

The Extended Extrapleural Radical Mastectomy:

Its Role in the Treatment of Carcinoma of the Breast

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DURING THE PAST DECADE, several surgical methods have come into vogue in terms of treating the patient with primary carcinoma of the breast. These range from lumpectomy⁴ to the extended radical mastectomy,^{25,29} with each method having a proponent advocating reasons for suitability based on immunologic or anatomic criteria.^{10,24} The opinion still voiced among surgeons is that mastectomy with regional node dissection is the method offering the best opportunity for cure.¹ The present study was undertaken to evaluate the role of the extended mastectomy in terms of internal mammary chain involvement and the effect of removing these nodes on the overall survival rate. All patients in the present study with primary operable carcinoma of the breast were subjected to radical mastectomy and removal of the internal mammary node chain. The usual contraindications to radical mastectomy were employed and include: (1) primary tumor fixed to chest wall, (2) fixed axillary nodes, (3) ulceration of skin due to carcinoma or satellite nodules in the skin of the breast (4) palpable supraclavicular lymph nodes (5) inflammatory carcinoma of the breast, (6) edema of the arm, and (7) distant metastasis. Each patient was examined preoperatively, recording the site of the primary tumor. X-rays of the chest, skeletal survey and electrocardiogram were performed prior to the operation. An extended radical mastectomy, including extrapleural resection of the internal mammary nodes, was performed on all patients in this series; those over 65 years of age and all with medical contraindications underwent either the standard or modified radical mastectomy.

Methods and Material

All of the operative procedures in the present study were performed by the senior author. Five hundred-and-eighty-three patients underwent extended radical mastectomy between 1955 and 1970. These patients were evaluated for incidence of nodal involvement as related to the quadrant of the breast in which the tumor arose. Three hundred-and-seventy-three of the patients were suitable for evaluation of 5-year survival rates. The ages of these patients fell primarily into the 40-49 and 50-59 year groups, between which there were 139 and 136 respectively (Table 1).

The operation consisted of the classical Halstead radical mastectomy followed by extrapleural resection of the internal mammary chain. Skin flaps were developed and muscles were divided to expose the contents of the axilla. Level III lymph nodes were removed first and marked for identification. Other levels were similarly labelled. The pectoralis major was separated from its sternal attachments to expose the second, third and fourth costal cartilages. An incision was made in the third interspace through the intercostal muscles to its endothoracic fascia. With careful dissection, the third costal cartilage was separated from the endothoracic fascia and pleura. Intercostal vessels were tied at the costochondral junction. The cartilage was then cut at the costochondral junction and subluxated from the sternum. The procedure was repeated for the fourth and finally

second costal cartilages. The parasternal area was opened to expose the internal mammary vessels and lymph nodes. Ligatures were placed around the vessels on the undersurface of the first rib and upper end of the 5th rib. The internal mammary chain was then gently brushed off the pleura and removed en bloc with costal cartilages and intercostal muscles. The space between the sternum and cut ends of the rib cage were left open, no prosthetic device being employed. Operative time was approximately 4 to 5 hours.

Results

The extended extrapleural radical mastectomy was found to be an uncomplicated procedure, with no mortality and few postoperative complications. Mobidity resulted from occasional skin necrosis and from inadvertent entry into the pleural cavity.

Two hundred-and-ninety-six of the resected tumors in the overall series of 583 patients were found to be located in the outer quadrant of the breast. Ninety-seven lesions were found in the inner quadrant, 153 were centrally located and 37 arose in the nipple area. Each of the lesions was categorized in terms of its association with histologically positive or negative internal mammary nodes (Table 2).

Analysis of the 296 patients with outer quadrant lesions revealed that 165 had negative and 131 had positive axillary nodes. When the axilla was negative, there was a low incidence of positive internal mammary nodes (5%). When axillary nodes were involved with tumor, the overall incidence of involvement increased to 23%. Among the 97 patients with inner quadrant lesions, 70 had neither clinical nor microscopic evidence of axillary disease; 27 did have positive axillary nodes. A similar relationship between positive axillary nodes and internal mammary spread was noted again. Negative axillary nodes were associated with a 14% incidence of internal mammary node involvement. When the axilla was positive, this group demonstrated a 59% incidence of metastasis to the internal mammary chain. Centrally placed tumors metastasized to the axilla in approximately one-third of cases. In this group of patients, 43% of the internal mammary nodes removed were found to contain metastatic tumor. The highest incidence of internal mammary node involvement occurred in the 11 nipple lesions with positive axillary nodes. Seven of these patients (63%) had concomitant internal mammary node tumor metastasis.

