

## **Usefulness of Cube-IDEAL/Flex sequence in breast MRI evaluation of response to neo-adjuvant chemotherapy without contrast media**

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**Authors:** D. Cannata, V. Casali, M. Luciani, M. Telesca, R. Di Miscio, E. Miglio, F. Pediconi; Rome/IT  
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## **Aims and objectives**

To evaluate the feasibility of 3D Cube-IDEAL/Flex sequence in the evaluation of response to neo-adjuvant chemotherapy without contrast media in patients with breast cancer, in comparison with 2D T2 fast spin echo sequence with fat suppression.

## Methods and materials

30 patients with proven breast cancer (BIRADS 6) detected at x-ray mammography (Mx) and ultrasound (US), candidate for neo-adjuvant chemotherapy (age 18-70 years old), underwent standard MR examination with contrast media administration, including Cube-IDEAL/Flex and 2D T2 FSE fat-sat sequences. Two independent breast MD radiologists evaluated 3D Cube-IDEAL/Flex and the 2D T2 FSE images based on contrast resolution, spatial resolution, lesion contour delineation (if applicable), fat signal suppression homogeneity and scan times. Tumor size measurements on 3D Cube-IDEAL/Flex have been compared with those of 2D T2 FSE before and every two cycles after neo-adjuvant chemotherapy, by means of statistic T-test.

Images for this section:

## IDEAL SEQUENCE

- Multi-echo with 3 TE based on chemical shift
- Dixon method with 3 points: detachment of fat/water signal

### ADVANTAGES

- Improvement of fat saturation homogeneity and reproducibility vs STIR e FS
- 4 images data set with only one sequence
- ✓ water only
- ✓ fat only
- ✓ in-phase
- ✓ out-phase

The diagram illustrates the phase evolution of water and fat signals over three echoes. It shows three phase diagrams with the following equations:

- $\Phi_1 = -\pi/6 + k\pi$
- $\Phi_2 = \pi/2 + k\pi$
- $\Phi_3 = 7\pi/6 + k\pi$

Legend:  $k = \text{integer}$ , water (red arrow), fat (yellow arrow).

The resulting images are arranged in a 2x2 grid:

- Top-left: In Phase
- Top-right: Out Phase
- Bottom-left: Water Image
- Bottom-right: Fat Image

The process starts with an "Interative field map estimation" box, which leads to the "In Phase" and "Out Phase" images. A green arrow points from the phase diagrams to the "Interative field map estimation" box.

