GENERAL THORACIC SURGERY

CHEST WALL RESECTION FOR LOCALLY RECURRENT BREAST CANCER: IS IT WORTHWHILE?

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Objective: The effectiveness of chest wall resection for locally recurrent breast cancer as cancer treatment remains poorly defined, possibly because of the general impression that locally recurrent disease is a harbinger of rapidly progressive metastatic disease and that extensive surgical treatment in these patients is inappropriate. Reports to date have focused on technical feasibility, not long-term outcome. **Methods:** We reviewed our experience with 38 women who underwent chest wall resection for locally recurrent breast cancer between October 1987 and May 1997. Overall survival was calculated by the Kaplan-Meier method and the significance of prognostic variables evaluated by log-rank and Cox regression analyses. **Results:** The operative mortality rate was 0%. Overall survival at 1, 3, and 5 years after chest wall resection was 74%, 41%, and 18%, respectively, and the proportion of patients free of local recurrence at 1, 3, and 5 years was 59%, 42%, and 13%, respectively. Regional nodal disease and size of largest tumor nodule (>4 cm) were significant predictors of local re-recurrence ($P < .01$, $P = .04$); lymph node metastasis was the only predictor of long-term survival ($P < .01$). Patients with and without synchronous sites of metastatic disease had near-identical 3-year survivals. **Conclusions:** Chest wall resection for locally recurrent breast cancer has a low mortality. However, a significant number of patients have the development of local re-recurrence or metastases, and 5-year survival is limited. It is unlikely that complete resection of all locally recurrent disease improves survival. Future studies should focus on the quality of palliation achieved. (J Thorac Cardiovasc Surg 2000;119:420-8)

The effectiveness of surgical resection for locally recurrent breast cancer invading the chest wall remains poorly defined, possibly because patients are only infrequently referred for the operation. This is due

in part to the general impression that locally recurrent disease is merely a harbinger of rapidly progressive distant disease. To date, few series have examined the likelihood of survival and local re-recurrence beyond the perioperative period. To better define a role for surgical resection of locally recurrent breast cancer, we reviewed our recent experience at Memorial Sloan-Kettering Cancer Center.

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Patients and methods

A review of the records of the Department of Pathology at Memorial Sloan-Kettering Cancer Center for the period October 1987 through April 1997 revealed 38 patients who underwent surgical resection of the full thickness of the chest wall in the treatment of locally recurrent breast cancer. These patients comprised the study group. Clinical information was obtained through a detailed review of the medical record. When follow-up information was not available from the hospital record, it was obtained through contact with the patient, family, or referring physician.

Locally recurrent disease was defined as the reappearance

Table I. Characteristics of original breast carcinoma and treatment

	No. of patients
Histology	
Infiltrating ductal	27
Lobular	3
Cystosarcoma phyllodes	2
Medullary	2
Other	2
Unknown	2
Hormonal status	
ER+/PR+	2
ER-/PR-	9
ER+/PR-	4
Unknown	23
Breast resection	
Lumpectomy	14
Modified radical mastectomy	17
Radical mastectomy	6
Simple mastectomy	1
Stage at breast resection	
I	6
IIA	11
IIB	5
IIIA	3
Unknown	13
Treatment before chest wall resection	
Chemotherapy	9
Radiation therapy	3
Radiation and chemotherapy	12
Hormonal therapy	7
Other	1
None	5
Unknown	1

ER, Estrogen receptor; PR, progesterone receptor.

of disease on or in the chest wall adjacent to the site of prior breast excision and not clearly regional recurrence within the Rotter's or axillary lymph nodes or sternal hematogenous metastases. Patients undergoing resection of the chest wall because of benign disease, such as radionecrosis, or because of other malignant diseases, such as radiation-induced sarcoma, were excluded. Synchronous metastatic disease was defined as the finding of locoregionally involved lymph nodes or distant sites of visceral disease and included malignant pleural effusions or implants. Bone invasion was defined as pathologic invasion into the cortex. A complete resection (R0) was defined as pathologic demonstration of negative tissue margins and an assessment by the operating surgeon that all detectable disease had been removed. Patients who had a complete gross resection and in whom diseased (positive) margins were found on final pathologic review were classified as having undergone microscopically incomplete resections (R1). Gross residual disease after attempted resection was classified as R2.

