

# Shoulder mobility after axillary sentinel node biopsy for early infiltrating breast cancer treatment

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## Summary

It is known that complete axillary lymph node dissection for breast cancer treatment causes more frequent sensitive and motor alterations in the homolateral shoulder and upper limb than sentinel lymph node (SLN) biopsy. However, it is not clear how often patients treated by SLN biopsy suffer from shoulder mobility (SM) restriction, as well as its severity and duration. This study was done aiming to evaluate SM in 38 patients with early infiltrating breast cancer treated by SLN biopsy in whom shoulder movements were assessed before surgery and repeated at one, two and three months later. Shoulder-arm mobility was evaluated by goniometry considering flexion, abduction, adduction, extension, internal rotation and external rotation. An abnormal result for each movement was defined by restriction greater than ten degrees compared to preoperative findings. Significant abnormal results for flexion and abduction were found in all of the patients at the first month evaluation. At the third month assessment no women showed any kind of SM impairment. The average restriction evolution for each of the parameters is presented. It is concluded that there is frequently a slight and transient SM limitation in patients undergoing SLN biopsy. Early postoperative physiotherapeutical assistance should thus be advisable to relieve and shorten disability symptomatology.

*Key words:* Breast cancer; Sentinel node biopsy; Morbidity.

## Introduction

The lifetime risk of developing breast cancer is estimated at 13% for women living in the USA and 8% in Europe [1, 2]. The number of breast cancer survivors is progressively increasing worldwide due to the high neoplasia incidence, early diagnosis and more accurate therapy. Nevertheless some hazardous physical morbidity, transitory or definitive, secondary to axillary lymph node surgical management are very common in these women as limitations of shoulder mobility (SM), paresthesias and arm swelling [3-5].

The severity of these disturbances is related to the extent of axillary lymph nodes dissection (ALND). Sentinel lymph node (SLN) biopsy is a minimally invasive staging procedure that reduces the frequency and severity of the complications observed after full axillary clearance [5-7]. SLN biopsy is currently the gold-standard procedure for managing early infiltrating breast carcinomas up to 3 cm in diameter that should also be employed in combination with radioguided occult lesion localization [8-11].

While the side-effects of ALND have been extensively described in the literature, the short and long-term morbidity after SLB biopsy are not well established. Some studies have compared shoulder arm mobility in patients who underwent ALND and SLN biopsy and all of them pointed out the benefits of the less extensive maneuver, but to the best of our knowledge, they all were carried out without assessing arm function previously. Theoretically someone about to initiate an accurate research on arm function after SLN biopsy should first evaluate the mobility parameters before surgery and repeat them afterwards.

The aim of this study was to investigate if there is SM restriction after axillary SLN biopsy for breast cancer treatment comparing the surrogate arm movements in the same patients before and after the surgery.

## Patients and Methods

Thirty-eight patients with palpable T1-2, N0 breast carcinomas were prospectively enrolled in the study. They underwent radioisotopic lymphatic mapping, breast segmental resection and SLN biopsy under probe guidance. Average patient age was 48.3 years (35-65).

The Research Protocol Review Committee of our institution approved the investigation and a written informed consent was obtained from each patient.

On the day before surgery a solution containing dextran labeled with 15 MBq of <sup>99m</sup>Tc was injected in the peritumoral area. Lymphoscintigraphy was performed preoperatively to identify lymphatic pathways and hot spots were marked on the skin. Detailed nuclear medicine methodology was published elsewhere [12].

Immediately after breast segmental resection SLN was biopsied with gama probe monitoring. The mean number of excised lymph nodes was 1.9 [1-4] for each patient.

Regardless of the different breast tumor locations, SLN harvesting was always performed through a unique breast incision. SLN was intraoperatively cut at 1 mm intervals for fresh imprint cytological testing. In this casuistic the definitive analysis always confirmed the intraoperative cytology findings. All the patients showed uninvolved SLN and received no further axillary treatment.

SM extent was measured by a goniometer, which consists of a plastic circle with two rulers, graduated in degrees (0-360°). With the patient in the orthostatic position the following movements were evaluated in the homolateral shoulder to the axillary biopsy: flexion, extension, abduction, adduction, internal and external rotation. Illustrative flexion, extension and abduction measurements are presented in Figure 1.

