



ORIGINAL RESEARCH PAPER

Pathology

THE ROLE OF CA15.3 IN BREAST CANCER DIAGNOSIS, PROGNOSIS, AND TREATMENT: A COMPREHENSIVE REVIEW.

KEY WORDS: CA15.3, breast cancer, tumour marker, biomarker, disease progression,

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ABSTRACT

Breast cancer is a complex and heterogeneous disease with significant implications for patient diagnosis, prognosis, and treatment. In recent years, there has been growing interest in the role of tumour markers, such as CA15.3, in enhancing our understanding of breast cancer and improving clinical outcomes. This comprehensive review aims to provide an in-depth analysis of the role of CA15.3 in breast cancer, focusing on its diagnostic, prognostic, and treatment-related implications. The diagnostic application of CA15.3 in breast cancer involves its measurement as a biomarker to aid in early detection and diagnosis. Elevated levels of CA15.3 can serve as an indicator of breast cancer presence, although it lacks specificity and cannot be solely relied upon for definitive diagnosis. Combined with other clinical assessments, CA15.3 testing contributes to a comprehensive diagnostic approach. Furthermore, CA15.3 has significant prognostic value in breast cancer. Studies have shown that elevated baseline CA15.3 levels are associated with more advanced disease, larger tumour size, lymph node involvement, and poor overall survival rates. Monitoring CA15.3 levels over the course of treatment can provide insights into disease progression and response to therapy, allowing for tailored treatment strategies and appropriate prognostic assessments. The evaluation of treatment response in breast cancer patients using CA15.3 is a crucial aspect of patient management. Changes in CA15.3 levels during and after treatment can indicate treatment efficacy and disease control. A decline in CA15.3 levels is generally associated with a favourable response to therapy, while persistent or increasing levels may suggest disease recurrence or resistance to treatment. Regular monitoring of CA15.3 alongside other clinical and radiological assessments can guide treatment decisions and help optimize patient outcomes.

INTRODUCTION

Breast cancer is one of the most common malignancies affecting women worldwide. The identification of biomarkers for the early detection and monitoring of breast cancer has been a critical area of research in recent years. One such biomarker is CA15.3, a glycoprotein expressed by breast cancer cells that has been extensively studied for its role in breast cancer diagnosis, prognosis, and treatment evaluation. In this paper, we will explore the role of CA15.3 in breast cancer by examining its diagnostic and prognostic applications and evaluating how it helps in monitoring response to treatment in breast cancer patients. By examining the current research on CA15.3, we aim to provide a comprehensive understanding of its potential as a biomarker for breast cancer management.

CA15.3: A Biomarker for Breast Cancer

CA 15-3 is a protein made by breast cancer cells [1]. It is also known as cancer antigen 15-3, and is related to breast cancer [1]. It is a tumour marker which is measured in the blood to detect breast cancer [2]. It is a useful marker for monitoring breast cancer and is particularly useful for monitoring stage 4 breast cancer or secondary tumours in other parts of the body [3]. It is not necessarily prognostic immediately post-diagnosis but rather prognostic in terms of monitoring [4]. It is shed by the tumour cells and enters the blood [2]. In many people with cancerous breast tumours, there is an increased production of CA 15-3 and the related cancer antigen 27.29 [2]. Laboratories use both designations in their printouts but are referring to the same marker [4]. Numbers above 38 indicate that there is probably cancer activity in a patient who has already been diagnosed with breast cancer [4]. It is used as an indicator to determine the efficacy of treatment that is being utilised [4]. However, it lacks specificity [4]. CA 15-3 is elevated in fewer than 50% of women with early localized, breast cancer or with a small tumour [2]. It is useful in following the course of breast cancer [2], and a high-risk threshold of CA15-3 should be deeply taken under consideration [5]. Further tests are necessary to determine the underlying cause of an elevated CA 15-3 level [3], as it can be higher than normal in both cancerous and non-cancerous conditions [1]. It is particularly increased in breast cancer that has spread to other parts of the body [1], and is associated

with bone metastasis and metastasis spreading rate in breast cancer patients [5]. CA15-3 levels are monitored periodically during the treatment period in breast cancer patients [5] and an elevated CA 15-3 level may suggest that cancer has returned [3]. It is considered an important concern in breast cancer oncology [5].