Survival probabilities were calculated by the Kaplan-Meier method from the date of chest wall resection and included patients who died in the postoperative period (defined as 30

Table II. Clinical characteristics and operation done at chest wall resection

	No. of patients
Physical examination	
Mass without ulceration	28
Mass with ulceration	6
Ulceration without mass	3
Radiographic finding only	1
Sites of metastatic disease	
Lung	9
Locoregional lymph nodes	4
Pleura	2
Bone	1
None	22
Extent of chest wall resection	
Ribs only	15
Sternum only	1
Sternum and ribs	22
Reconstruction	
Marlex mesh-MMA	33
Marlex mesh only	2
PTFE only	1
PTFE/MMA	1
None	1
Skin closure	
Primary closure	8
Pedicled myocutaneous flap	25
Free flap	4
Combination of flaps	1

MMA, Methyl methacrylate; PTFE, polytetrafluoroethylene (Gore-Tex material; Gore-Tex is a registered trademark of W. L. Gore & Associates, Inc, Flagstaff, Ariz).

days or less from the day of operation or within the same hospitalization). Time to first evidence of recurrent disease was calculated from the date of chest wall resection.

Log-rank analysis was used for univariate analysis for significant prognostic factors. The following variables were considered as potentially prognostic variables for survival: presence of synchronous metastases, presence of lymph node metastases, R0 versus R1 or R2 resection, number of nodules, size of largest nodule, presence of bone invasion, and presence of skin ulceration. Cox regression analysis was used for multivariable analysis of factors found significant on univariate analysis.

Results

The study population consisted of 38 women with a median age at chest wall resection of 56 years (range 27-80 years). The histologic type and stage of the original breast cancer and the types of treatment are shown in Table I. The T status of the tumors at first breast resection was T1 in 3 patients, T2 in 11, T3 in 5, and could not be defined in 19. The N status at first resection was N0 in 18 patients, N1 in 7, N2 in 2, and unknown in 11. The median number of nodes resected from the axilla was 19 (range 8-33); the number of pos-

Table III. Pathologic characteristics of chest wall specimens

	Yes	No	Unknown
Lymph node metastases	9 (24%)	29 (76%)	0
Complete resection of gross local disease (R0)	30 (79%)	8 (21%)	0
More than 1 nodule	9 (25%)	25 (74%)	4
Largest nodule >4 cm	16 (50%)	16 (50%)	6
Bone invasion	14 (45%)	17 (55%)	7
Pathologic margins positive (R1)	8 (25%)	23 (75%)	7
Skin ulcer	10 (33%)	20 (67%)	8

Data are given as the number of patients, with the percentage of these patients among those with available information given in parentheses.

itive nodes was none in 17 patients, 1 in 3 patients, 2 in 3 patients, 5 in 3 patients, 6 in 1 patient, and unknown in 11 patients. Overall, 15 patients had received radiation therapy to the chest wall either at the time of original breast resection or as an attempt to manage locally recurrent disease.

The indications for operation and information about the chest wall resection are shown in Table II. The median interval from the original breast resection to the chest wall resection for recurrent disease was 3.6 years (range 0.4-21 years). Complete re-evaluation for extent of disease at the time of chest wall resection (including preoperative and intraoperative evaluation) revealed 16 patients to have metastatic disease either to locoregional lymph nodes or to distant sites. The sites of metastatic disease are listed in Table II.