Fig. 1: Ideal Sequence description

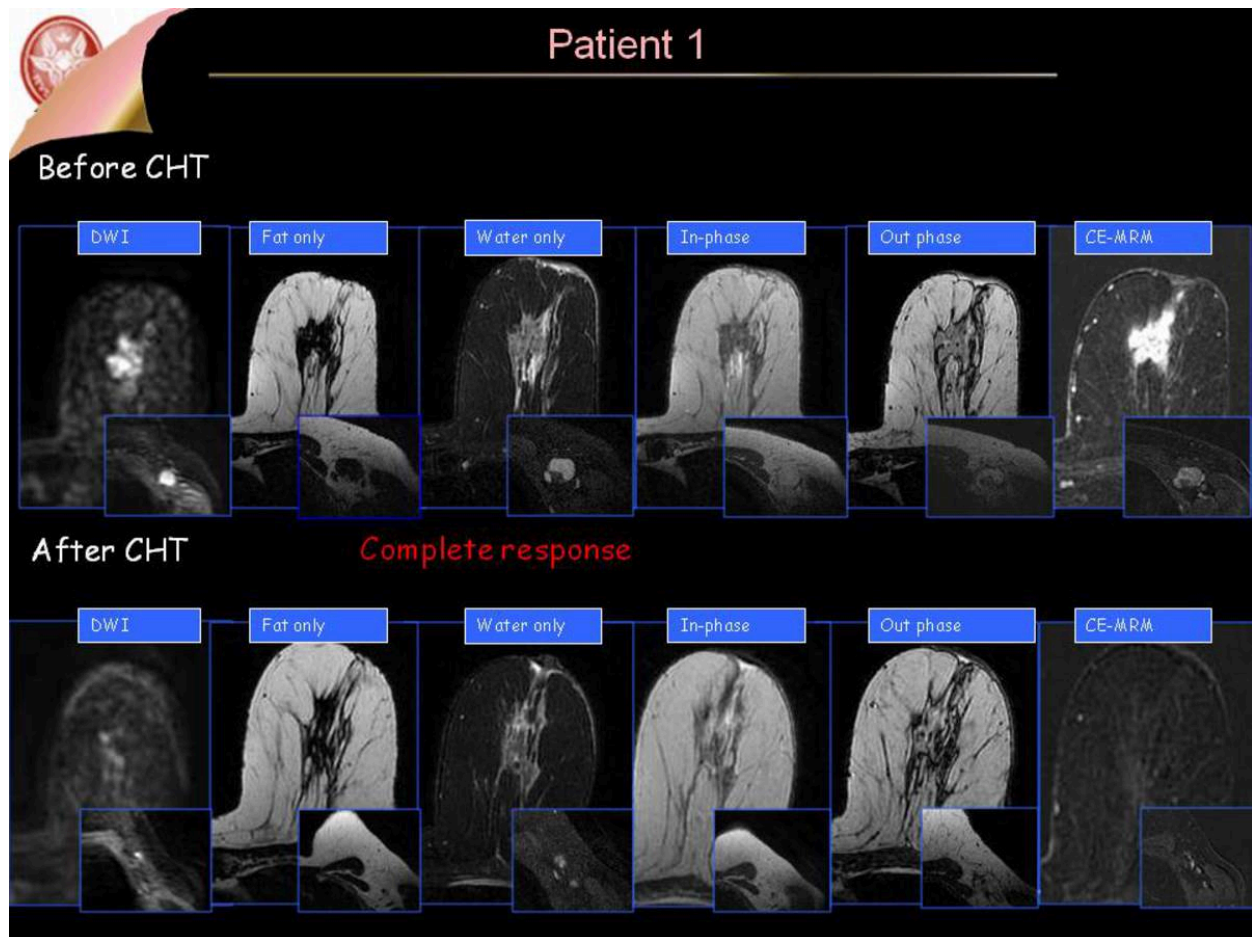
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## Results

No significant differences were found in the lesion size evaluation between the two sequences for both radiologists.

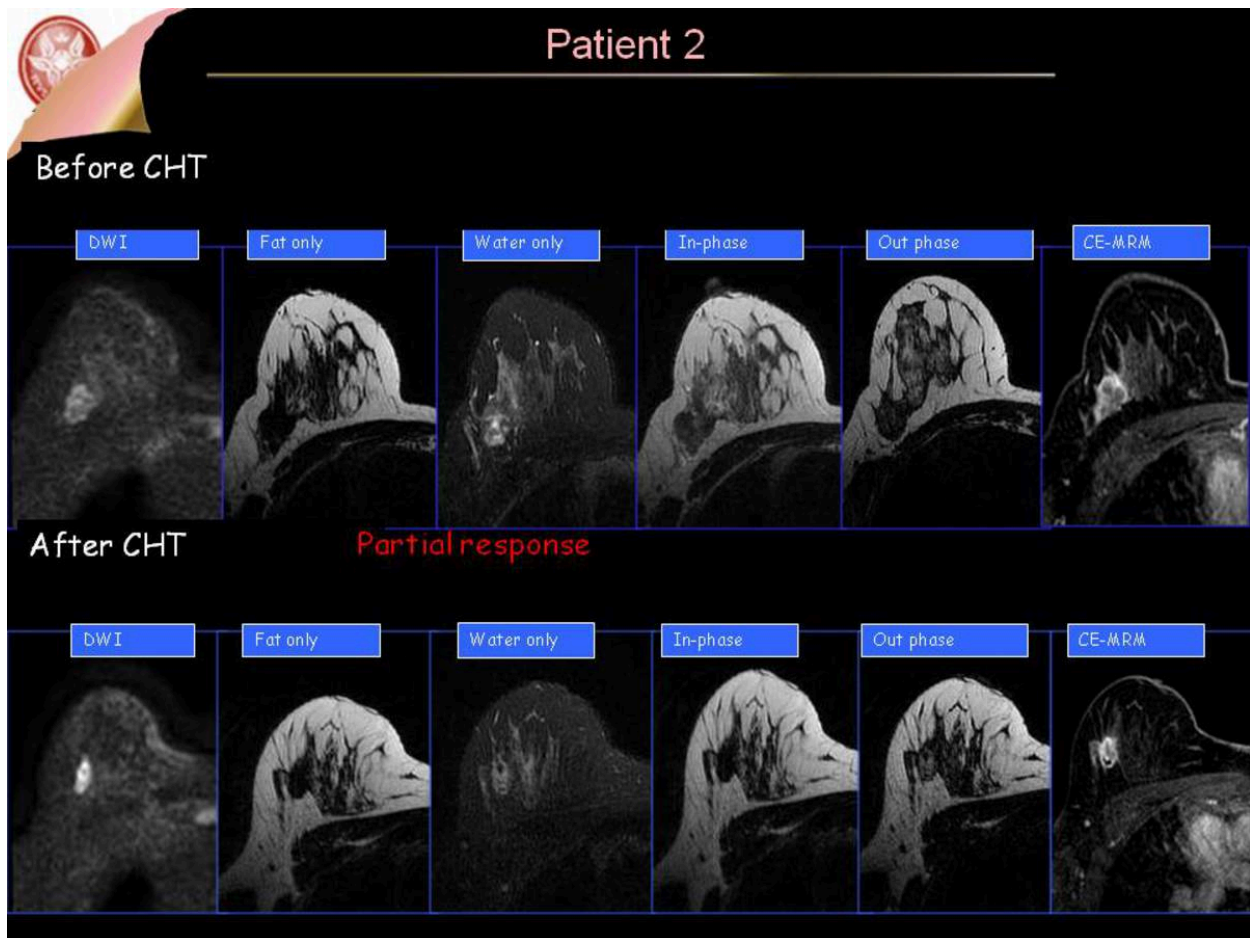
The images quality of Cube-Flex and Cube-Ideal was considered better, for both radiologists, in terms of spatial and contrast resolution, compared to 2D Ideal.

