

# Preservation of Lateral Thoracic Vein and Intercostobrachial Nerve in Breast Conservative Surgery

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**Background and aim:** *The major nervous structures of the axilla such as the thoracodorsal and the long thoracic nerves are preserved by most breast surgeons. Nevertheless, the intercostobrachial nerves are frequently sacrificed. The aim of this study was to assess the effect of preservation of intercostobrachial nerve (ICBN) and lateral thoracic vein (LTV) in decreasing postoperative sensory affection and breast edema respectively in breast conservative surgery.*

**Patients and methods:** *This study was conducted on 30 female patients with early stage breast cancer at General Surgery Department (Surgical Oncology Unit), Tanta University Hospital during the period from September 2013 to September 2014. Patients were divided according to preservation or sacrifice of ICBN and LTV.*

**Results:** *Preservation of ICBN was accomplished in 15 patients (50%) and accidentally sacrificed in other 15 patients (50%). Preservation of LTV was accomplished in 27 patients and sacrificed in the other 3 patients.*

**Conclusion:** *ICBN preservation decreases postoperative pain and sensory deficit at posteromedial aspect of arm. LTV preservation decreases the occurrence of early postoperative breast edema.*

**Keywords:** *Axillary dissection, breast edema, parasthesia, LTV, ICBN.*

## Introduction:

The Halstedian concept of radical surgery, based on the belief that lymph nodes function as a barrier to tumor spread (dissemination theory), had suggested that the “en bloc” excision of the tumor with its efferent lymphatics could lead to definitive cure.<sup>1</sup> Nevertheless, it was subsequently recognized that less aggressive surgery both on the primary tumor and the regional nodes was able to confer similar survival benefits.<sup>2-5</sup> Axillary dissection still represents the standard operation for all patients with cytologically positive nodes and for patients with a positive sentinel lymph node biopsy.<sup>6,7</sup>

Several studies have dealt with the preservation of the neurovascular elements embedded in or passing through the axillary tissue: the intercostobrachial nerve (ICBN) and the lateral thoracic vein (LTV).<sup>8-16</sup> The major nervous structures of the axilla such

as the thoracodorsal and the long thoracic nerves are preserved by most breast surgeons. Nevertheless, the intercostobrachial nerves are frequently sacrificed. These nerves supply the skin of the upper half of the medial and posterior aspects of the arm. Cunnick G H et al<sup>15</sup> documented the anatomical variants of this nerve. These variants have been classified broadly into six main variants; Variant 1: Nerve arises from T2 alone and does not give off any branches (42%). Variant 2: Nerve arises from T2 alone and divides into a large main trunk and a much smaller branch (22%). Variant 3: Nerve arises from T2 alone and divides equally into two branches (11%). Variant 4: Nerve formed by two equal-sized branches from T1 and T2 nerves. No significant branches given off during its course through the axilla (9%). Variant 5: Nerve arises from two separate T2 radicals to form a single nerve which does not give off

branches in the axilla (9%). Variant 6: Nerve arises from T2 alone and divides into a large main trunk and at least two smaller branches (range: 2-5 branches (7%).

Preservation of LTV has no purpose during mastectomy. Theoretically, however, if the breast is being spared, the preservation of the LTV could prevent postoperative breast edema; a common complication of conservative breast cancer surgery. In almost all published studies this preservation could not be achieved in all cases, where it had been intended.<sup>17</sup>

### **Patients and methods:**

This study was conducted on 30 female patients with early stage breast cancer at General Surgery Department (Surgical Oncology Unit), Tanta University Hospital during the period from September 2013 to September 2014. All the patients had breast cancer which was amenable to conservative surgery. Patients with multicentric tumor, previous breast irradiation, 1<sup>st</sup> and 2<sup>nd</sup> trimester during pregnancy and persistent positive margins were excluded from the study.

All the patients were subjected to: History taking, general & local examination, investigations that include: Complete blood picture, prothrombin time and activity and blood grouping, bilateral X-ray mammography & complimentary breast ultrasonography were done. Fine needle aspiration cytology (FNAC) and/or true-cut biopsy and metastatic work-up were done.

