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## Forequarter amputation for recurrent breast cancer



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## ABSTRACT

**INTRODUCTION:** Localized excision combined with radiation and chemotherapy represents the current standard of care for recurrent breast cancer. However, in certain conditions a forequarter amputation may be employed for these patients.

**PRESENTATION OF CASE:** We present a patient with recurrent breast cancer who had a complicated treatment history including multiple courses of chemotherapy, radiation, and local surgical excision. With diminishing treatment options, she opted for a forequarter amputation in an attempt to limit the spread of cancer.

**DISCUSSION:** In our patient the forequarter amputation was utilized as a last resort to slow disease progression after she had failed multiple rounds of chemotherapy and received maximal radiation. Unfortunately, while she had symptomatic relief in the short-term, she had cutaneous recurrence of metastatic adenocarcinoma within 2 months of the procedure. In comparing this case with other reported forequarter amputations, patients with non-metastatic disease showed a mean survival of approximately two years. Furthermore, among patients who had significant pain prior to surgery, all patients reported pain relief, indicating a significant palliative benefit. This seems to indicate that our patient's unfortunate outcome was anomalous compared to that of most patients undergoing forequarter amputation for recurrent breast cancer.

**CONCLUSION:** Forequarter amputation can be judiciously used for patients with recurrent or metastatic breast cancer. Patients with recurrent disease without evidence of distant metastases may be considered for curative amputation, while others may receive palliative benefit; disappointingly our patient achieved neither of these outcomes. In the long term, these patients may still have significant psychological problems.

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## 1. Introduction

Historically, forequarter amputations have been used for management of bone and soft-tissue sarcomas of the shoulder girdle, although more recently it has been employed in the treatment and palliation of recurrent breast cancer. Axillary tumor recurrence can be very problematic for patients, causing significant pain, lymphedema, limb dysfunction, and/or skin ulceration. In cases of isolated recurrence, management using localized surgery, chemotherapy, and radiation is the preferred approach. However,

for patients who have more significant invasion without the possibility of local excision, a radical approach may be necessary for removal of the tumor in those patients desiring aggressive oncologic treatment. In these cases, the forequarter amputation offers the possibility of stopping the spread of the tumor while also palliating the pain and other morbidities often associated with invasion. We report the case of a forequarter amputation attempting to palliate a patient for axillary recurrence of breast cancer and provide a review of the literature on this controversial subject.

## 2. Presentation of case

A 49-year-old woman presented to our institution with a history of recurrent breast cancer. On her initial presentation two years earlier, she detected a mass in her right breast and presented to her primary care physician for further work-up. Prior surgical history included a gastric bypass but no breast-related procedures. The family history was significant for bilateral breast cancer in her mother. The patient was on no medications and was otherwise healthy. The physical examination detected a mobile, palpable, firm

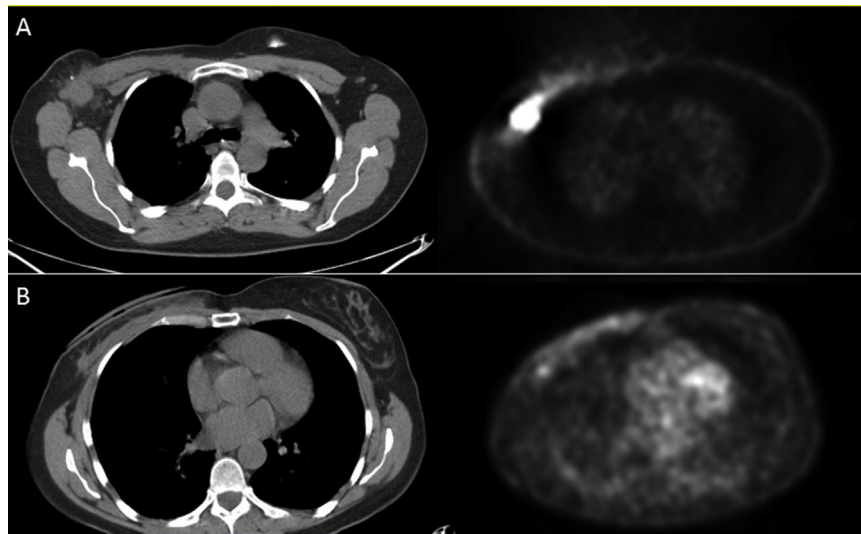
**Abbreviations:** ALND, axillary lymph node dissection; BCT, breast conserving therapy; CA, cancer antigen; ER, estrogen receptor; MRA, magnetic resonance angiography; OR, operating room; PET/CT, positron emission tomography/computed tomography; PR, progesterone receptor; RT, radiotherapy; SLN, sentinel lymph nodes.

