Clinical Implications of Breast Cancer 49

Dimitris-Andrew D. Tsiftsis

Breast cancer (BC) has advanced by strides the last few years reaching the stage of functional molecular imaging. The objectives though remain the same: detection of tumors at the earliest phase, reliable pre- and post-treatment staging, and correlation of image characteristics to prognosis.

49.1 Early Diagnosis and Preoperative Planning

It is well-documented that early diagnosis of BC tenders less disfiguring treatments and thus improved quality of life. The crucial step to a woman's striving for early diagnosis is to have her risk assessed. For low to moderate risk, the accepted guideline is from age 40 to 70 digital mammography (dMm) every 2–3 years. In high risk women MRI of upgraded specifications to increase its specificity is introduced as a reliable screening, with better tumor yield even at a higher biopsy rate. MRI is also indicated in dense breasts and diffuse micro calcifications. It is imperative for centers using MRI to have available MRI-guided interventions like core biopsy and J-wire placement. In confirmed genetic predisposition, MRI breast screening protocols have to compete against prophylactic surgery that holds the leading role [1].

Another open to debate subject pertains to the routine use of MRI on all women with newly diagnosed BC preoperatively in an effort to detect multicentricity, contralateral disease, and the extend of the reference tumor. Meta-analysis have shown a rise of 16 % in additional tumors detected at the cost of more radical surgery that does not translate into better survival or fewer re-excisions and recurrences. RCTs are needed to settle the argument and until then this practice is not recommended [2].

49.2 Accurate Diagnosis of Breast Lesions

The cornerstone of the evaluation of a breast finding is the triple assessment. Central component of the triad is Mm and the clinician is bound to take further action or not on the BI-RADS classification of the finding. The same applies to US and MRI.

Category 3 is assigned to very few reports (2.34 %) and the probability of malignancy remains low (0.81 %). Short-term follow-up (FU) covers the patient sufficiently. In categories 4 and 5, a definite tissue diagnosis of the lesion is mandatory. In palpable lesions this is accomplished either by FNA or core biopsy. The use of US helps to select the proper site of the mass to take the sample. In non-palpable lesions the sample has to be taken under the guidance of the imaging modality that has revealed the lesion. Core needle is used to secure a dissent specimen. Today, we have automated stereotactic apparatus

D.-A. D. Tsiftsis (✉)
Hygeia Diagnostic and Therapeutic Center of Athens, Er. Stavrou 4, 15123 Marousi, Greece
e-mail: d.d.tsiftsis@gmail.com

A. D. Gouliamos et al. (eds.), *Imaging in Clinical Oncology*,
DOI: 10.1007/978-88-470-5385-4_49, © Springer-Verlag Italia 2014

that can approach safely almost any part of the breast and cut specimens of a size that combines biopsy and cure. If sampling is unsuccessful or not feasible, a J-wire or a tracer is left in place for a guided open biopsy. The patient has the right to be fully informed and consulted of the nature of her finding and the treatment options available to her. Open surgical biopsy is not the first choice.

In cases where a patient has disease in her axilla with a negative Mm, MRI may reveal the index tumor in the breast and allow a sample of it. The surgical treatment of the axilla in patients with BC has become less extensive with the introduction of sentinel lymph node (SLN) biopsy. Further, clinical N1 nodes can be assessed preoperatively by US and sampled by guided FNA. To locate the SLN during surgery the patient usually has a radioisotope lymphoscintigraphy beforehand and in theater the surgeon with a handheld probe spots the "hot" node. There are patients with unusual, complex, or delayed drainage and those with extra axillary drainage. In these cases, the use of SPECT/CT gives excellent results with 3D images and a clear map of the lymphatic route [3].

49.3 Evaluation of Response to Therapy

Accurately measuring the response to therapies of the index tumor or of the metastatic disease is a difficult but inescapable endeavor for many reasons. The size of the tumor does not correspond to the tumor cells volume. The criteria used (RECIST or WHO) have application limitations. Each treatment modality has different response time. Targeted treatment aims mainly at stabilizing and not decreasing the tumor burden. Different imaging studies have better yield in different organs. Technological evolution and the introduction of new methods are so rapid that the added value of each cannot be assessed in the long run. This reflects to the fact that there are not published guidelines.