All the patients underwent breast conservative surgery and axillary dissection. The LTV (and artery) were identified posteriorly (behind) the middle third of the lateral board of the pectoralis major muscle. Preparation proceeded along these vessels to the axillary vein (up) and breast tissue (down). The fibro fatty tissue over the LTV was tracked antero-medially and posterolaterally using two Allis clamps, and then cut along the vein. The vascular small branches were cauterized. An alternative technique was to identify the axillary vein and the LTV inflow first and then to dissect down the LTV until the breast tissue

was reached. It was important not to damage the ICBN during this procedure. By gentle palpation of the dissection area, the nerve was identified as a tense string transversal to the lateral thoracic vessels (Different varieties are shown in **Figures (1–4)**).

Postoperative evaluation:

The patients were divided according to preservation or sacrifice of ICBN and LTV. They were evaluated postoperatively with:

A- The sensory affection in the area innervated by ICBN at discharge and 3 months after surgery. 1- Sensory Symptoms in term of paresthesia, hypoesthesia and numbness. 2- Neuropathic pain by means of a visual analogue pain scale. 3- The ability to perceive soft touch on the axilla/arm of the operated side (soft touch test) 2.5 cm away from scar **Figure (5)**.

B- Breast edema was assessed at 2 weeks postoperatively to avoid inflammatory phase of wound healing at 1st week and lymph edema after 2 weeks due to radiotherapy after operation, it was evaluated by: 1-Presence of clinical breast edema. 2-Skin thickness by ultrasound: Normal < 2mm- breast edema >3mm.

Statistical analysis:

Statistical analysis of the results was conducted, using the mean, median, standard error, student t-test and Chi-square using SPSS Statistical package (version 12.0). P value is significant at 0.05 levels. Informed consent was obtained from all patients before participation in the study. The study was approved by the local institutional ethical committee.

### **Results:**

The patients' age ranged from 29 years to 70 years with a mean age 47 years. Only 2 patients were recorded to have diabetes mellitus (DM). No patient was encountered with shoulder or axillary operations. ICBN was preserved in 15 patients (50%) and accidentally sacrificed in 15 other patients (50%). LTV was preserved in 27 patients (90%) and accidentally sacrificed in the

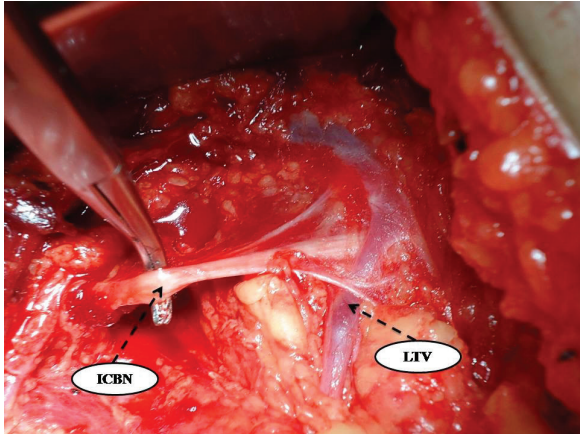


Figure (1): Relation between LTV and ICBN (6<sup>th</sup> variant).

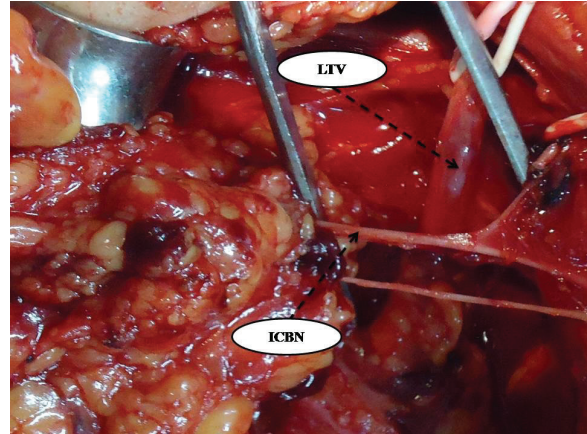


Figure (2): Relation between LTV and ICBN (4<sup>th</sup> variant).

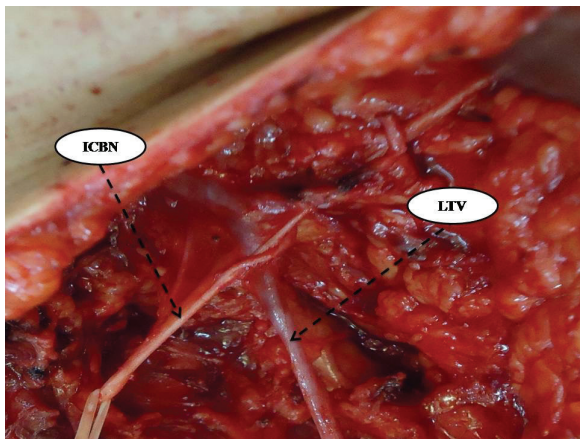


Figure (3): Relation between LTV and ICBN (2<sup>nd</sup> variant).