Diagnostic and Prognostic Applications of CA15.3 in Breast Cancer

CA 15-3 is a biomarker that can be measured in units per millilitre (U/mL), and the normal range for a healthy person is 30 U/mL or below [6]. It is produced by breast cancer cells and can be used as a prognostic tool [7][8] to monitor response to treatment [6]. It can also be used as a diagnostic marker [9][7], though it is not reliable for screening or staging breast cancers [8]. It should not be used alone to monitor treatment response as false rises can occur in the first 4-6 weeks of therapy [8]. If levels are elevated, it may indicate the need for further testing [6], as high CA 15-3 concentration can indicate certain clinic-pathological variables [7]. It is estimated that CA 15-3 is elevated in approximately 76 percent of metastatic breast cancer cases [6]. As such, CA 15-3 test is part of a comprehensive cancer treatment plan, used in conjunction with other gene, protein and blood tests to track the progression of advanced-stage cancer [6]. Results from CA 15-3 testing can vary depending on the methods used [9], however, persistently elevated CA 15-3 after chemotherapy can indicate poor prognosis [7]. Expert panels recommend the routine use of CA 15-3 in monitoring therapy in patients with IABC, and serum CA 15-3 levels can be measured by ELISA for diagnostic and prognostic applications [7]. It can be estimated at the time of diagnosis and following each cycle of PC and every three months following surgery [7]. The most important application of CA 15-3 is in monitoring therapy in patients with advanced breast cancer [7].

Evaluation of Treatment Response in Breast Cancer Patients using CA15.3

The CA 15-3 test is a useful tool for evaluating the response to treatment in breast cancer patients [2][9]. It can be used in those patients who are currently undergoing treatment or have already had treatment for invasive breast cancer [9]. The CA 15-3 test is ordered periodically to monitor the

effectiveness of the treatment [2]. Healthcare practitioners wait a few weeks after starting treatment to begin monitoring CA 15-3 levels [2]. This is because CA 15-3 levels can rise during the initial 4-6 weeks of starting therapy [8]. Transient increases and decreases in CA 15-3 do not correlate with the person's progress [2]. Elevated levels of CA 15-3 beyond the normal range may indicate the need for changes in treatment [2]. CA 15-3 can also be used to monitor response of metastatic breast cancer to active therapy [8]. An increase in CA 15-3 levels in the absence of measurable disease could indicate treatment failure [8]. In contrast, a decrease in CA 15-3 marker levels during treatment can indicate tumour response [8]. Stable or increasing CA 15-3 levels despite adequate treatment can indicate that the tumour is not responding to treatment or that the tumour is recurring [8]. The test can also be used to watch for recurrence of breast cancer [2]. CA 15-3 levels may increase in larger tumours and higher-stage breast cancers, which is consistent with its putative role in anti-adhesion, cancer cell invasion, and metastases [8]. This transient rise does not usually correlate with disease progression [8]. CA 15-3 measurement can be used to survey disease recurrence after treatment of metastatic breast cancer [8].

The Role of CA15.3 in Breast Cancer is an important topic in oncology research, as it provides a useful marker for monitoring breast cancer progression and response to treatment. The results of this study confirm that CA 15-3 is a protein made by breast cancer cells and is shed into the bloodstream, making it an easily measurable tumour marker. The study also found that an increase in CA 15-3 levels can indicate disease recurrence after treatment of metastatic breast cancer, while a decrease in CA 15-3 levels can indicate tumour response. However, the study also identified potential limitations, such as the fact that not all breast cancer cells produce CA 15-3, and that other factor, such as inflammation or liver disease, can also cause elevated levels of this marker. Additionally, the study suggests that further research is needed to better understand the relationship between CA 15-3 and breast cancer, particularly in the context of different subtypes of breast cancer and treatment modalities. Overall, this study provides valuable insights into the role of CA 15-3 in breast cancer, but also highlights the need for continued research in this area.

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