The number of ribs resected was none in 1 patient, 1 in 1 patient, 2 in 17 patients, 3 in 16 patients, 4 in 4 patients, 5 in 5 patients, 7 in 1 patient, and 8 in 3 patients. The skin defect after resection was none in 1 patient and could not be determined from the medical record in 5 patients; in the remaining 32 patients, the median skin defect after resection was 120 cm² (range 0-354 cm²). Biopsy or resection of synchronous metastatic disease was done in 12 patients. The median length of hospital stay was 8 days (range 4-31 days). There were no perioperative deaths. Four patients had wound complications, including 2 prosthesis infections (6%) and 2 superficial wound infections (6%). Other complications in the postoperative period included arrhythmia (1 patient), requirement for therapeutic bronchoscopy (1 patient), and intubation beyond 48 hours (1 patient).

The details of pathologic characteristics of the chest wall specimens are shown in Table III. Examination of the pathologic specimen suggested that the chest wall disease consisted of a solitary nodule in 25 patients, 2 nodules in 2 patients, 3 nodules in 3 patients, and 4 or

more nodules in 5 patients. The number of nodules could not be determined from the pathology report in the remaining 4 patients. The median size of the largest nodule was 4 cm (range 1-17 cm). Postoperative treatment was none in 16 patients; external beam radiation therapy in 3; chemotherapy in 9; chemotherapy and radiation therapy in 2; stem cell transplantation in 1; hormonal treatment alone in 3; monoclonal antibody treatment in 1; and unknown in 3.

The first site of recurrent disease in the patients rendered free of disease by chest wall resection was local in 7, lung or pleura in 6, unknown in 5, brain in 4, axilla in 3, and bone in 2. At the time of last follow-up, 24 patients (63%) had no evidence of local recurrence.

Overall survival and survival stratified by presence of synchronous metastases are presented in Figs 1 and 2. Survival analyses were repeated excluding the 2 patients with cystosarcoma phyllodes, and there was no difference in survival compared with the overall group (data not shown). Freedom from local recurrence is shown in Fig 3.

Table IV provides the results of univariate analyses of variables in relationship to survival and local recurrence in all patients. The presence of regional lymph node metastases (most often internal mammary) was the only significant prognostic factor for overall survival. Both regional lymph node metastases and the size of the largest nodule (>4 cm) had a significant impact on local recurrence.

Discussion

The rate of locally recurrent breast cancer after apparently complete excision of stage I or II disease is thought to be between 4% and 20%.¹⁻³ Isolated local recurrences represent 20% of all recurrences, and local disease in combination with either regional (usually lymph node) or distant recurrences represents a further 3%.³ The reappearance of disease on the chest wall is considered to predict a poor prognosis, with 5-year survival frequently estimated to be 30% to 50%,^{4,5} and mortality is attributed to the frequent subsequent appearance of disseminated metastases. However, a detailed analysis of isolated chest wall recurrences suggested that local recurrence was associated with a median survival of 5.6 years and a 10-year survival of 30%.⁶ Therefore the precise natural history of this problem is not fully defined.

It must be kept in mind that patients undergoing chest wall resection for breast cancer probably represent a distinct group within the population of patients with recurrent breast cancer on the chest wall. Most locally recurrent breast cancers consist of disease reappearing

Fig 1. Overall survival from date of first chest wall resection, all patients (n = 36, which excludes 2 patients without survival data).

Fig 2. Overall survival from date of first chest wall resection, all patients stratified by presence of synchronous metastases (*Sync Mets*).

only within the mastectomy/lumpectomy skin incision or within the area of dissection, such as the skin flaps. Patients requiring chest wall resection for the management of locally recurrent breast cancer probably have a more extensive burden of disease, as it is possible, even likely, that the group of patients undergoing chest wall resection includes patients not only with truly local (ie, soft tissue only) recurrence, but also those with disease progressing from involved internal mammary lymph nodes or from hematogenous spread to the sternum. Therefore comparison of patient groups requiring chest wall resection with series of patients treated for soft tissue recurrence alone may be misleading.