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**Fig. 1.** (A) Horizontal sections on PET/CT indicating axillary recurrence of the cancer prior to surgery, and (B) post-surgical scan indicating removal of the affected lymph nodes and subsequent reduction in PET/CT signal.

mass in the central right breast. No worrisome lymphadenopathy was appreciated. Mammography detected a probable right-sided breast cancer.

An ultrasound-guided fine needle aspiration identified an invasive ductal carcinoma, and the patient was advised to have surgery. The patient opted for a right simple mastectomy to remove the 2.5 cm mass; margins were free. Two axillary sentinel lymph nodes (SLN) were negative. The mass was a Nottingham grade III invasive ductal carcinoma that was estrogen receptor (ER), progesterone receptor (PR), and HER-2/neu negative (triple negative). The nipple, skin, and chest wall were free of involvement. She was subsequently treated with dose-dense adjuvant chemotherapy using Adriamycin and cyclophosphamide for four cycles followed by four cycles of Taxol given every two weeks followed by external beam radiation to the chest wall and lower right axilla (50 Gy in 25 fractions).

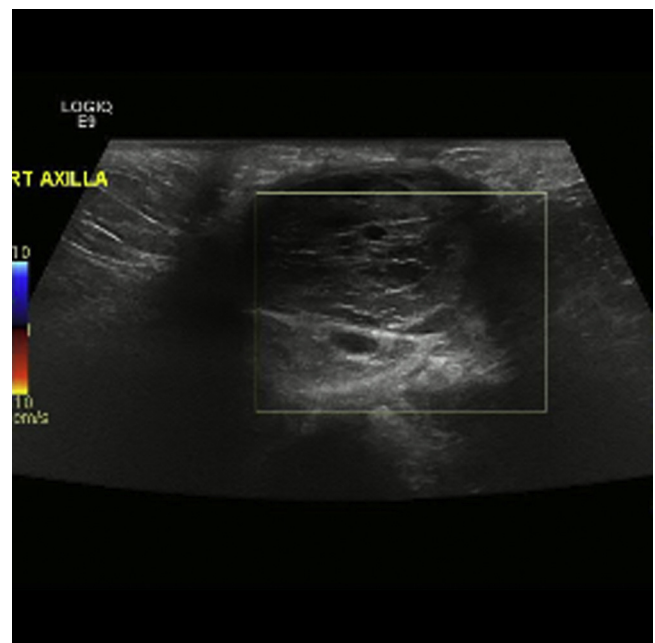
Despite a negative BRCA genotype, the patient sought aggressive management of her oncologic risks and underwent bilateral oophorectomy for known polycystic ovaries and a rising cancer antigen (CA) 125 level. She was fit and seemingly well for one year.

Thirteen months after the simple mastectomy and SNL removal, she noticed right axillary lymphadenopathy which was confirmed by positron emission tomography/computerized tomography (PET/CT) as shown in Fig. 1A. There was no evidence of systemic metastatic disease. A fine-needle aspiration indicated this was metastatic poorly differentiated adenocarcinoma, and subsequent axillary dissection found 2 of 10 lymph nodes involved with tumor (Fig. 1B indicates PET/CT following axillary dissection). Postoperatively the patient received an additional 50 Gy of radiation to the axilla. She started adjuvant chemotherapy with gemcitabine and carboplatin, completing five cycles over the next five months.

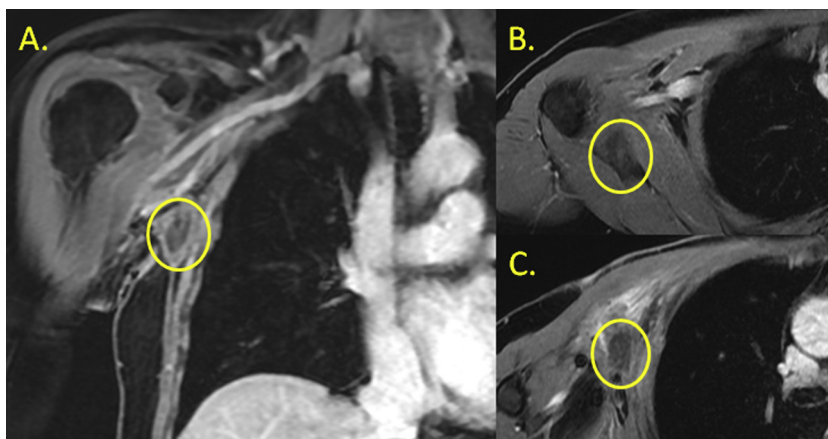
A month after conclusion of her chemotherapy a PET scan indicated some nonspecific uptake in the right axilla, but no treatment was recommended at that time. Six months later, there was a palpable, firm node in the right axilla. An ultrasound-guided biopsy revealed metastatic adenocarcinoma. At this time, she was referred to our institution.

