Breast-MRI-NACT-Pilot

Summary

This collection contains longitudinal DCE MRI studies of 64 patients undergoing neoadjuvant chemotherapy (NACT) for invasive breast cancer.

Patient population

This pilot study to investigate the use of serial DCE MRI examinations during neoadjuvant chemotherapy for invasive breast cancer recruited 68 patients with stage II or III locally advanced breast cancer enrolled between 1995 and 2002 in an institutional review board (IRB)-approved research protocol. All patients gave written informed consent to participate. All patients had confirmed breast cancer diagnoses based on histopathology of biopsy or surgical excision, and none had prior treatment with chemotherapy, surgery or radiation. All patients received pre-operative chemotherapy with four cycles of adriamycin-cytoxan administered every three weeks. A subset of 17 patients received additional weekly treatment with taxane after the Anthracycline regimen was completed. Three DCE-MRI scans were scheduled for all patients: MRI_1 before treatment; MRI_2 after one cycle of chemotherapy; MRI_3 after completion of Anthracycline treatment and before surgery or further treatment. Subjects receiving Taxane were scheduled for an additional exam, MRI_4, after completion of all chemotherapy treatment and before surgery.

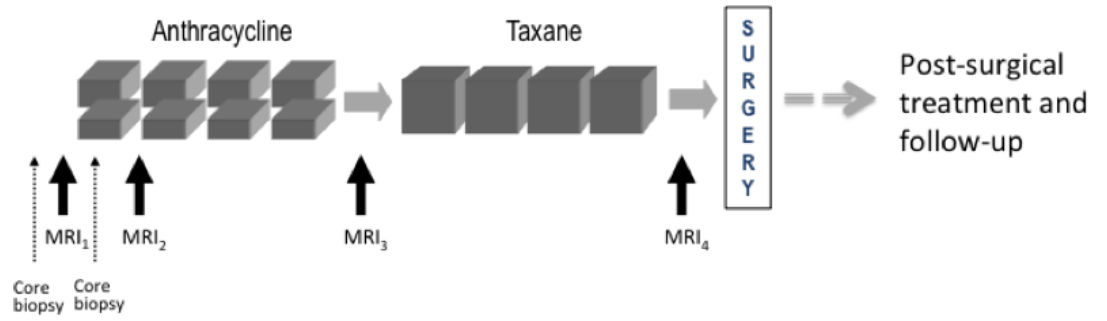

Figure 1. UCSF Pilot NACT study schema. Only an N=17 subset of patients received Taxane and MRI_4 as a result of changes in standard of care during the course of the study. Note: Not all patients received core biopsies as indicated in this schema.

Exclusions: Of the 68 patients, four have been excluded from this collection: one did not undergo surgery, one did not have a pre-surgery time-point MRI, one was rejected due to unanalyzable MR images, and one had metastatic disease prior to the completion of treatment. None of the excluded patients were from the 17 subject Taxane group. Three patients are included here but may be excluded at researchers' discretion due to treatment anomalies: a) Two subjects in the Taxane group (UCSF_BR_30 and UCSF_BR_53) did not complete the Taxane treatment, but were moved directly to surgery early and did not have the final MRI_4 examination, and b) Patient UCSF_BR_27 declined standard-of-care post-surgery radiation and hormonal treatments. These cases are noted in the accompanying clinical information workbook.

Endpoint data: Recurrence-free survival (RFS) was assessed for each patient at 6-month or 1-year intervals following surgery. For patients that recurred, length of RFS was defined as the time from initial surgery to either local or distant recurrence. Other clinical and endpoint data includes patient age, lesion characteristics including pretreatment tumor size, histologic type, pathologic size, tumor subtype, and lymph node involvement. These data are included as supplemental information for the collection in the accompanying clinical information workbook.

MRI acquisition

Breast MRI was acquired on a 1.5-T scanner (Signa, GE Healthcare, Milwaukee, WI) using a bilateral phased array breast coil. The MR imaging protocol included a 3D localizer and a unilateral sagittal DCE acquisition. The DCE acquisition utilized a high spatial resolution, low temporal resolution, T1-weighted, fat-suppressed 3D fast gradient-recalled echo sequence developed for pre-surgical staging (TR/TE 8/4.2; flip angle 20 degrees; field of view 18-20 cm; acquisition matrix 256 x 192 x 60, section thickness 2 mm; spatial resolution 0.7 x 0.94 x 2.0 mm^3). A minimum of three time points were acquired during each contrast-enhanced MRI protocol: a pre-contrast scan (t_0), followed by 2 consecutive post-contrast time points: early (t_1) and late (t_2) phases. The gadopentetate dimeglumine contrast agent (Magnevist, Bayer HealthCare, Berlin, Germany), was injected at a dose of 0.1 mmol/kg of body weight (injection rate = 1.2 mL per second) followed by a 10 mL saline flush, with injection starting coincident with the start of the early t_1 phase acquisition. Imaging time was approximately 5 minutes per acquisition, resulting in effective early and late post-contrast time points of 2.5 minutes and 7.5 minutes from the start of the contrast injection, respectively, using standard k-space sampling. Fat suppression was performed using a frequency-selective inversion recovery preparatory pulse.