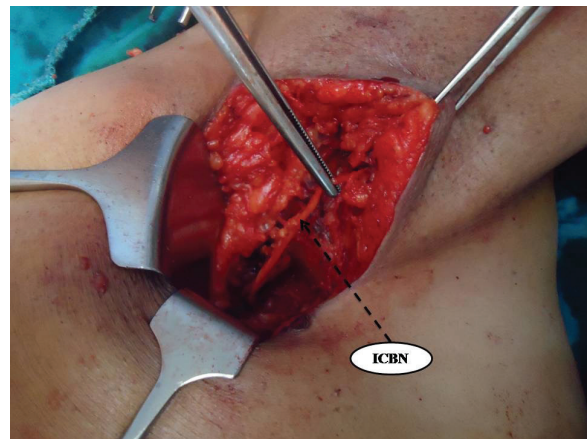


Figure (4): ICBN (1<sup>st</sup> variant).

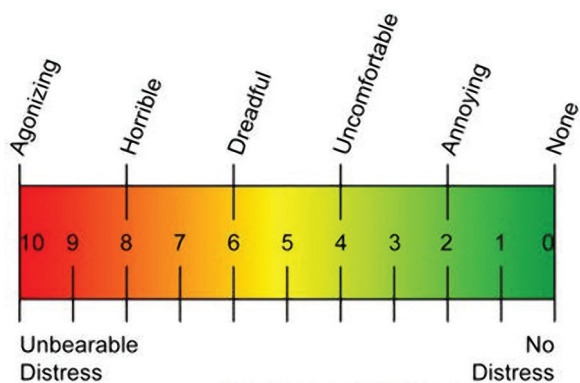


Figure (5): Pain visual analogue scale.<sup>23</sup>



Figure (6): Left breast edema.

remaining 3 patients (10%). The majority of the tumors were located in the outer breast quadrant, most of the tumors were grade II, while the commonest tumor histology was

invasive duct carcinoma **Table (1)**.

It was noted that all patients with preserved ICBN (50%) had mild paraesthesia at discharge (probably due to neuropraxia)

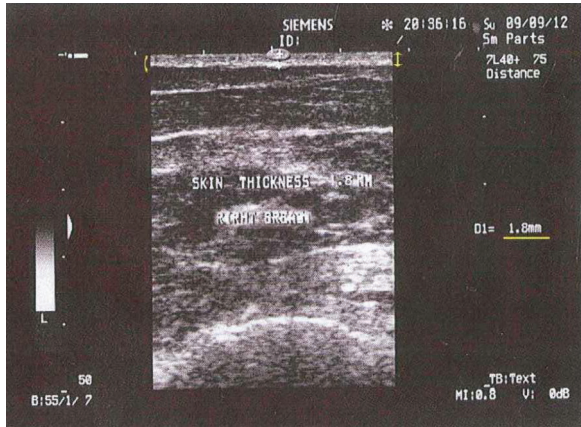


Figure (7): Operated breast (LTV preserved) skin thickness: 1.8 mm.

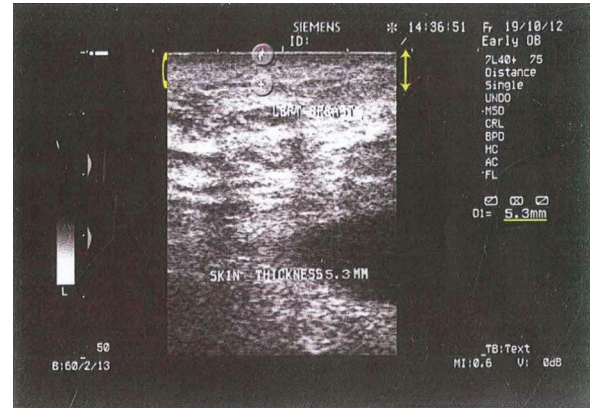


Figure (8): Operated breast (LTV sacrificed) skin thickness: 5.3 mm.

Table (1): Clinical & pathological findings in the studied cases.

