphoedema with summed truncated cone volume method.[11]

Lymphoedema was evaluated by circumferential tape measurements. A truncated cone was assumed to measure the volume of a single segment between the two adjacent measured segments. All four cones were added to measure arm volumes based on anatomic landmarks (wrist to mid forearm, mid forearm to elbow, elbow to mid upper arm, and mid upper arm to upper boundary of the arm), the upper boundary of the arm was marked at the upper border of the paper which was placed in the armpit; bringing its upper border over the anterior side of the arm this site was marked (Figure).

Circumferential measurements were recorded at each of the above points with the help of a thin, flexible plastic tape. Total limb volume was acquired by summing up the volumes of cones in between the wrist and upper-boundary. The volume is calculated as follows:[11]

$$V_1 = \frac{h(C_1)^2 + C_1C_2 + C_2^2}{12\pi}$$

Equation 1: Volume of truncated cone

In Equation 1, "V_1" is volume of segment of 1st truncated cone, "C1" and "C2" are the circumferences at the ends of the segment, and "h" is the distance between them (segment length). Volume of the whole limb was then calculated as

Equation 2: Whole Upper limb Volume

$$V_t = V_1 + V_2 + V_3 + V_4$$

Data was analysed using SPSS v20.0. Normality was assessed at individual level using Shapiro-Wilk test. Normal distribution (p>0.05) signified use of Paired sample t test for wrist extension, and Wilcoxon sign rank test was used to compare all remaining bilateral upper limb range of motion and lymphoedema, and grip strength of both hands. Spearman co-relation test were used to determine the association between kinesiophobia, ROM, grip strength, and lymphoedema. (CI = 95%, p<0.05).

Of the 55 patients, the reported mean age was 54.2±11.07 years and the mean BMI was 22.93±3.04 kg/m^2. The median value for pain and kinesiophobia was 6.00[2] and 24.00[8] on NPRS and TSK-11 respectively. No significant difference (p=0.240) was observed in grip strength between operated and un-operated side with mean values of 9.53±3.24 kgf and 9.88±3.24 kgf, respectively. Similarly, the median volume of the limb of operated and un-operated side was 777.98 cm^3 and 750.21±167.85 cm^3 respectively with the mean volume difference of 27.76±74.90 cm^3 between the two. A statistically significant difference (p=0.02) between the limb volumes of operated and un-operated sides was found and the number of patients with greater volume of operated side was higher (Table 1). For shoulder ranges, significant differences (p<0.05) were observed in shoulder

Table-1: Limb Comparison of Grip strength, Lymphoedema, Range of Motion.

Variable	Range of motion/Joint	Operated Side Limb Median (IQ) Mean ±SD	Un-operated Side Limb Median (IQ) Mean ±SD	*p*-value
Grip Strength (kgf)		9.53±3.04)	9.88±3.24)	0.240
Lymphoedema (Limb Volume) (cm^3)		742.17 (214.29)	740.01 (176.73)	0.025*
Range of Motion				
	Shoulder			
	Flexion	85 (107)	170 (27)	< 0.001*
	Extension	30 (25)	53 (19)	< 0.001*
	Abduction	87 (48)	140 (60)	< 0.001*
	Adduction	28 (12)	30 (07)	< 0.001*
	Internal Rotation	60 (15)	64 (20)	< 0.001*
	External rotation	63 (34)	69 (24)	< 0.001*
	Elbow			
	Flexion/Extension	120 (18)	125 (15)	0.008*
	Forearm			
	Supination	81 (12)	87 (10)	< 0.001*
	Pronation	85 (15)	90 (10)	0.002*
	Wrist			
	Flexion	70 (20)	70 (09)	0.007*
	Extension	63.95±12.59	65.35±12.37	0.251
	Radial Deviation	24 (10)	25 (10)	0.006*
	Ulnar Deviation	30 (08)	32 (08)	0.450*

Table-2: Correlation of Tsk with Age, Pain and Outcome Variables.

