Original research

Increase of mastectomy rates after preoperative MRI in women with breast cancer is not influenced by patients' age

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A R T I C L E   I N F O

Article history:
Received 15 May 2014
Accepted 15 June 2014
Available online 23 August 2014

Keywords:
Breast cancer
Breast magnetic resonance imaging
Mastectomy

A B S T R A C T

Preoperative magnetic resonance imaging (MRI) is increasingly used for staging women with breast cancer, including screening for occult ipsilateral or contralateral cancer. If breast-conserving surgery is planned, a MRI examination should be performed in all women with suspected breast cancer, especially those exhibiting dense or heterogeneously dense breast parenchyma, for which the sensitivity of both ultrasonography and mammography is low. MRI staging causes more extensive breast surgery in a significant proportion of women by identifying additional cancer. If the ability to find additional occult cancer is the true value of MRI, this is not influenced by patients' ages. For this reason, preoperative MRI should be counseled to all women with breast cancer by clinicians, independently from the age, as the age alone does not preclude additional findings.

1. Introduction

Breast cancer staging and surgical planning are affected by the burden of pathologically proven cancer detected on clinical examination and/or imaging. Magnetic resonance imaging (MRI) has superior sensitivity and accuracy for the detection of invasive and in situ breast cancer when compared with physical examination, mammography and ultrasound but can be limited in specificity. The use of preoperative breast MR imaging for evaluating the extent of disease remains controversial because clinical studies have not definitively demonstrated MRI preoperative breast study to improve overall survival, decrease re-excision rates or the costs of care [1]. Patient age does not influence the value of breast MRI, in the context of newly diagnosed breast cancer [2]. Evidence consistently shows that MRI changes surgical management, usually from breast conservation to more radical surgery resulting in overtreatment without conclusively proven beneficial effects on such clinical outcomes as decrease in reoperation rates or improved patient survival [3]. We discuss the usefulness of preoperative magnetic resonance imaging in the surgical planning.

2. Results and discussion

In the absence of consensus about the role of preoperative MRI, we review data on its detection capability and its impact on surgical treatment. We outline that the assumptions behind the adoption of MRI, namely that it will improve surgical planning and will lead to a reduction in re-excision surgery and in local recurrences, have not...
been substantiated by clinical trials. Evidence consistently shows that MRI changes surgical management, usually from breast conservation to more radical surgery; however, there is no evidence that it improves surgical care or prognosis. Emerging data indicate that MRI does not reduce re-excision rates and that it causes false positives in terms of detection and unnecessary surgery [3,4]; overall there is little high-quality evidence at present to support the routine use of preoperative MRI [4].

Preoperative MRI is increasingly used for staging women with breast cancer, including screening for occult ipsilateral or contralateral cancer. A meta-analysis by Houssami et al. [5] demonstrated that preoperative breast MRI detected additional areas of disease in the same breast in approximately 16% of women with newly diagnosed breast cancer. A large study from 2007 revealed additional occult disease in the contralateral breast in 3% of newly diagnosed breast cancer patients who underwent preoperative breast MRI [6].

However MRI does not reliably distinguish benign from malignant findings resulting in a high false positive (FP) rate [7], so it is a highly sensitive but nonspecific method in detecting ipsi- or contra-lateral lesions [8], so cytologic evaluation and core needle biopsy remain mandatory when MRI findings suggest the need for mastectomy [9]. A retrospective study demonstrated that the 40% of women in all age groups (40–49; 50–59; 60–69; 70–79) shows additional findings after preoperative MRI: mastectomy rates can be decreased when these additional findings are furtherly studied with needle biopsy [2].

If breast-conserving surgery is planned, a MRI examination should be performed in all ages women with suspected breast cancer, especially those exhibiting dense or heterogeneously dense breast parenchyma, for which the sensitivity of both ultrasonography and mammography is low [10] and in patients with doubts about the local and distant extension of the tumor on conventional assessment [11]. Ultrasound (US) is probably the standard imaging procedure in most centers, and US-guided fine-needle cytology can be added if suspicious lymph nodes are found. However, US-guided fine-needle cytology remains an invasive method to diagnose a metastasis and has showed relatively low sensitivity. In general, diffusion-weighted (DW) MRI has become an emerging technique for discriminating benign from malignant breast lesions in a short imaging acquisition time. Chung J et al. [12] suggest an Apparent Diffusion Coefficient (ADC) cut-off value of 0.90 × 10^{-3} \text{mm}^2/\text{s} between metastatic and benign axillary lymph nodes. Using ADC cut-off, reported sensitivity, specificity, and accuracy of DW MRI were 100%, 83.3%, and 93.6%, respectively. The sensitivity, specificity, and accuracy of US were 94.1%, 54.8%, and 79.1%, respectively.