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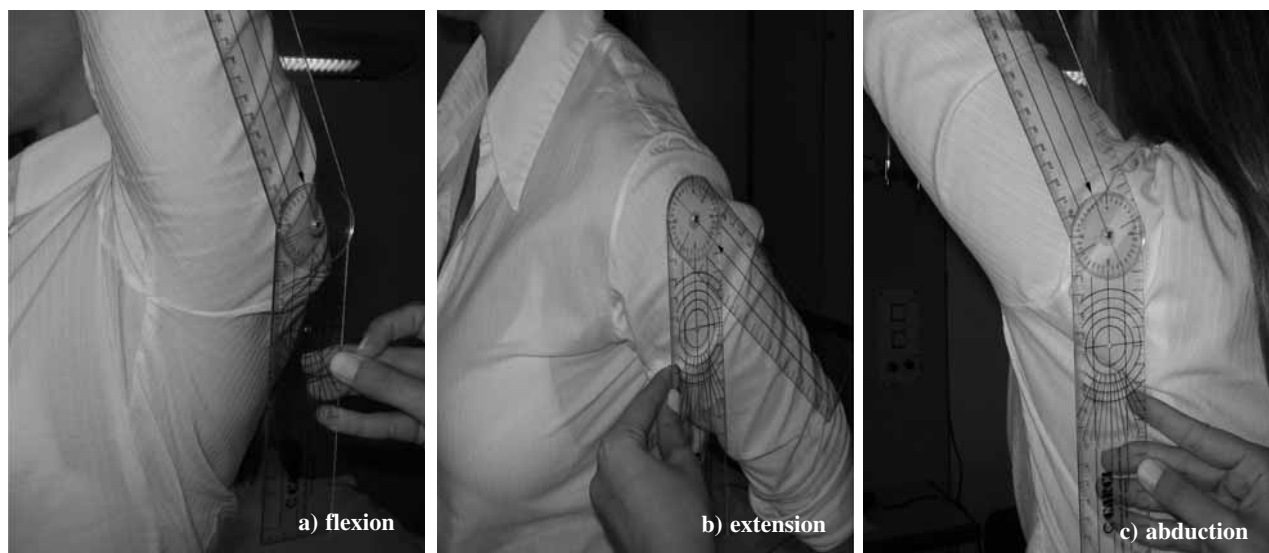


Figure 1. — Shoulder mobility measurements: a) flexion, b) extension, c) abduction.

No postoperative physiotherapeutical intervention was offered to these women to avoid interference in the results.

All patients were examined the day before the operation and one, two and three months thereafter by a physiotherapist. The range of the different pre- and postoperative shoulder movements were compared. Results were registered as abnormal when outcome measures compared to preoperative evaluations found a restriction diversion greater than 10 degrees.

## Results

The most frequent affected shoulder movements are flexion and abduction, however the impairments were without exception transitory. The range of shoulder flexion and abduction was abnormally restricted in all of the patients at one month evaluation compared to preoperative measurement (100%). In addition nine patients (23.6%) suffered from aduction disturbance. In a single case (2.6%) shoulder extension deficiency occurred. There was not any case of abnormality in shoulder internal rotation, external rotation and extension.

Table 1 shows the evolution of the abnormal results for each of the shoulder movements in the three postoperative assessments.

It is possible to observe that aduction and extension hazards disappeared at the second assessment. On the other hand the number of patients with deficient flexion and abduction was reduced at two months and at the last evaluation (3 months after the surgery), all patients had fully recovered SM.

Figures 2 and 3 show the evolution of the average degree values of the extension of shoulder flexion and abduction movements.

## Discussion

Undoubtly with the less extensive lymph node dissection required for SLN staging there is less morbidity than after ALND [13-16, 18-21]. Nevertheless the prevalence, severity and duration of SM restriction in patients undergoing SLN biopsy clearance are still a point of concern.

Table 1. — Number of abnormal results for measures of mobility of the shoulder (reduction greater than 10°).