Item	Number of Patients	(%)
<b>Tumor histology</b>		
Invasive duct carcinoma	25	83.3%
Invasive lobular carcinoma	5	16.7%
<b>Tumor grade:</b>		
1	5	16.7%
2	21	70%
3	4	13.3%
<b>Tumor classification:</b>		
T1	16	53%
T2	14	47%
<b>Tumor location:</b>		
Upper medial	6	20%
Lower medial	2	6.6%
Upper lateral	15	50%
Lower lateral	7	23.4%
<b>Median tumor size: mm</b>	24mm (10mm-38mm)	
Median number of harvested nodes on axillary clearance.	13 (5-25)	
Median number of positive nodes.	4 (1-15)	

which disappear after 3 months. At discharge seven patients (46.67%) with preserved ICBN had pain which disappears after 3 months. In patients with sacrificed ICBN (50%), at discharge 4 patients (26.67%) had mild paraesthesia, one patient had hypoesthesia (6.67%). After 3 months, 3 patients (20%) had persistent mild paraesthesia. At discharge all patients with sacrificed ICBN had pain, which persisted 3 months after operation with

significant P value (<0.001) **Table (2).**

Soft touch test.

Sensory evaluation using soft touch test revealed that all patients with preserved ICBN (100%) showed normal test at discharge and 3 months after operation. All patients with sacrificed ICBN (100%) had diminished soft touch sensation at discharge and after 3 months 7 patients had diminished sensation

**Table (2): Sensory symptoms at discharge & 3months after operation.**

	ICBN Preserved		ICBN Sacrificed		Chi-square	
	N	%	N	%	X <sup>2</sup>	P value
<b>Pain</b>						
At discharge	7	46.67%	15	100%	23.644	<0.001
3 months after operation	0	0.00%	15	100%	41.589	<0.001
<b>Diminished sensation</b>						
At discharge	0	0.00%	1	6.67%	22.032	0.99
3months after operation	0	0.00%	0	0.00%	34.107	1
<b>Paraesthesia</b>						
At discharge	15	100%	4	26.67%	22.032	<0.003
3months after operation	0	0.00%	3	20%	34.107	<0.002

**Table (3): Sensory deficit examination at discharge and 3 months after operation.**

Soft touch sensation	ICBN Preserved		ICBN Sacrificed		Chi-square	
	N	%	N	%	X <sup>2</sup>	P-value
<b>Normal</b>						
At discharge	15	100.00	0	0.00	41.589	<0.001
At 3-month	15	100.00	8	53.33		
<b>Diminished</b>						
At discharge	0	0.00	15	100.00	41.589	<0.001
At 3-month	0	0.00	7	46.67		

**Table (4): Pain visual analogue score at discharge and 3 months after operation.**

Variable		ICBN preserved		ICBN sacrificed		Chi-square	
		N	%	%	%	X <sup>2</sup>	P value
<b>Type of Pain</b>	<b>score</b>						
<b>At discharge</b>							
No pain	0	8	53.33	0	0.00	23.644	<0.001
Annoying	2	7	46.67	6	40.00		
Uncomfortable	4	0	0.00	9	60.00		
<b>At 3 months after operation</b>							
No pain	0	15	100.00	0	0.00	41.589	<0.001
Annoying	2	0	0.00	15	100.00		
Uncomfortable	4	0	0.00	0	0.00		

(46.67%) and 8 patients showed normal touch sensation (53.33%) with significant P value (<0.001) **Table (3)**.

Pain visual analogue score:

At discharge, preservation of ICBN was associated with no pain in 8 patients (53.33%) and annoying pain in 7 patients

(46.67%). However, sacrificed ICBN was associated with uncomfortable pain in 9 patients (60%) and annoying pain in 6 patients (40%). After 3 months, all patients with preserved ICBN were found to have no pain. However, all patients with sacrificed ICBN were complaining of annoying pain with significant P value (<0.001) **Table (4)**.

**Table (5): Impact of sacrification of LTV on the operated breast compared to its preservation**

Item	LTV preserved N=27		LTV sacrificed N=3		Chi-square	
	N	%	N	%	X <sup>2</sup>	P value
<b>Clinical breast edema at 2wks</b>						
Present	0	0.00	3	100.00	19.505	<0.001
Absent	27	100.00	0	0.00		
<b>Mean breast skin thickness by us at 2 wks</b>						
>2mm (4.65)	0	0.00	3	100.00	19.505	<0.001
<2mm (1.7)	27	100.00	0	0.00		

Evaluation of postoperative breast edema:

Clinical evaluation: Clinical evaluation at 2 weeks postoperatively showed that all patients with preserved LTV didn't develop postoperative breast edema, whereas the 3 patients with sacrificed LTV developed clinically detected breast edema (100%).

