Received: 20 May 2020 | Accepted: 21 May 2020

DOI: 10.1111/tbj.13931

COMMENTARY

The Breast Journal WILEY

Outcome of CT staging prior to neo-adjuvant chemotherapy in patients with early breast cancer

Rachel Broadbent MBBCH[1,2] | Sophie Ralston BSc[2] | Joshua Lauder MBBCH[3] | Sacha Howell MBBCH, PhD[1,2]

[1]Department of Medical Oncology, The Christie NHS Foundation Trust, Manchester, UK

[2]Division of Cancer Sciences, Faculty of Biology Medicine and Health, University of Manchester, Manchester, UK

[3]Department of Radiology, Wrightington, Wigan and Leigh NHS Foundation Trust, Wigan, UK

Correspondence: Rachel Broadbent, Department of Medical Oncology, The Christie NHS Foundation Trust, Wilmslow Road, Manchester M20 4BX UK.
Email: Rachel.broadbent-2@postgrad.manchester.ac.uk

Neo-adjuvant chemotherapy (NACT) is increasingly used to treat early-stage breast cancer.[1] Current recommendations for pretreatment staging are based on evidence from the adjuvant setting.[2-4] The National Comprehensive Cancer Network (NCCN) recommends considering a staging CT scan for all stages apart from T1N0.[2] The European Society of Medical Oncology (ESMO) guidelines

TABLE 1 Cases of positive staging scans by tumor phenotype and stage

Stage	% metastatic	Phenotype (number of patients)			
		TN	Her2 + ER−	Her2 + ER+	ER + Her2−
T0N + M0	N/A	1	0	0	0
T1N0M0	0	7	1	3	0
T1N0M1		0	0	0	0
T1N + M0	0	4	2	3	2
T1N + M1		0	0	0	0
T2N0M0	2.30%	27	7	6	2
T2N0M1		1	0	0	0
T2N + M0	17.30%	13	9	16	5
T2N + M1		0	4	2	3
T3N0M0	0	3	1	4	0
T3N0M1		0	0	0	0
T3N + M0	12.90%	9	3	6	9
T3N + M1		1	1	0	2
T4N0M0	100%	0	0	0	0
T4N0M1		0	0	1	0
T4N + M0	20%	3	0	0	1
T4N + M1		1	0	0	0
M1/total (% metastatic) by phenotype		3/70 (4.3)	5/28 (17.9)	3/41 (7.3)	5/24 (20.8)

Abbreviations: ER, estrogen receptor; Her2, human epidermal growth factor receptor 2; TN, triple-negative.