With concerns radiation was no longer an option, the patient and her oncologists desired lymph node removal in hopes of analysis to devise a better chemotherapy regimen. With a full understanding that more surgery would unlikely be curative, the patient and

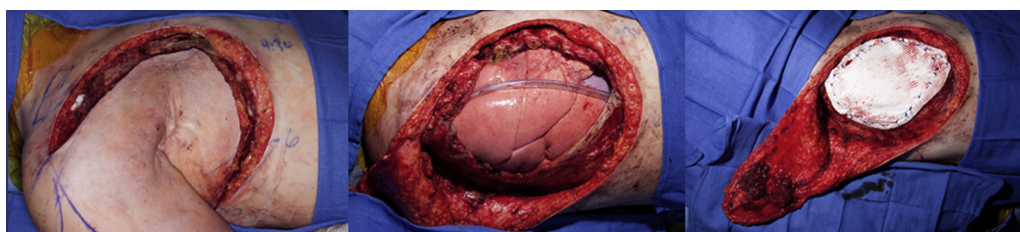
surgeon agreed on a third axillary operation; the procedure was difficult with dense, irradiated scar tissue throughout the axilla (Fig. 2 shows the intraoperative ultrasound). The node and surrounding tissue was removed en bloc, but resection of the axillary vein and pectoralis muscle was avoided. Histologic analysis revealed poorly differentiated adenocarcinoma involving the lymph node consistent with a primary breast source. Magnetic resonance angiography (MRA) performed three months later showed an ill-defined 4.5 cm soft tissue mass in the right axilla consistent with recurrent tumor or adenopathy and possible involvement of the axillary vein and chest wall (Fig. 3). At this time there was no evidence of distant metastatic disease. In consulting with her medical team, the patient was presented the options of continuing with observation, further chemotherapy, or a forequarter amputation. In order to attempt a more aggressive solution to the issue, the patient opted for a



**Fig. 2.** Intraoperative ultrasound of the axilla indicating dense, woody tissue with diffuse scarring from radiation therapy.



**Fig. 3.** (A) Coronal MRA showing axillary recurrence of a 4.5 cm mass abutting the chest wall and axillary vein with possible involvement; (B) and (C) demonstrate the tumor in horizontal sections.



**Fig. 4.** Photographs during the surgical procedure showing removal of the right arm, resection of the chest wall between ribs 2–5, resection of a lung nodule, placement of a brachial plexus nerve catheter, and chest wall reconstruction.

forequarter amputation, which was successfully performed one month later. The surgery involved removal of the right arm, resection of the chest wall from ribs 2–5, wedge resection of a 1 mm right lung nodule (palpated during surgery but not seen on imaging), chest wall reconstruction, and placement of a right brachial plexus nerve catheter (Fig. 4). The total OR time was 4.5 h. Histology revealed that the axillary mass and pulmonary nodule were both consistent with poorly differentiated adenocarcinoma with a primary breast source; surgical resection margins were negative. Her postoperative course was generally uneventful save for a brief episode of atrial fibrillation. The patient was discharged on postoperative day 7 with referrals to physical therapy, occupational therapy, and amputee service, as well as deep vein thrombosis prophylaxis with acetylsalicylic acid for six weeks.

At six week follow-up, the patient had developed new skin nodules on the chest surrounding the surgical site. Biopsy of these nodules was positive for ER/PR negative metastatic undifferentiated adenocarcinoma. Additionally, a PET scan showed that there was now left axillary lymphadenopathy measuring 2 cm in diameter. She thus underwent three full cycles of eribulin treatment. In the following months she was treated with further palliative radiation and weekly cisplatin chemotherapy. Unfortunately, this patient went on to suffer from further metastases to the lung with deterioration of her health and consistent phantom pain. She was also hospitalized multiple times for severe polymicrobial skin ulcerations until her eventual passing several months later.

### 3. Discussion

Breast cancer represents the most common form of cancer among women in the United States. The 5-year relative survival of individuals with breast cancer in 2009 was reported to be 98.6% for

those with localized breast cancer at diagnosis, 84.4% with regional spread, and 24.3% with distant metastasis [1]. Since the early 1990s, the death rates have declined with the addition of new therapies and earlier detection [2].