The overall incidence of internal mammary node involvement by tumor appears directly related to concomitant tumor spread to axilla, as well as the position of the tumor in the breast. When axillary nodes were negative, 8% of the overall group of patients had internal mammary node involvement. When the axillary nodes

TABLE 1. Age Distribution of Patients Treated by Extended Extrapleural Radical Mastectomy

Age	Number of Patients
24	1
29	1
30-39	50
40-49	139
50-59	136
60-68	46
Total	373

were positive, the overall incidence of substernal node metastasis was 32%.

One of the reasons for failure to control local disease was the appearance of chest wall metastasis. Among the 373 patients analyzed in terms of survival, 24 developed chest wall recurrence without evidence of distant metastasis. Five additional patients developed chest wall disease concomitant with systemic dissemination of tumor. These 29 cases represent a 7.7% incidence of local recurrence of tumor. There were no patients with recurrent axillary or parasternal disease. When local disease recurred within the first two years of surgery, the overall prognosis was poor. Twenty-two of the patients in this series developed disease during this interval and expired before 5 years. Four patients developed recurrence 3 years postmastectomy and survived 5, 7, 8 and 9 years. Three patients developed recurrence 3, 7 and 8 years postoperatively and survived with disease 12, 14 and 15 years respectively.

Local chest wall recurrence was next evaluated in terms of nodal disease found at surgery. Among the 204 patients where all node-bearing areas were found to be free of disease, 6 patients (3%) developed recurrence in their chest wall. When axillary nodes were negative, but internal mammary nodes found to be positive, 2 patients

TABLE 2. Extended Extrapleural Radical Mastectomy Analysis (583 cases, 1955-1970)

No.	Outer	No. Central
165	AX- IM- 157(5%) AX- IM+ 8	97 AX- IM- 87(10%) AX- IM+ 10
131	AX+ IM- 101(23%) AX+- IM+ 30	56 AX+ IM- 32(43%) AX+ IM+ 24
296	Overall 13%	153 Overall 22%
70	Inner AX- IM- 60(14%) AX- IM+ 10	Nipple 26 AX- IM- 26 AX- IM+ 0
27	AX+ IM- 11(59%) AX+ IM+ 16	11 AX+ IM- 4(63%) AX+ IM+ 7
97	Overall 27%	37 Overall 20%
18% Positive Internal Mammary AX- 8% IM+ AX+ 32% IM+		

of 15 or 13% showed local recurrence of tumor. In the 104 patients with positive axillary and negative internal mammary nodes, 8 patients (8%) developed recurrent local disease. When both of the major lymph node areas were involved by tumor, an anticipated increase in local recurrent tumor was seen. Among the 50 cases in this group, 8 or 16% manifested signs of recurrent tumor (Table 3).

Three hundred-and-seventy-three of the patients in the present study were evaluated in terms of 5-year survival with and without disease (Table 4). When both internal mammary and axillary nodes were negative, 175 of the 204 patients in this group were free of disease. An additional 6 patients were alive but with disease present. The overall 5-year survival rate free of disease in the group where no lymph node metastasis were noted, was 85%. When the internal mammary nodes were involved by tumor and the axilla remained free, the 5-year survival clinically free of disease was 53%. When nodal metastases were limited to the axilla, a similar 5-year rate free of disease was noted.

In terms of overall 10-year survivals, 102 of 172 patients studied (60%) were clinically free of disease (Table 5). In this group the absence of any metastatic nodes at the time of surgery resulted in an attrition rate of 7% over the 10-year period; the survival rate free of disease dropped from 85% to 78% during this time (Table 6). It is of interest that when nodes in the axilla were found to be positive with associated negative internal mammary chain, the 5 and 10-year survival rates differed little. When axillary and internal mammary nodes were found to be positive at surgery, the 10-year survival rate free of disease decreased from 32% to 17%. The overall survival rate free of disease for the entire group of patients in this study dropped from 68% 5-years to 60% at the 10-year level.