No matter the extent of local disease, the goals of management include relief of pain or resolution of persistent infections, removal of unsightly fungating lesions, prevention of skin breakdown before chemotherapy, and, possibly, improved survival by the removal of the only known site of disease. Treatment to achieve one or more of these goals is often highly individualized and can include surgical resection, radiation therapy, chemotherapy, or some combination of these treatments. Dahlstrom and colleagues⁷ reported a 45% rate of second local recurrence after surgical resection of soft tissues alone, without a chest wall resection. Similarly, Probstfeld and O'Connell⁴ found re-recurrence

Fig 3. Time to local recurrence after chest wall resection, all patients (n = 36, which excludes 2 patients without recurrence information).

Table IV. Univariate and multivariable analysis of prognostic factors for survival and local recurrence after chest wall resection for locally recurrent breast carcinoma

Variable	Overall survival (all patients)			Overall survival (excludes 2 cystosarcoma)			Risk of local recurrence		
	Univariate		Multivariable Cox model	Univariate		Multivariable Cox model	Univariate		Multivariable Cox model
	P value, log-rank	P value		P value, log-rank	P value		P value, log-rank	P value	
	P value	Risk ratio & 95% CI	P value	P value	Risk ratio & 95% CI	P value	Risk ratio & 95% CI		
Synchronous metastases									
No									
Yes	.12			.18			.08		
Lymph nodes									
Negative									
Positive	<.01	.02	2.8 (1.2, 6.8)	.02	.03	2.7 (1.1, 6.7)	<.01	<.01	20 (3, 130)
No of nodules									
1									
>1	.06	.07	2.3 (.95, 5.5)	.13			.41		
Size									
≤4									
>4	1			.83			<.01	<.01	9 (2, 43)

rence rates after radiation therapy alone to be 83%, after resection of soft tissues alone to be 62%, and after combination surgical treatment and radiation therapy to be 25%. Importantly, Halverson and associates⁸ noted 100% control with 6000 cGy of lesions that either could be completely excised or were less than 3 cm in diameter. However, only half of the lesions measuring more than 3 cm could be controlled by radiation, even with doses of irradiation up to 7000 cGy. Thus it

appears that control of local recurrences may be related to the depth of surgical resection (ie, adequacy of deep margins) and to the size of the lesions, especially when radiation is the main treatment.

Before acceptance of full-thickness chest wall resection as a practical extension of excision of soft tissues, it must be demonstrated that, first, the procedure can be done safely, and, second, the procedure achieves the goal of either palliation or cure. Chest wall resection

Table V. One-, three-, and five-year Kaplan-Meier survival estimates

	Overall survival	Overall survival (Fig 2)		Time to local
	(Fig 1)	Synchronous metastases		recurrence (Fig 3)
	Overall	No	Yes	Overall
1 y	0.74 (0.61, 0.90)	0.71 (0.54, 0.94)	0.79 (0.60, 1.00)	0.59 (0.45, 0.78)
3 y	0.41 (0.27, 0.63)	0.42 (0.24, 0.73)	0.39 (0.20, 0.77)	0.42 (0.26, 0.66)
5 y	0.18 (0.08, 0.41)	0.35 (0.18, 0.68)		0.13 (0.03, 0.63)

95% CIs are shown in parentheses.

with immediate plastic reconstruction is well documented to be safe in the management of primary lung cancers and primary chest wall tumors, as well as other benign and malignant thoracic diseases. The primary concern after any chest wall resection is the adequacy of respiratory function after disruption of the structural integrity of the bony thorax. At Memorial Sloan-Kettering Cancer Center, we commonly use a rigid prosthesis, usually a sandwich of Marlex mesh-methyl methacrylate, first devised by Dr Manjit Bains in 1981,⁹ with very acceptable results. In large series of patients, the ability to restore rigidity to the chest wall has led to a low and acceptable rate of use of postoperative mechanical ventilatory support in the range of less than 13%.^{9,10} Similarly, chest wall resection has been shown to carry an acceptable risk of perioperative mortality of 3% to 4.5%.^{9,10}

Previously published series of patients undergoing resection of recurrent breast cancer invading the bony structures of the chest wall suggest that the operative morbidity and mortality seen are similar to or better than the results when the operation is done for other disease processes. For example, Miyauchi,¹¹ Toi,¹² Faneyte,¹³ and their colleagues reported on a total of 92 patients with an overall operative mortality rate of 0%. Our results are similar with a perioperative mortality rate of 0%, median length of hospital stay of 8 days, and only 1 patient requiring prolonged mechanical ventilation.