For the evaluation of the primary breast tumor to induction chemotherapy conventional means like clinical examination still hold strong. Mm and US are used widely correlating well with the pathology specimen. Modalities like quantified DW/PW MRI and dynamic PET can not only measure response accurately but also tumor function and can predict if it will respond to given treatment. Another functional study is diffuse optical spectroscopy promising better prediction of response with early application in the treatment course.

For the evaluation of systemic disease, FDG-PET seems more accurate. Early results from trials using new imaging agents like amino acid analogs and choline fair even better [4]. As for the assessment of residual disease after breast conserving surgery (BCS), MRI is the study of choice especially if the breast has been augmented with implants.

49.4 Preoperative Staging

A patient with confirmed BC needs clinical TNM staging and detailed review of her pathology report. For clinical stages I–IIB, additional imaging studies are not indicated unless directed by signs and symptoms. For stage IIIA or locally advanced disease when preoperative chemotherapy is scheduled chest CT, abdominal ± pelvic CT or MRI, bone scan, and FDG-PET/CT are recommended (NCCN, NICE, ESMO, BASO guidelines). In this clinical setting, RCTs are still trying to define which combination of imaging studies is best to detect metastatic disease being cost-effective at the same time and most importantly whether this additional information has any gain for the patient in terms of DFS or OS. Take into account that preoperative staging is the phase where a high proportion of patients undergo unnecessary, costly, high-end investigations to no avail.

49.5 Post-Treatment Surveillance

Women after BCS may develop ipsilateral recurrence or a new metachronous primary in the operated or contralateral breast as well as systemic disease. Ipsilateral recurrence is known

to affect survival. Women with a second tumor ≥2.0 cm are at greater risk of death compared to those with tumors ≤1.0 cm or no recurrence. So, early detection seems to be beneficial to the patient's outcome. Of the potentially treatable relapses almost half are detected by Mm, 15 % at clinical visits and the rest by the patient. From the surveillance studies Mm seems to have been adopted as the preferred method by the majority of clinicians (87 %) and scientific bodies. Issued guidelines (ASCO, ESMO, NICE) differ in frequency, protocol, and duration. They agree on closer FU the first 2–3 years. We must keep in mind that though relapses are indeed more often the first 2–3 years, they never cease to appear and that metachronous tumors occur latter. Mm is a widely available, reliable, time-honored study with a sensitivity of about 65 % and a specificity of 85–97 % [5]. A new array of technological improvements (tomosynthesis, spectral Mm, dye enhanced, etc.) is expected to increase its performance. MRI fares better and is a useful tool in dubious cases. The length of FU should be 10 years for the average case. We do need though robust evidence from RCTs that would allow us to categorize patients according to their risk for relapse and tailor surveillance protocols to meet their needs.

49.6 DCIS

As a result of breast screening the incidence of DCIS has increased disproportionately to other tumors. Age-adjusted incidence rate is 32.5 per 100,000 women. The average size is 1.0–1.5 cm, 50 % is high grade and the usual histologic type is "non-comedo". In 2005 the estimated prevalence in the US was 500,000 cases. This number is expected to double by 2020. The 10 year survival rate is 96–98 %. A substantial proportion will remain "in situ" and will never progress to invasive. It is easily concluded that a tumor of fairly good prognosis is very often treated aggressively to a great psychological and physical cost for the woman.

MRI is more often employed today pretreatment to evaluate the local extent, multicentricity, and contralateral disease. Comparison to dMm gives inconsistent results. Therefore, if there could ever be an imaging study that combined with the findings of the core biopsy could safely distinguish patients in need only of FU it would had provided women and healthcare system with a miraculous service.

References

1. Kurian AW, Sigal BM, Plevritis SK (2010) Survival analysis of cancer risk reduction strategies for BRCA ½ mutation carriers. J Clin Oncol 28:222–231
2. Houssami N, Hayes DF (2009) Review of preoperative magnetic resonance imaging (MRI) in breast cancer. CA Cancer J Clin 59:290–302
3. Wagner T, Buscombe J, Gnanasegaran G, Navalkissoor S (2013) SPECT/CT in sentinel node imaging. Nucl Med Commun 34:191–202
4. Zhu A, Lee D, Shim H (2011) Metabolic positron emission tomography imaging in cancer detection and therapy response. Semin Oncol 38:55–69
5. Robertson C, Arcot Ragupathy SK, Boachie C et al (2011) The clinical effectiveness and cost-effectiveness of different surveillance mammography regiments after the treatment for primary breast cancer. Health Technol Assess 15:1–322