Discussion

In the patient with carcinoma of the breast, undergoing the classical radical mastectomy, only a portion of the regionally draining nodes is removed. Anatomically, while 75% of the lymphatic channels drain to the axilla, a significant flow (25%) is directed to the internal

TABLE 4. *Extended Extrapleural Radical Mastectomy Two Series 1955-1960; 1960-1965 Result in 373 Patient—5 Year Follow-up*

No.	N E D	%	Survival	%
204 AX - IM -	175	85%	181	89%
15 AX - IM +	8	53%	9	60%
104 AX + IM -	54	52%	63	61%
50 AX + IM +	16	32%	25	50%
34 APEX -	16	47%	22	65%
16 APEX +	0	0	3	19%
Overall				
373 Cases N E D	253		68%	
373 Cases Survival	278		75%	

mammary chain.²² This suggests that the latter group of nodes represents an important pathway for the spread of carcinoma in the breast.²⁴

Proponents of a lesser than mastectomy procedure³ have suggested that an immune defense mechanism or barrier develops within the intact node system and that these nodes resist local spread of tumor.⁴ It is therefore implied that clinically negative nodes be left undisturbed. No study exists, however, which can implicate the regionally draining nodes as the sole factor in host tumor immunity, should it exist. It is more probable that if an immune response does develop, it is a systemic one and will not be altered by partially interrupting any one pathway. What is important, therefore, is the consequence of leaving regional nodes behind, nodes which may be involved by tumor and which may act as foci for recurrent and metastatic disease.

Clinical attempts at evaluating nodal involvement have been notoriously inaccurate. Coleman and Barry² noted that among 898 patients with clinically negative nodes, 41.1% had microscopic tumor involvement. Stender²³ reported that in Stage I carcinoma of the breast, metastases usually involve 30% of the cases considered to have clinically negative axillas. These factors must be taken into consideration when one decides that nodes are to be spared for the sake of their immunologic capabilities. If an immunologic defense mechanism were in existence, as one might predict in the presence of medullary carcinoma of the breast with concomitant sinus histiocytosis,²¹ then metastasis to regional nodes would be uncommon and one might predict an improvement in survival. In actuality, when lesions classified as medullary carcinoma reach 2.5 cm. or more in diameter the incidence of nodal metastasis becomes greater than 20%, and in such instances there is a concomitant diminution in survival rate.⁹

In the present study, an attempt was made to evaluate the significance of internal mammary node involvement by tumor and to determine possible improvement in survival resulting from resection of these nodes. Previous studies have suggested that tumor spread to the internal

TABLE 3. *Extended Extrapleural Radical Mastectomy: Local Recurrence in Group of 373 Cases*

Para-sternal Recurrence	Chest Wall Recurrence	Chest Wall and Disseminated Disease	Axillary Recurrence
204 AX - IM -	6(3%)	0	0
15 AX - IM +	2(13%)	0	0
104 AX + IM -	8(8%)	1	0
50 AX + IM +	8(16%)	4(8%)	0
Totals 0	24	5	0

mammary chain may be important in the natural history of breast carcinoma;¹⁷ that determining their incidence of involvement can be valuable in prognosticating the course of events, and that their removal may have a salutary effect on end-results of the disease. Several studies have been performed that have been helpful in selecting those patients in the high risk category.²⁷ Donnigan⁵ noted that in the laterally placed lesions, where the axilla was considered clinically free of disease, a 4% incidence of internal mammary spread occurred. This increased to 13% with medially placed tumors. Veronesi²⁸ found that in instances of clinically palpable axillary disease the internal mammary nodes were involved in as many as 42% of patients undergoing surgery. Review of data in the present study indicated that lateral quadrant lesions had a low ratio of internal mammary nodes to axillary node involvement. When axillary disease became clinically evident however, a shift in balance favoring mediastinal node involvement resulted. For the overall group of patients studied, the presence of axillary nodes suggested that a high degree of internal mammary node metastasis would be found (32%). Negative axillary nodes were associated with an 8% involvement by metastatic disease to the internal mammary chain. The highest incidence of internal mammary node metastasis occurred with primary inner quadrant and nipple lesions. In these patients, positive axillary nodes were associated with 59 and 63% incidence of internal mammary node disease respectively.