Meta-analysis of three studies that compared MRI plus mammography versus mammography alone showed the sensitivity of MRI plus mammography as 94% (95% CI 86–98%) and the incremental sensitivity of MRI as 58% (95% CI 47–70%). Incremental sensitivity of MRI was lower when added to mammography plus ultrasound (44%, 95% CI 27–61%) or to the combination of mammography, ultrasound plus clinical breast examination (31–33%). Estimates of screening specificity with MRI were less consistent but suggested a 3–5-fold higher risk of patient recall for investigation of false positive results [13]. No studies assessed whether adding MRI reduces patient mortality, interval or advanced breast cancer rates, and we did not find strong evidence that MRI leads to the detection of earlier stage disease.

In 2009, McGuire et al. [14] documented a steady rise in mastectomy rates, from just over 30% in the late 1990s to approximately 60% in 2007 and Mahmood et al. [15] reported increased rates especially among patients with early breast cancer. Similarly, the rate of bilateral mastectomy has been increasing. Tuttle et al. [16] demonstrated that the use of contralateral prophylactic mastectomy among patients with unilateral breast cancer markedly increased from 1998 to 2003, rising from 4.2% in 1998 to 11.0% in 2003 and a study from Memorial Sloan–Kettering demonstrated that among nearly 3000 women presenting with unilateral breast cancer between 1997 and 2005, 13.8% chose contralateral prophylactic mastectomy [17]. Sorbero et al. [18] reported a nearly two-times higher risk of contralateral prophylactic mastectomy when preoperative breast MRI was performed. Although other factors play a role, preoperative breast MRI was the strongest factor predicting for the use of contralateral prophylactic mastectomy, with an odds ratio of over 3. Last, a recent German study of over 142,000 cases reported that breast MRI was independently associated with mastectomy (odds ratio: 1.42; 95% CI: 1.36–1.47) [19].

3. Conclusion

The use of breast MRI has diffused rapidly. A recent study [20] on over 52,000 women with newly diagnosed breast cancer between 2005 and 2008 showed that the use of breast MRI more than doubled from 20 to 50%. The reasons for this rapid increase are not entirely clear, especially given the lack of benefit with regard to long-term outcomes for breast cancer, its high FP rate and costs [21]. MRI, in fact, is a highly sensitive but non-specific exam. It should be performed after clinical breast examination, US and Mammmography but its findings need to be confirmed by pathologic examination, especially core needle biopsy when mastectomy is proposed as surgical treatment.

DW MRI of axillary lymph nodes can provide reliable information for the differentiation of benign from metastatic axillary lymph nodes in invasive breast cancer patients [13]. Evidence supports that more extensive breast cancer surgery is not necessarily better for women with respect to local recurrence (in cases of wider local excision), distant metastases or other more qualitative outcome measures, such as quality of life and body image [21]. Besides if there is no improvement in clinical outcomes and no short-term benefits for patients, even finding more cancers at an earlier stage could not be useful. It increases patient anxiety, the need for additional imaging and biopsy, drive-up costs and delay definitive surgical treatment [22–31]. MRI staging causes more extensive breast surgery in a significative proportion of women by identifying additional cancer. If the ability to find additional occult cancer is the true value of MRI, this is not influenced by patients’ ages. For this reason, preoperative MRI should be counseled to all women with breast cancer by clinicians, independently from the age, as the age alone does not preclude additional findings [2].

Randomized clinical trials are needed to determine the clinical, psychosocial and long-term effects of MRI in detecting additional disease when this could change standard surgical treatment.

Ethical approval

None required.

Funding

All Authors have no source of funding.

Author contribution

Gianni Antonio Della Corte: Participated substantially in conception, design, and execution of the study and in the analysis and interpretation of data; also participated substantially in the drafting and editing of the manuscript.
Nicola Rocco: Participated substantially in conception and design of the study and in the drafting and editing of the manuscript.

Vincenzo Sabatino: Participated substantially in conception and design of the study and in the drafting and editing of the manuscript.

Corrado Rispoli: Participated substantially in collecting data.

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Giuseppe Falcone: Participated substantially in collecting data.

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Bruno Amato: Participated substantially in the drafting and editing of the manuscript.

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Conflict of interest

The Authors have no conflict of interest or any financial support.

References