For patients who underwent a mastectomy as initial treatment there is a 5–10% local recurrence rate within 10 years, although up to 36% of patients with local recurrence may have simultaneous distant metastases [3–5]. For recurrence following BCT and RT, mastectomy is the standard approach given there is no evidence of distant metastasis; however, palliative mastectomy may still be performed [6,7]. When axillary recurrence occurs, it has been shown that multimodal treatment involving surgery, irradiation and chemotherapy is the best approach to optimize disease-free survival [8].

In the case of our patient, having received the maximum amount of radiation and in an attempt to prevent further spread, radical excision was performed using a forequarter amputation. While the axillary recurrence had not caused any symptoms of pain or dysfunction yet, palliating these problems as well as delaying further spread and recurrence made the forequarter amputation a more viable option in the eyes of the patient.

The usage of forequarter amputation for recurrent breast cancer is a rare practice, and Table 1 provides a summary of the outcomes from published cases [9–20]. When patients sought surgery for curative benefit, they generally had good survival outcomes from the procedure. For those who had locally recurrent cancer, 5 out of 9 survived to the time of published data with an average survival among all patients of  $23.4 \pm 14.6$  months. While this is not enough to determine that patients with locally recurrent breast cancer will universally benefit from a forequarter amputation, it provides better context for its usage. Meanwhile, patients who sought palliative therapy had a mean survival of  $13 \pm 8.1$  months if

**Table 1**  
Meta-analysis of patients who have undergone forequarter amputation for breast cancer recurrence [9–20].

	Patients (%)	
Total number of cases	28 (100%)	
Female	27 (96%)	
Age	56.6 ± 10.6 years	
Pre-surgical diagnosis		
Local recurrence only	16 (57%)	
Confirmed metastasis	12 (43%)	
Presenting symptoms		
Pain	15 (71%)	
Edema	12 (57%)	
Limb dysfunction	11 (52%)	
Ulceration	10 (48%)	
Infection	4 (19%)	
Bleeding	3 (14%)	
Fungation	1 (5%)	
Necrosis	1 (5%)	
Blistering	1 (5%)	
Wound care	1 (5%)	
No symptoms	1 (5%)	
Intention of surgery (n = 28)		
Palliative	18 (64%)	
Curative	10 (36%)	
Surgical complications (n = 19)		
Flap necrosis	4 (21%)	
Delayed healing	1 (5%)	
Pleural effusion	1 (5%)	
Pain relief (n = 15)	15 (100%)	
Survival	Alive	Mean survival
Recurrent, palliative (n = 7)	1 (14%)	13 ± 8.1 mos.
Recurrent, curative (n = 9)	5 (56%)	23.4 ± 14.6 mos.
Metastatic, palliative (n = 11)	0 (0%)	13.3 ± 16.3 mos.
Metastatic, curative (n = 1)	1 (100%)	23 mos.

they had local recurrence and 13.3 ± 16.3 months with metastatic disease.

Upon initial presentation, the most common symptoms among patients included pain (71%), edema (57%), limb dysfunction (52%), and ulceration (48%). In patients who noted pain as a presenting symptom, 100% reported relief following the procedure. Furthermore, immediate post-surgical complications were relatively limited, with 4 patients (21%) experiencing flap necrosis and only 1 patient each (5.3%) having problems with pleural effusion and delayed healing. As a result, there can be palliative benefit from this surgery with seemingly limited post-operative complications.

Our patient lacked any real issues with pain or limb dysfunction as noted in patients in other studies and unfortunately did not garner benefit from this procedure because of early recurrence and progression of her cancer. We hope that her experience was atypical given that many of the patients who underwent this procedure had a much longer survival and received palliative benefit long-term.

#### 4. Conclusion

As suggested by previous authors, we would concur that there are certain curative and palliative uses for the forequarter amputation with careful consideration. Our relatively asymptomatic patient appreciated the efforts to eradicate her local tumor recurrence, but she did not gain long term benefits. Patients who have immobile, unresectable recurrent tumors in the axilla, with severe pain with loss of function, are negative for distant metastasis, and have any tumor-related complications including bleeding, infection, or edema can be considered for curative forequarter

amputation. Palliatively, forequarter amputations can be used as salvage therapy in patients with advanced axillary recurrence of breast cancer and intractable pain [11–14,16].

#### Conflicts of interest

The authors have nothing to disclose and no conflicts of interest.

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None.

#### Consent

Informed consent was obtained from the patient for publication of the case report and accompanying images.

#### Author contributions

Study Design: Pundi, Farley.

Data Collection: Pundi.

Data Analysis: Pundi, Farley.

Writing: Pundi, AlJamal, Ruparel, Farley.

Edits: Pundi, AlJamal, Ruparel, Farley.

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