Among the 373 patients followed for 5 years, 169 (45%) had at least one site of nodal disease; 65 (17%) had disease involving their internal mammary chain (Table 4). Internal mammary nodes from the 1st to 4th intercostal spaces were removed for evaluation at the time of surgery. The highest incidence of positive nodes was found in the second interspace.

Several reports have suggested that minimizing the extent of resection at the time of surgery offers fewer complications,^{12,13} better cosmetic results and survival rates comparable to those seen with radical mastectomy.¹⁸ These studies were usually performed in selected patients having small primary lesions and minimal, if any, axillary disease.¹ In spite of this, there appeared to be a higher incidence of local recurrence, a factor known to be associated with diminished long-term survival.¹⁴ Handley and Thackrey,^{12,13} employed the conservative radical mastectomy in a selected series of 143 patients over a 10-year period. The incidence of local recurrence in their hands was 22% (Table 7). Rissanen¹⁹ described results in the treatment of 1,008 cases managed between 1948 and 1961. Four hundred-and-fifteen were offered local excision and postoperative radiation therapy. Five hundred-and-ninety-three patients were managed by radical mastectomy with pre and postoperative radiation

TABLE 5. *Extended Extrapleural Radical Mastectomy 1955-1960 10-Year Follow-up to 1970 Result in 172 Patients*

No.	N E D	%	Survivalnts	%
90 AX- IM-	70	78%	74	82%
8 AX- IM+	3	38%	3	38%
50 AX+ IM-	25	50%	27	54%
24 AX+ IM+	4	17%	4	17%
15 APEX-	4	27%	4	27%
9 APEX+	0	0	0	0
Overall				
172 Cases	N E D	102	60%	
172 Cases	Survival	108	63%	

therapy. Local recurrence developed in 107 patients (25.8%) where limited surgery had been performed. Thirty-nine of these patients required further excision plus radiation therapy and 68 went on to either simple or radical mastectomy. In the group undergoing radical mastectomy, the local recurrence rate was 9.5%. Employment of the classical radical mastectomy at Memorial Hospital was associated with a similar decrease in incidence of chest wall recurrence. Among 555 patients undergoing radical mastectomy the incidence of local recurrence was noted to be 1.3% when there was no evidence of any nodal metastasis.⁷ This increased to 24.8% when axillary metastasis was clinically present. Farrow⁸ studied two groups of patients having similar sized lesions and theoretically the same stage of disease. One group (77 patients) was treated by radiation after aspiration or incisional or excisional biopsy plus radiation. Forty-seven of these patients (61%) developed signs of local recurrence. When radical mastectomy was employed 9.1% of the patients developed evidence of locally recurrent disease.

In the present study, where internal mammary node dissection was employed as part of the mastectomy, 7.7% of the cases developed local recurrence. When axillary and internal mammary nodes were found to be negative, the incidence of local recurrence was 3%; when axillary and internal mammary nodes were positive, 16% of the group developed evidence of local chest wall disease. One can speculate that procedures which fail to implement removal of regionally draining lymph nodes, especially those with metastatic disease, tend to allow an

TABLE 6. *Extended Extrapleural Radical Mastectomy*

	N E D		Survival	
	5 Years	10 Years	5 Years	10 Years
AX- IM-	85%	78%	89%	82%
AX- IM+	53%	38%	60%	38%
AX+ IM-	52%	50%	61%	54%
AX+ IM+	32%	17%	50%	17%
Apex-	47%	27%	65%	27%
Apex+	0	0	19%	0
Overall	68%	60%	75%	63%