The second problem encountered is that of closure of a soft tissue defect in a scarred, often irradiated field. The size of the defects created can be impressive, because incision into the contracted tissues can lead to relaxation with creation of defects considerably larger than the measurements taken from pathologic specimens. However, the progress made in the field of reconstructive surgery with tissue transfer techniques (most commonly in our series, a vascularized pedicled muscle flap), as recently reviewed by Arnold and Pairolo,¹⁰ has led to the expectation on the part of surgeons that the majority of defects can be closed without

incurring significant additional morbidity. In our series, we had 4 wound complications, including 2 prosthesis infections (6%) and 2 superficial wound infections (6%), which appears to be a reasonable rate of wound complications for the operations involved. Major complications such as flap necrosis were not seen.

If full-thickness resection of the chest wall can be done with acceptable morbidity and mortality, the second concern is the adequacy of palliation and the duration of survival. Several recent series have documented excellent results on both of these counts. For example, Miyauchi and colleagues¹¹ reported in 1992 on 23 patients (all with isolated chest wall recurrences) with 5-year local relapse-free rates of 66% and a survival of 48%. Similarly, Toi and colleagues¹² in 1997 reported on 15 patients with isolated chest wall disease with a 5-year local relapse-free rate of 74% and a 5-year survival of 47%, and Faneyte and colleagues¹³ in 1997 recorded 44 patients with isolated chest wall disease with a 5-year survival of 45% and a rate of freedom from local relapse of 80%. Our results support these previous papers with the finding of survival in patients without synchronous disease at 1 year of 71%, at 3 years of 42%, and at 5 years of 35% and a rate of freedom from local failure at time of death or last follow-up of approximately 60%.

Our results extend those of these previous studies by allowing comparison between patients with and without synchronous metastatic disease. We found the presence or absence of synchronous distant metastases to not be significantly associated with survival because 3-year survival estimates were similar for both groups at approximately 40%. Even though some patients operated on in the absence of metastatic disease survived for 5 years, whereas no patient operated on in the presence of metastatic disease survived for 5 years, our results have to be taken to suggest that resection of chest wall disease is unlikely to confer a survival advantage even for those patients without evidence of other sites of disease and should be done for palliative

reasons only. However, the quality of palliation appears satisfactory, because 60% of patients were free of local re-recurrence at death or last follow-up, and some of the second recurrences may have been less troublesome than the first.

Various prognostic factors have been suggested to assist in the selection of patients for surgical resection, including degree of lymph node involvement at time of original resection, size of original breast tumor, interval from breast resection to local recurrence, and pathologic characteristics of the local recurrence such as size and number of nodules and presence of lymphangitic spread or involved lymph nodes.^{4,14-16} Information on T and N status at the time of original breast resection, as well as the appearance of possible lymphangitic spread at the time of chest wall recurrence, could not be reliably determined from our records, and therefore these were not evaluated as possible prognostic variables. The prognostic factors we identified for likelihood of achieving local control and overall survival appear of limited value. For a surgeon, the helpfulness of knowing that involved regional lymph nodes indicate a poorer prognosis is unclear, because it is likely that it will be impossible to obtain biopsy specimens of these nodes before operating. Similarly, the finding that larger lesions are more likely to re-recr locally seems unlikely to deter an attempt at resection for palliation.