This shared data set was provided by David Newitt, PhD and Nola Hylton, PhD from the Breast Imaging Research Program at UCSF.

This work was supported by grants:

- National Institute of Health/National Cancer Institute: IUO1CA151235; RO1CA132870
- Susan G Komen: SAC110017

Data Access

Data Access

Click the **Download** button to save a ".tcia" manifest file to your computer, which you must open with the NBIA Data Retriever. Click the **Search** button to open our Data Portal, where you can browse the data collection and/or download a subset of its contents.

Data Type	Download all or Query/Filter
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ISPY-1 DCE MRI Data Sharing Dictionary_v2	Download

Click the Versions tab for more info about data releases.

Third Party Analyses of this Dataset

TCIA encourages the community to publish your analyses of our datasets. Below is a list of such third party analyses published using this Collection:

- SDTM datasets of clinical data and measurements for selected cancer collections to TCIA

Detailed Description

Detailed Description

Collection Statistics	
Modalities	MR
Number of Patients	64
Number of Studies	189
Number of Series	2228
Number of Images	99058
Image Size (GB)	19.5

QIN BMMR Challenge

Subsets of this collection are being used as the training data set for the NCI Quantitative Imaging Network (QIN) Breast MRI Metrics of Response (BMMR) challenge. To download these subsets use the following links:

Download Link	Description
QIN_BMMR_Training DCE_Derived_HRknown	n=47 subject training set for bMMR Challenge, DCE series and derived maps and segmentations
QIN_BMMR_Training DCEonly_HRknown	n=47 subject training set for BMMR Challenge, primary DCE series only
QIN_BMMR_Training AllSeries_HRknown	n=47 subject training set for BMMR Challenge, all acquired and derived series
QIN_BMMR_Training AllSeries_AllSubjects_n64	n=64 training set for BMMR Challenge, all series all patients
QIN_BMMR_Training DCEonly_AllSubjects_n64	n=64 training set for BMMR Challenge, Original DCE series only, all patients
QIN_BMMR_Training DCE_Derived_AllSubjects_n64	n=64 training set for BMMR Challenge, DCE series and derived maps and segmentati, all patients

BMMR_Training_Tissue_DSO_AllSubjects	Breast tissue segmentations for all studies in Breast-MRI-NACT-Pilot collection
BMMR_Training_Tumor_DSO_AllSubjects	Breast enhancing tumor segmentations for all studies in Breast-MRI-NACT-Pilot collection

Included image data

Original and time-of-scan derived images.

Original DCE images are contained in a single series for each study. For the majority of studies (174 of 198) this series contains only the 3 time-points described above. 12 studies have 1 additional post-contrast acquisition for a total of 4 phases, while 2 studies, UCSF_BR_36, visit 1, and UCSF_BR_42, visit 1, have 4 and 6 post-injection phases respectively.

NOTE: Study UCSF_BR_18, Visit 1, has two pre-contrast acquisitions and two post-contrast phases. Use of the 2nd pre-contrast phase for time-point t_0 is recommended. All other studies have a single pre-contrast phase.

Other original image series present in the collection include 3-plane scout images for each study, and for some studies T2 weighted images and diffusion weighted images. In addition, some studies may contain derived images from the DCE series including subtraction images and projection images.

Tumor volumetric analysis images.

The primary predictor variable for the original study, functional tumor volume (FTV), was measured from contrast-enhanced images using the signal enhancement ratio (SER) method. Four derived series per study from this analysis are included in this collection:

Series ID (x=original DCE series ID)	Object Type	Series description
x1000	MR	SER*1000 map[1]
x1001	MR	PE_{early} map
x2000	Segmentation	PE_{early} segmentation for SER map calculation[2]
x2001	Segmentation	Breast tissue segmentation for PE_{early} map calculation[3]

1. SER true values range from 0.0 to 3.0. These are scaled by 1000 in order to store in integer format. DICOM viewers utilizing the rescale-slope field (0028,1053) will display the true SER values.
2. The PE_{early} segmentation is based on both the breast tissue segmentation (background level threshold, see next footnote) and an early percent enhancement threshold of 70%.
3. The breast tissue segmentation is based on an intensity threshold applied to the pre-contrast image. Threshold was set to 60% of the 95% percentile intensity within the tumor region volume-of-interest. Coordinates of the VOI are stored in all derived DICOM images using private fields (0117, 10a1) and (0117, 10a2) for the starting and ending voxel coordinates respectively.