	1 month		2 months		3 months	
	n	%	n	%	n	%
Flexion	38	100	33	86.4	0	-
Abduction	38	100	29	76.3	0	-
Extension	1	2.6	0	-	0	-
Aduction	9	23.7	0	-	0	-
Internal Rotation	0	-	0	-	0	-
External Rotation	0	-	0	-	0	-

The major finding in this study was the demonstration that most of the patients presented slight and transient shoulder-arm movement impairment after SLN biopsy, mainly flexion, abduction and aduction. The movement modifications were short-term restricted. Three months after the operation full range of shoulder motion, compared with preoperative measurements, was always observed, with no residual signs of shoulder limitation.

Our study corroborates previous work by Leidenius *et al.*, who found that a large subset of the patients (75%) after SLN biopsy experienced limited and ephemeral SM restriction [4].

The exact etiology of the SM transitory limitations is not well understood, but probably they are caused by pain and/or strain in the wound and muscles, as result of the inhibitory effects of tissue injury and fibroses [17, 18].

Schrenk *et al.*, in 2000, pioneerly stressed that SLN biopsy is associated with less postoperative SM limitation compared with conventional ALND [19]. Currently it is the consensus that axillary staging by SLN biopsy, without complete clearance, decreases the interference with daily life caused by SM limitation. In the literature there are only three randomized controlled clinical trials comparing SLN biopsy versus primary ALND [3, 20, 21] and all these studies have confirmed the best performance in the former group of patients regarding physical postoperative morbidity.

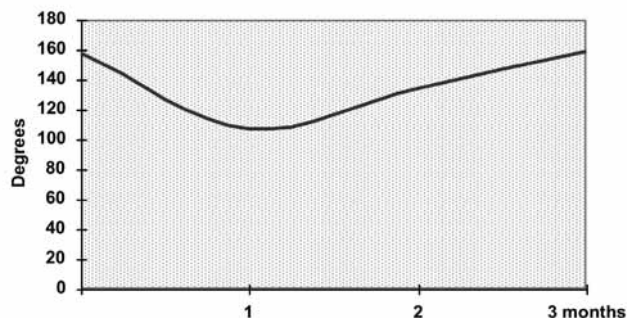


Figure 2. — Average values of shoulder flexion movement evolution after sentinel lymph node biopsy.

It is reasonable to suppose that the rather high mean number of excised lymph nodes [1-9] is associated with the shoulder functional symptomatology. However it is worthwhile to point out the importance of removing all radioactive and suspicious nodes on palpation after SLN harvest to avoid false-negative results [24].

The frequency of short-term SM restriction is not negligible and a substantial number of women undergoing axillary SLN biopsy suffer from transient SM limitation after surgery [25-27]. As a consequence, surgeons consider the SLN biopsy risk-benefit relationship for each case, avoiding the procedure in situations in which there is very low involvement probability, for instance, in prophylactic mastectomy for women at high risk of breast cancer and segmental mastectomy for low-grade ductal carcinoma in situ.

After axillary SLN biopsy, physical therapy combining specific arm exercises and massages performed in the setting of a tailored program under the guidance of a trained therapist is very useful. Physiotherapeutic measures should reduce symptoms and shorten the duration of mobility limitations. Rehabilitation care should begin in the first 24 hours of the postoperative period to preserve muscle strength and maintain SM. Health providers involved with breast cancer patients need to be aware of SLN biopsy repercussions and available preventive physical therapy options to render optimal assistance in these patients, allowing them, as early as possible, to follow a normal lifestyle.

In conclusion, breast cancer patients undergoing SLN biopsy suffer from transitory debilitating SM restriction, mainly due to flexion and abduction limitations, lasting up to three months after the operation. It is a self-limited condition that should be potentially relieved by early physiotherapeutic interventions.

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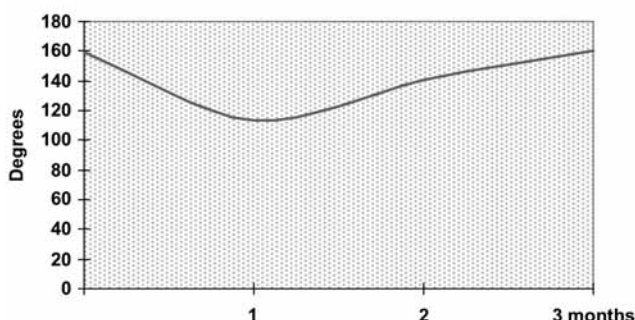


Figure 3. — Average values of shoulder abduction movement evolution after sentinel lymph node biopsy.

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