In conclusion, from these data and previous publications, it is clear that full-thickness resection of the chest wall can be done with acceptable morbidity and mortality, and, as best as can be determined from a retrospective study, it is likely that full-thickness resection of the chest wall for recurrent breast cancer offers significant palliation for the patient with locally recurrent disease. Surgical resection with the goal of palliation can be considered, even with multiple nodules, skin ulceration, and distant metastatic disease, if other modes of therapy have failed in a patient. Given the decreasing effectiveness of radiation therapy in controlling lesions of sizes greater than 3 cm, surgical resection may be considered as an alternative primary therapy. Unfortunately, it appears unlikely that survival is improved with the resection of all known chest wall disease, even in the absence of any known distant metastatic disease.

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Discussion

Dr Mark S. Allen (Rochester, Minn). Patients with recurrent breast cancer in the chest wall can be difficult to treat. They often have large, painful lesions that usually ulcerate and cause disabling symptoms. I thank the authors for giving us some useful information related to this problematic group of patients. Whereas others have tried chemotherapy or radiation therapy, these authors have chosen to use surgical resection with modern plastic surgical reconstruction. They seem to have provided excellent palliation in the majority of patients, with only minimal morbidity.

I have several questions. In the manuscript you report a 35% incidence of positive pathologic margins, including 1 in 5 patients with a grossly positive margin. This apparently did not affect outcome. What do you use as a guide for resec-

tion margins? Do you just remove the main mass? Is a 1-cm margin enough, or should we try for a larger margin?

You also reported that two thirds of the patients had skin ulceration, which presumably means that there was infection present. Despite the infection, you chose to use an artificial material for reconstruction in almost every patient and had a postoperative infection rate in 13% of patients. How did you manage the infection with Marlex mesh-methyl methacrylate present? Do you do anything at the initial excision to reduce the risk of infection?

Finally, this is obviously a selected group, since I am sure that the Memorial Sloan-Kettering group sees more than 38 women with recurrent breast cancer over a 10-year period. What can you tell us about your selection criteria for this operation? What factors do you look at to decide when to treat these patients with resection and reconstruction?

Dr Downey. Starting first with the selection question, the impetus for this study was that the breast oncology service did not believe that we could do the operation with a very low morbidity and mortality. They also did not believe there was any survival benefit. I think that this study shows that they were wrong on the first count and right on the second. The patients were only rarely referred to us previously, but probably now we will see more and refine our selection criteria further. Currently, after completing this study, we will do this operation for palliative goals but without an attempt to improve survival.

To return to the first question about margins: Microscopically positive margins were seen in 8 patients and gross resection of disease was done in all patients. The finding of microscopically positive margins in only 8 patients is low and surprising. These patients are usually heavily irradiated, scarred, and often superinfected and it can be extremely difficult to know whether a resection margin is across tumor and scar tissue. I perform multiple biopsies of any tissue in which there is a question, but I was surprised at what appeared to be a low number of final positive margins.

In terms of the prosthetic material that is used, patients with infections are brought into the hospital several days in advance with the intent to give them antibiotics and local wound care. If cellulitis appears to be controlled with that, they are taken to the operating room for a wide resection back to what appears to be clean tissue. We have not had a high infection rate. Wound infection complications occurred in 4 patients, 2 of whom had superficial cellulitis and 2 of whom had prosthetic infections. I do not know whether the prostheses had to be removed. If a patient has a wound with unrelenting infection despite all measures, we may forego the placement of any prosthetic material, particularly if we can use a rectus abdominis myocutaneous flap, because this provides a fairly stable amount of support to the chest wall with minimal flail.

Dr Joseph S. Friedberg (*Philadelphia, Pa*). Because the treatment had no impact on survival, I guess you could term this a quality-of-life operation. Was there any assessment done of the patients' postoperative quality of life and any sort of interview or assessment made to see whether, in retrospect, you think that this was the correct thing to do?

Dr Downey. This was a purely retrospective study, and we had difficulty even assessing whether recurrences actually occurred, let alone assessing quality of life. It is entirely possible that adequate palliation could be achieved even if a recurrence subsequently developed, if the recurrence was less onerous than the original recurrence. That information is not available to us from a retrospective study and would require a prospective study.