Measurement of skin thickness by Ultrasonic examination: Postoperative increased breast skin thickness (>2mm) was detected only in patients with sacrificed LTV (100%). However normal skin thickness (<2mm) was encountered in patients with preserved LTV with significant P value (<0.001) **Figures (6–8) and Table (5).**

### Discussion:

Conservative breast surgery is currently the standard treatment for women with stage I or II invasive breast cancer.<sup>18</sup> Several studies have dealt with the preservation of the neurovascular elements embedded in or passing through the axillary tissue: The ICBN and LTV.<sup>8–16</sup>

This study was conducted on 30 female patients with early stage unilateral breast cancer. They were subjected to breast conservative surgery with intention to preservation of LTV and ICBN.

In the present study the patients' ages ranged from 29 years to 70 years, with a mean of 47.53 ±11.10 while in the study of Salmon R. J et al,<sup>11</sup> it was 54 (43-65) for group of nerve preservation and 56 (44-68) for group of nerve section. In the study of Ivanovic N et al,<sup>16</sup> the age ranged from 33 to 67 years with

a mean of 57. In the present study, the median number of harvested lymph nodes on axillary clearance was 13 (5-25) which is comparable to the results of the study conducted by Riitta H et al.<sup>19</sup>

In the present study, ICBN was preserved in 15 (50%) patients, whereas LTV was preserved in 27 (90%) patients. We achieved 50% success rate of preservation of ICBN which is comparable with the finding of Maycock, L et al<sup>13</sup> Also in Salmon R. J et al.<sup>11</sup> study, 128 patients were included in their study with conservation of the nerve in 66 (51.56%) patients and section in 62 (48.44%) patients. In Abdullah T. I et al<sup>12</sup> study, 60 patients were randomized to ICBN preservation; only 40 (66.67%) patients were preserved. While In Maycock L et al study,<sup>13</sup> 71 patients underwent axillary node clearance; ICBN was preserved in 37 (52.11%) patients and was divided in 34 (47.89%) patients. While Ivanovic N et al<sup>14</sup> achieved a higher success rate in preservation of both ICBN & LTV. When they adopted a fragmentation technique of fibrofatty tissue, they achieved 100% and 95% success rate of preservation of ICBN and LTV respectively.

In the present study, regarding sensory symptoms either at discharge or 3 months postoperative there is statistically significant difference in the outcome between either groups of ICBN preservation and scarification. (p <0.001). This agrees with the results of Warriar S et al<sup>20</sup> who concluded that there was statistical significant difference in relation to diminished sensation and pain

at discharge. While Andersen K. G et al<sup>21</sup> reported no significant difference in the sensory symptoms between both groups.

In the present study as regard soft touch test, there is statistically significant difference between either group of ICBN preservation and scarification ( $p < 0.001$ ). These results are comparable with the results of Verma S et al<sup>22</sup> who concluded that there was statistical significant difference concerning sensory deficit at discharge but did not correlate with the results of Salmon R. J et al<sup>11</sup> as they found no statistical significant difference in sensory deficit.

In the present study pain assessment with VAS<sup>23</sup> either at discharge or 3 months post operative there is statistically significant difference in the outcome between either groups of ICBN preservation and scarification ( $p < 0.001$ ). These results are comparable with the results of Zhu J.J et al<sup>24</sup> who found that; there was statistical significant difference in severity of pain between either groups of patients. Pain in the group who had their nerve preserved was mild, where as more patients in the group who had their nerve divided had moderate or severe pain.

In the present study all patients with preserved LTV didn't develop postoperative breast edema, whereas the 3 patients with sacrificed LTV developed clinically detected breast edema (100%) and this was confirmed by ultrasonic measurement of breast skin thickness. The difference was statistically significant ( $P < 0.001$ ). This is not comparable with Riitta H et al<sup>19</sup> who reported that the skin thickness did not differ between the patient groups.

### Conclusion:

The present study proved the important role of ICBN and LTV preservation in breast conservative surgery. Preservation of ICBN can prevent or decrease postoperative pain and sensory deficit at posteromedial aspect of arm. LTV preservation decrease the occurrence of early postoperative breast edema.

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