

## Personalized Management of Breast Cancer, In the Era of Precision Medicine

Saira Saleem

Professor of Surgery and Oncoplastic Breast Surgeon, Madinah Teaching Hospital & The University of Faisalabad.

Correspondence: \* [dsairajaz32@yahoo.com](mailto:dsairajaz32@yahoo.com)

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This is an era of technological advancement and its use to provide a precise and safe patient care. Our knowledge of disease pathogenesis as well as approach to manage patients has changed significantly with recent scientific developments and breakthroughs so that we can now offer a more predictable, precise and powerful health care according to individual patient needs [1]. A very widely used definition of precision medicine (PM) as defined by President's Council of Advisors on Science and Technology (PCAST) is; "the tailoring of medical treatment to the individual characteristics of each patient to classify individuals into subpopulations that differ in their susceptibility to a particular disease or their response to a specific treatment. Preventative or therapeutic interventions can then be concentrated on those who will benefit, sparing expense and side-effects for those who will not" [2]. In simple words, Precision medicine is a way of offering specific and individualized care to the patients, based on their genes and thus making a more accurate diagnosis and patient specific treatment [3].

Breast cancer is the most common cancer of the women. Breast cancer is very heterogeneous, that means within same tumour, we can find different subtypes. Treatment of breast cancer is therefore very challenging. Advancements in molecular medicine, has now enabled us to differentiate between these different intrinsic subtypes and tailor the breast cancer treatment according to molecular characteristics of individual tumours. This approach has done a significant contribution to improve disease outcomes. Offering personalized care starts with screening. Women with family members affected by breast cancer are at increased risk of developing the disease. This risk increases further if such women carry genetic mutations e.g.; the BRCA1 or BRCA2 gene mutation. So women with a history of breast or ovarian cancer in their families and test positive for BRCA mutations or other high penetrance genes should undergo a more frequent screening. Especially addition of MRI breast to mammography in these patients improves the detection of breast cancer at an early stage [4].

Understanding of tumor development, particularly an

in-depth knowledge of cancer genetics, transcriptomics, proteomics, metabolomics and epigenetics of pathological lesions, is central to the development of precision medicine. Although genomic characterization of tumors is of immense value, DNA aberrations do not give a clear picture of the related biological pathways. However, development and application of transcriptomic studies have efficiently filled this gap and have emerged as one of the essential techniques in molecular diagnostics. Also the transcriptomics studies have helped to develop bioinformatic tools that further improve our understanding of differential gene expression related to biological functions. One of the success stories related to achievements of genomics, is the development and use of targeted breast cancer therapeutics according to individual genetic profile that have played a very important role in survival from breast cancer [5,6]. The next generation sequencing (NGS) techniques have proved to be invaluable for gaining insights into molecular profiles of tumors and development of targeted therapies [5].

PM is no more a futuristic approach or limited to clinical trials, it is here and being practiced in routine clinical practice in developed world [7]. Increasingly, consideration of the individual patient's molecular characteristics, when deciding treatment has resulted in improved outcome especially a decline in mortality. Implementing PM in our routine clinical practice requires infrastructure development and investment. Also curriculum development by skilled and professional genetic care experts is important to establish PM services. In developing countries like Pakistan, high cost for molecular diagnostics and lack of infrastructure and expertise are considered the main obstacles to PM. The developed countries are therefore the major beneficiary as compared to resource deficient populations [5].

Policymakers need to have a coordinated effort among different stakeholders to integrate PM approaches into national strategies to bring an improvement in patient health [2]. In this way we can drive towards the individualized patient care so as to better struggle against breast cancer and achieve a goal of improved patient outcome and precise health care for all.

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