Test Variables	r-value	p-value
Age x Kinesiophobia	-0.189	0.166
Pain (NPRS) x Kinesiophobia	0.300	0.026*
Kinesiophobia x Lymphoedema	-0.060	0.664
Kinesiophobia x Grip strength	0.146	0.289
Kinesiophobia x Shoulder Flexion Op	-0.091	0.508
Kinesiophobia x Shoulder Extension Op	-0.179	0.299
Kinesiophobia x Shoulder Abduction Op	-0.001	0.992
Kinesiophobia x Shoulder Adduction Op	0.117	0.393
Kinesiophobia x Shoulder External Rotation Op	-0.017	0.901
Kinesiophobia x Shoulder Internal Rotation Op	0.142	0.299
Kinesiophobia x Elbow Flexion Op	0.195	0.154
Kinesiophobia x Supination Op	-0.020	0.886
Kinesiophobia x Pronation Op	-0.154	0.262
Kinesiophobia x Wrist Flexion Op	-0.009	0.947
Kinesiophobia x Wrist Extension	-0.133	0.334
Kinesiophobia x Wrist Radial Deviation Op	0.140	0.307
Kinesiophobia x Wrist Ulnar Deviation Op	0.082	0.551

* Statistically significant correlation; r: Correlation coefficient

flexion, abduction, internal rotation, external rotation, elbow flexion forearm supination, pronation, wrist flexion, and radial deviation between the operated and un-operated sides. However, no significant difference ($p>0.05$) was seen in wrist extension and ulnar deviation of both the upper extremities (Table 1).

A significant positive correlation ($r=0.3$ $p=0.026$) was found between pain scores and kinesiophobia. Co-relation of lymphoedema and upper limb range of motion was also calculated with kinesiophobia; however, none of them had a statistically significant value ($p>0.05$). Detailed Results are presented in Table 2.

Discussion

The current study showed an increase in lymphoedema on the operated side at initial post-op stage highlighting the need for lymphoedema management immediately after mastectomy as lymphoedema has been known to contribute to upper extremity impairment.[12] A study conducted by Norman et al concluded that lymphoedema, although mild, is a common complication following mastectomy and mild changes in the arm circumferential measurements can be the early indicators of increasing lymphoedema.[13] Therefore, it is crucially important to diagnose and detect lymphoedema at an early post-op stage to reduce the negative effects that can be prevented through timely detection and intervention.

The current study also showed marked reduction in ranges of upper limb on the operated side as compared to the non-operated side. These results are supported by Blomqvist et al, who states that flexion and abduction ranges are significantly reduced in non-irradiated patients after the surgery.[14] The results are also consistent with Thomas-MacLean et al, who noted a restricted shoulder abduction range (less than 170º on the operated side) in 205 out of 347 women who underwent surgery for unilateral breast cancer.[15]

The current study showed that there was a positive correlation between pain scores and kinesiophobia, indicating an increase in fear of movement as a result of increasing pain levels. All other correlations including kinesiophobia with lymphoedema, shoulder ranges, etc. were non-significant. Similarly, the correlation between kinesiophobia and lymphoedema scores was statistically non-significant. This meant kinesiophobia might not contribute to developing early lymphoedema in post-mastectomy patients.

These results are supported by the results of Landowska J. et al, who suggested that the pain severity is positively related to the intensity of kinesiophobia symptoms and to the beliefs about pain duration.[16]

The current study also determined that a negative correlation, though not significant, is present in shoulder flexion, extension, abduction, and external rotation of the operated limb with kinesiophobia. This means that there is a relation between kinesiophobia and ranges; as kinesiophobia increases, the movement of shoulder joint decreases.

The current study had a few limitations. Due to significant evaluation time, data from limited sample was obtained. The robustness of findings needs to be verified by large-scale study utilising more objective tools with follow-up comparison.

Conclusion

Marked reduction in upper limb ROM occurs on the operated side in post-mastectomy patients. Similarly, limb oedema starts to develop at acute post-operative stage on the operated side, which may be managed through physiotherapy. Upper limb range of motion, lymphoedema, and grip strength is not influenced by fear of movement. However, fear of movement is higher in patients reporting higher pain levels.

Disclaimer: The article is a part of Final year thesis project of DPT conducted in Foundation University Islamabad.

Conflict of interest: None.

Funding disclosure: None

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