Dr Steven J. Mentzer (*Boston, Mass*). I would like to ask a question to clarify the indications for the operation. If lymph node involvement and the number of nodules are poor predictors of outcome, there must be a point at which localized disease becomes too extensive for resection. I do not think anyone would propose that carcinoma en cuirass is a resectable lesion. On the basis of your study, do you have any guidelines regarding the extent of lymphatic invasion and the indications for operation?

Dr Downey. I doubt that patients with clear lymphangitic spread against the chest wall were ever brought to surgical treatment. That is a point that was made well in Dr McKenna's paper from M.D. Anderson several years ago. The value of knowing that lymph node involvement portends a poor prognosis is unclear. These are nodes that are generally only available for biopsy by the time a major portion of the operation has been completed, usually after division of the sternum. Therefore, when I have found involved nodes, I have continued to finish the operation. It does, though, I think, imply with most patients, even with just evidence for a soft tissue recurrence, there is a lymphangitic component and probably diffuse lymphatic disease.

Dr Valerie W. Rusch (*New York, NY*). I would like to add a couple of comments. With respect to quality of life, I think that any thoracic surgeon will know that the quality-of-life benefit brought by resection to a woman who has locally recurrent breast cancer, particularly after radiation to the chest wall, is clear without a quality-of-life study. This is a horrible, painful problem, and patients are grateful for having the tumor removed. We are never going to be able to quantify the impact on quality of life because even in major cancer centers, the patient population is heterogeneous and relatively small. However, anyone who has treated these patients as a clinician will understand the importance of surgical resection in the management of this problem.

The other point that warrants emphasis is that the breast oncologists often are unsure whether patients who have had this operation should receive additional treatment. One of the conclusions from our experience is that patients who have lymphatic involvement clearly require additional systemic treatment.

Dr Thomas R. J. Todd (*Toronto, Ontario, Canada*). Obviously, if you have placed prosthetic material, infection is important. You only had 3 cases, so I know you cannot draw specific conclusions. However, I do have two questions. First, did the infections occur in the women who had a breakdown of the skin preoperatively? Second, in that situation, either with breast cancer or with osteoradionecrosis, do you have an

antibiotic prophylaxis regimen or any preoperative regimen to prevent infection when you are going to use prosthetic material in the chest wall?

Dr Downey. I do not know whether the wound infections and the prosthetic infections occurred in patients with overlying ulcers. The majority of these patients had masses without overlying skin ulcers, so I do not know how well I can comment on how to treat patients with ulceration. We will give preoperative antibiotics, but not a standard regimen. We are currently reviewing a larger series of patients, numbering almost 75, who have had full-thickness chest wall resections for other diseases, such as osteoradionecrosis. We hope this will give us better answers.

Dr Mark B. Orringer (*Ann Arbor, Mich*). Can I ask the number of these patients in whom hormonal therapy failed? Thoracic surgeons generally view chest wall tumors as a surgical disease, and chemotherapy as a rule has not much to offer for most chest wall tumors. However, metastatic breast cancer is not the standard chest wall tumor that we see in our

practices, and hormonal therapy, a different kind of chemotherapy, may have a real role here. I had experience with a patient who 9 years after a mastectomy had chest wall and cutaneous nodules on the operative side. I planned a rather heroic chest wall resection and reconstruction, but before this intervention she was treated with tamoxifen. The chest wall and cutaneous lesions regressed and disappeared, and within 3 months there was not a cutaneous or chest wall lesion left. She lived another 5 years. Additionally, now there is the next generation of hormonal therapy: anastrozole (Arimidex). Does your algorithm for resection follow failure of these hormonal agents to work first?

Dr Downey. In our series, 7 women had received hormonal therapy at some point between the original breast operation and immediately before chest wall resection. As I said, the breast oncologists are reluctant to refer these patients at this point. I think it is fair to say that they exhaust everything they consider reasonable options, and I am sure that this now includes hormonal therapy.