Further information on later NACT Breast Cancer MRI studies can be found at:

- ACRIN 6657 Protocol http://www.acrin.org/6657_protocol.aspx
- I-SPY TRIAL http://ncicb.nci.nih.gov/tools/translation_research/isp
- CALGB 150007 http://www.cancer.gov/clinicaltrials/search/view?cdrid=69280&version=HealthProfessional

Metadata

Excel workbook with clinical data and disease free survival (DFS) data for the 64 patients in this study:

Clinical and DFS Data (xls)

DICOM data dictionary defining fields included in the 0x0117 private group for PE/SER calculation parameters and results, and deduced DCE scan timing information. NOTE: Dictionary contains sections for attributes from the I-SPY 1 TRIAL which are not included in this pilot study.:

ISPY-1 DCE MRI Data Sharing Dictionary_v2

Citations & Data Usage Policy

Citations & Data Usage Policy

Please be sure to include the following citations in your work if you use this data set:

UCSF Pilot Data Citation

David Newitt, Nola Hylton, "Single site breast DCE-MRI data and segmentations from patients undergoing neoadjuvant chemotherapy", The Cancer Imaging Archive (2016). DOI: 10.7937/K9/TCIA.2016.QHsyhJKy

TCIA Citation

Clark K, Vendt B, Smith K, Freymann J, Kirby J, Koppel P, Moore S, Phillips S, Maffitt D, Pringle M, Tarbox L, Prior F. **The Cancer Imaging Archive (TCIA): Maintaining and Operating a Public Information Repository**, Journal of Digital Imaging, Volume 26, Number 6, December, 2013, pp 1045-1057. DOI: 10.1007/s10278-013-9622-7

Other Publications Using This Data

1: Partridge SC, Gibbs JE, Lu Y, Esserman LJ, Tripathy D, Wolverton DS, Rugo HS, Hwang ES, Ewing CA, Hylton NM. **MRI measurements of breast tumor volume predict response to neoadjuvant chemotherapy and recurrence-free survival**. AJR Am J Roentgenol. 2005 Jun;184(6):1774-81. PubMed PMID: 15908529.

2: Li KL, Partridge SC, Joe BN, Gibbs JE, Lu Y, Esserman LJ, Hylton NM. **Invasive breast cancer: predicting disease recurrence by using high-spatial-resolution signal enhancement ratio imaging**. Radiology. 2008 Jul;248(1):79-87. doi: 10.1148/radiol.2481070846. PubMed PMID: 18566170.

3: Hattangadi J, Park C, Rembert J, Klifa C, Hwang J, Gibbs J, Hylton N. **Breast stromal enhancement on MRI is associated with response to neoadjuvant chemotherapy**. AJR Am J Roentgenol. 2008 Jun;190(6):1630-6. doi: 10.2214/AJR.07.2533. PubMed PMID: 18492917.

4: Li KL, Henry RG, Wilmes LJ, Gibbs J, Zhu X, Lu Y, Hylton NM. **Kinetic assessment of breast tumors using high spatial resolution signal enhancement ratio (SER) imaging**. Magn Reson Med. 2007 Sep;58(3):572-81. PubMed PMID: 17685424; PubMed Central PMCID: PMC4508009.

5: Jones EF, Sinha SP, Newitt DC, Klifa C, Kornak J, Park CC, Hylton NM. **MRI enhancement in stromal tissue surrounding breast tumors: association with recurrence free survival following neoadjuvant chemotherapy**. PLoS One. 2013 May 7;8(5):e61969. doi: 10.1371/journal.pone.0061969. Print 2013. PubMed PMID: 23667451; PubMed Central PMCID: PMC3646993.

TCIA maintains a list of publications which leverage our data. If you have a publication you'd like to add please contact the TCIA Helpdesk.

Versions

Version 2 (Current): Updated 2016/04/16

deleted 4 duplicate DICOM series:

1.3.6.1.4.1.14519.5.2.1.7695.2311.274969196687715738621052447111

1.3.6.1.4.1.14519.5.2.1.7695.2311.790802609328661944330528970451

1.3.6.1.4.1.14519.5.2.1.7695.2311.869262000688001356814712906748

1.3.6.1.4.1.14519.5.2.1.7695.2311.914480028549654883806586724682

Data Type	Download all or Query/Filter
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Clinical and DFS Metadata (XLS)	Download
ISPY-1 DCE MRI Data Sharing Dictionary_v2	Download

Version 1: Updated 2016/01/30

Data Type	Download all or Query/Filter
Images (DICOM, 19.5 GB)	Download (Download requires the NBIA Data Retriever.)
Clinical and DFS Metadata (XLS)	Download
ISPY-1 DCE MRI Data Sharing Dictionary_v2	Download