TABLE 7. Local Recurrence within 10 Years

Author	No.	Nature of Primary Treatment	(Columbia Clinical Classification)			Survival 10 Years
			Parasternal	Chest Wall	Axilla	
R. S. Handley	143	Conservative radical (Patey + radiation)	8 5.6%	29 20%	3 Cases	43%
Kaae & Johansen ABC	196	Simple mastectomy + deep X-ray McWhirter	1 1%	20 10%	20 10%	45%
Haagensen & Cooley ABC	584	Entire series radical mastectomy + 39 cases referred for radiation Positive Apex or Internal mammary biopsy	24 10% 4%	42 7%	3 Cases	53%
Livingston	373	Extended extrapleural radical mastectomy + radiation for + axilla AX + 43% IM + 19% APEX + 28%	0	29 7.7%	0	60% NED 147 cases 63% survival
Farrow, Fracchia, Robbins, Castro	17	Excisional biopsy + radiation	6 patients had subsequent radical 1 simple			1 patient alive had radical mastectomy.

increase in the appearance of local tumor and as a reflection of this, decrease survival rate.⁶

Attempts to justify a high incidence of local recurrence following simple mastectomy have been made with the assumption that further surgery could always be employed with equally good results.⁴ In the present study, 29 patients did develop chest wall recurrence; 22 died before 5 years irrespective of additional therapy that was offered to the site of locally recurrent tumor.

In most series evaluated, there appears to be a theoretical improvement in survival when lymph node areas clinically considered to be involved are removed as part of the operative procedure.^{11,26} Lewisohn¹⁶ reported a 48.7% overall 10-year survival rate at Johns Hopkins Hospital when patients underwent the classical radical mastectomy. Farrow noted that the 10-year overall survival rate for the radical mastectomy group in his series, was 49.4%. Leak¹⁵ similarly noted that there was at least a 20% greater survival rate for patients undergoing radical mastectomy than in those having a lesser procedure. When the internal mammary chain was additionally removed as part of the radical mastectomy operation, a further improvement in survival was noted.²⁰ Urban reported that, in 315 patients undergoing internal mammary node dissection, he was able to achieve a 5-year survival rate of 65.8% free of disease and a 10-year survival rate of 54% free of disease.

In the present study, where extrapleural resection of internal mammary nodes was added to the operative procedure, the overall 10-year survival rate free of disease was found to be 60%. Among the patients in this group having negative axillary and internal mammary nodes, 78% survived free of disease for 10 years. Where the both node-bearing areas were positive, a 17% survival rate free of disease was achieved. When internal mammary nodes were involved and axilla was not only clinically, but microscopically negative, 38% of the patients remained free.

In this latter group, one would expect that the classical radical mastectomy would have overlooked the presence of metastatic disease and that further metastasis would have developed. A comparison of overall survival rates for various surgical series is seen in Table 7. There appears to be a progressive improvement in ten-year survival as more attention is given to the extirpation of the regional nodes draining the tumor. We see a 10-year survival rate of 45% for simple mastectomy plus radiation, a 53% survival for the standard radical mastectomy and 60% survival free of disease for the extended radical mastectomy.

To establish if the differences in survival for the various groups were statistically significant, the CHI square test was applied. Here, to establish significance, a P value (probability) of 0.05 must be obtained. When the survival data for the standard mastectomy was compared to the simple mastectomy plus radiation, a CHI square value of 3.64 was obtained with a P value approximating 0.05 suggesting that the improved survival in the radical mastectomy group was probably significant. When the extended mastectomy (present study) was compared to the classical radical, CHI square was found to be 6.5 with a P value of 0.01 establishing more dramatically improvement in overall survival. One must conclude from this information that adequate control of all sites of nodal involvement remains the crucial factor in managing this disease entity.

Summary

A review of several operative series describing the surgical management for patients with breast carcinoma appears to suggest that the standard radical mastectomy is a superior operation to one where lymph nodes are left behind. This is reflected in several parameters including the incidence of local recurrence and improvement in 5 and 10-year survival rates. The addition of the internal mammary node resection to the classical radical

mastectomy is recommended when one suspects a high incidence of internal mammary disease. The operation not only appears to add to the survival rate, but also provides an accurate means of assessing the presence or absence of nodal metastasis, allowing for the better evaluation of overall prognosis and for possible further treatment. In the present study, where an extrapleural internal mammary node dissection was added to the operative procedure, the overall 10-year survival rate free of disease was found to be 60%. When both node-bearing areas were found to be positive, a 17% survival rate free of disease was achieved and when the internal mammary nodes alone were involved, 38% of the patients remained free of disease for 10 years.

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