Images for this section:



**Fig. 2:** Patient #1 before and after CHT

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**Fig. 3:** Patient #2 before and after CHT

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## Conclusion

Cube-IDEAL/Flex sequence could be very useful in measuring breast cancer size during follow-up evaluation of response to neo-adjuvant chemotherapy, without contrast media administration.



## References

1. Chen JH, Bahri S, Mehta RS, Kuzucan A, Yu HJ, Carpenter PM, Feig SA, Lin M, Hsiang DJ, Lane KT, Butler JA, Nalcioglu O, Su MY. Breast cancer: evaluation of response to neoadjuvant chemotherapy with 3.0-T MR imaging. *Radiology*. 2011 Dec;261(3):735-43. Epub 2011 Aug 30.
2. Wu LM, Hu JN, Gu HY, Hua J, Chen J, Xu JR. Can diffusion-weighted MR imaging and contrast-enhanced MR imaging precisely evaluate and predict pathological response to neoadjuvant chemotherapy in patients with breast cancer? *Breast Cancer Res Treat*. 2012 Apr 4. [Epub ahead of print]
3. De Los Santos J, Bernreuter W, Keene K, Krontiras H, Carpenter J, Bland K, Cantor A, Forero A. Accuracy of breast magnetic resonance imaging in predicting pathologic response in patients treated with neoadjuvant chemotherapy. *Clin Breast Cancer*. 2011 Oct;11(5):312-9. Epub 2011 Aug 10.
4. Woodhams R, Kakita S, Hata H, Iwabuchi K, Kuranami M, Gautam S, Hatabu H, Kan S, Mountford C. Identification of residual breast carcinoma following neoadjuvant chemotherapy: diffusion-weighted imaging--comparison with contrast-enhanced MR imaging and pathologic findings. *Radiology*. 2010 Feb;254(2):357-66
5. Chen JH, Feig B, Agrawal G, Yu H, Carpenter PM, Mehta RS, Nalcioglu O, Su MY. MRI evaluation of pathologically complete response and residual tumors in breast cancer after neoadjuvant chemotherapy. *Cancer*. 2008 Jan 1;112(1):17-26. Erratum in: *Cancer*. 2008 Apr 1;112(7):1642.
6. Carbonaro LA, Pediconi F, Verardi N, Trimboli RM, Calabrese M, Sardanelli F. Breast MRI using a high-relaxivity contrast agent: an overview. *AJR Am J Roentgenol*. 2011 Apr;196(4):942-55. Review.
7. Pediconi F, Catalano C, Padula S, Roselli A, Dominelli V, Cagioli S, Kirchin MA, Pirovano G, Passariello R. [Contrast-enhanced MR mammography: improved lesion detection and differentiation with gadobenate dimeglumine](#). *AJR Am J Roentgenol*. 2008 Nov;191(5):1339-46.