recommend considering staging in clinically node-positive (any T stage), tumors ≥5 cm, or aggressive biology.[3] A survey of UK breast surgeons found that 67% always perform a staging CT scan prior to NACT.[5] In our center, where all patients receive a CT thorax, abdomen, and pelvis prior to NACT, we evaluated the rate of diagnosis of metastatic disease on CT and the cost associated with staging. Clinical records were reviewed for all cases identified for potentially curative NACT at The Christie NHS Foundation Trust between January 1, 2015, and December 31, 2017. Patients with symptoms of metastases were excluded. The results of pretreatment imaging and biopsies were used to record T and N stage and phenotype. We recorded the results of the staging CT scan as "definite metastases," "equivocal," or "normal." All additional scans or procedures performed to investigate for metastases were recorded. The costs associated with imaging were calculated using the National Schedule of Reference Costs 2017-2018 for diagnostic imaging in the NHS.6 Of the 163 eligible cases identified, the initial staging CT results were as follows: 106 (65%) normal, 50 (30.7%) equivocal, and 7 (4.3%) definite metastases. The rate of metastases by clinical T stage, N status, and tumor phenotype is shown in Table 1. The 50 patients with an equivocal staging CT scan had 100 additional investigations (median 2, range 1-6): 24 MRI, 17 USS, 8 radionuclide bone scans, 33 additional CT, 8 PET-CT scans, and one gastroscopy, with a total cost of £16 389. This resulted in 9/50 (18%) patients being diagnosed with metastases and thus an overall metastatic rate of 16/163 (9.8%). 10/33 CT scans were CT thorax to investigate pulmonary nodules in 5 patients. The median number of CT thorax scans required to exclude metastases was 2 (range 1-3), and none were diagnosed with metastatic disease. 11/17 ultrasounds were performed to investigate gynecological abnormalities in 7 patients. Of these, 4 required a second ultrasound and 2/4 required an MR pelvis. None were diagnosed with metastases. Of 62 patients with T1-3 N0 disease at presentation, only one (1.61%) was diagnosed with metastases (Table 1). Of these 62 patients, 16 (25.8%) had an equivocal result (resulting in 31 further scans). The total cost of staging the T1-3 N0 subgroup to diagnose 1 case of metastatic disease was £11 980. Other studies report similar findings regarding rate of metastases detected on imaging—10.9% in the adjuvant setting on CT and bone scan[7] and 6.6% detected on PET-CT in the neo-adjuvant setting, with no significant difference between the rate of metastasis and tumor phenotype in the latter study.[8] In our study, 30% of patients required additional imaging following a staging CT to exclude metastatic disease. In another study, 43% required additional imaging, and in common with our study, a chest CT was the most common additional scan requested.[9] Regarding CT thorax findings, a study in keeping with ours found that stage I and II breast cancer patients required on average 2.34 additional scans to exclude metastases following a staging chest CT, with just 1.3% subsequently being diagnosed with pulmonary metastases.[10] In conclusion, in patients with T1-3 breast cancer and clinically negative lymph nodes we report a very low rate of metastases at not inconsiderable financial cost. Our study has contributed to a growing body of literature, which suggests that patients with clinically staged node-negative breast cancer do not require staging prior to neo-adjuvant chemotherapy irrespective of the tumor biology.

ORCID

Rachel Broadbent https://orcid.org/0000-0002-1913-3140

REFERENCES

1. Murphy BL, Day CN, Hoskin TL, Habermann EB, Boughey JC. Neoadjuvant chemotherapy use in breast cancer is greatest in excellent responders: triple negative and HER2+ subtypes. *Ann Surg Oncol*. 2018;25(8):2241-2248.
2. National Comprehensive Cancer Network. NCCN clinical practice guidelines in oncology 'Breast Cancer'. 2019. https://www.nccn.org/professionals/physician_gls/pdf/breast.pdf. Accessed 19th May 2020.
3. Cardoso F, Kyriakides S, Ohno S, et al. Early breast cancer: ESMO clinical practice guidelines for diagnosis, treatment and follow-up. *Ann Oncol*. 2019;30(8):1194-1220.
4. Barrett T, Bowden DJ, Greenberg DC, Brown CH, Wishart GC, Britton PD. Radiological staging in breast cancer: which asymptomatic patients to image and how. *Br J Cancer*. 2009;101(9):1522-1528.
5. Chand N, Cutress RI, Oeppen RS, Agrawal A. Staging investigations in breast cancer: collective opinion of UK breast surgeons. *Int J Breast Cancer*. 2013;2013:506172.
6. NHS Improvement. 'National schedule of reference costs'. 2018. https://improvement.nhs.uk/resources/reference-costs/#rc1718. Accessed 19th May 2020.
7. McCartan D, Prichard RS, MacDermott J, et al. Role of bone scan in addition to CT in patients with breast cancer selected for systemic staging. *Br J Surg*. 2016;103(7):839-844.
8. Srour MK, Lee M, Walcott-Sapp S, et al. Overuse of preoperative staging of patients undergoing neoadjuvant chemotherapy for breast cancer. *Ann Surg Oncol*. 2019;26(10):3289-3294.
9. Brothers JM, Kidwell KM, Brown RKJ, Lynn HN. Incidental radiologic findings at breast cancer diagnosis and likelihood of disease recurrence. *Breast Cancer Re Treat*. 2016;155(2):395-403.
10. Dull B, Linkugel A, Margenthaler JA, Cyr AE. Overuse of Chest CT in patients with Stage I and II Breast: an opportunity to increase guidelines compliance at an NCCN member institution. *J Natl Compr Canc Netw*. 2017;15(6):783-789.