Reversing Breast Cancer in a Premenopausal Woman: A Case for Phyto-Nutritional Therapy

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Abstract: Globally, breast cancer incidence increases at 1% to 2% annually. It is the number one cause of cancer death in women. Current literature implies that soy food intake is linked to decreased risk of breast cancer due to its rich isoflavones. On the other hand, intake of animal fat, red meat, organ meat and high-fat dairy products during premenopausal years may increase risk for this cancer, but no apparent risk has been established for fish or poultry intake. Monounsaturated fat and the improved ratio of omega-3 to omega-6 fatty acids have showed potential to reduce risk. On the other hand, high glycemic index diet but not glycemic load is associated with a significantly increased risk. Central rather than general obesity carries similar risk. Furthermore, lifestyle rather than genetic differences are widely implicated in breast cancer. A comprehensive phyto-nutritional therapy was adopted for treating a case involving stage IV breast cancer in a premenopausal woman, who was turned away by a hospital offering conventional treatment. The therapy involved designing and monitoring the implementation of dietary plans to achieve optimum health outcomes for the major abnormal metabolic blood/urine markers identified for this particular patient. Nutrient-dense food items with generous servings of a variety of spices and herbs, supplemented by vitamins, minerals and phyto-extracts was prescribed as part of the therapy. Many non-toxic dietary nutrients and phytonutrients are known cytotoxic agents promoting cancer regression via apoptosis pathways, which have yet to be fully understood. Conclusion: The complete remission of the malignancy initiated by this natural therapy would suggest that an advanced stage breast cancer is a metabolic disorder reversible by an evidence-based phyto-nutritional therapy. While not all cases of malignancy can possibly be completely reversed, the positive outcome achieved in partnership with the patient warrants further study involving larger number of women with similar level of malignancy.

Keywords: Breast cancer, nutritional therapy, dietary modification, nutraceuticals, apoptosis.

1. CASE INTRODUCTION

Kim T., age 48 and single mother to a 11-year old boy, worked as an accounts supervisor in a major hardware retail chain in Kuala Lumpur, Malaysia. After several lymph nodes in both her arm pits and neck began to swell, she admitted herself into a government-funded hospital. Her computed tomography (CT) scans detected extensive lumps on her left breast and a few much smaller lumps on her right breast. Biopsy results confirmed her worst fear: she was suffering from stage IV breast cancer. Her emotional state was made worse after being told by the hospital oncologist that “there wasn’t much point in trying to treat such a late stage cancer.” Despite such grim diagnosis, she returned to work after a week’s rest in order to financially support her child and mother.

Although she disliked alcohol, she was fond of having a carbonated drink for her lunch. Breakfast would usually consist of noodles, oat porridge, toasted white bread with fruit jam and/or margarine, puffed cereals with long-life milk, packaged fruit juice and/or a sweetened beverage. Biscuits, cookies, buns, cakes, or pastries with sweetened coffee or tea were provided by her employer during the late afternoon. Dinner was usually served at home. Her live-in mother helped to care for her over-weight child, who received just 2 months’ of breastfeeding. The family was fond of deep-fried foods and noodles. For convenience, canned food was often served after being microwaved. Fresh vegetables were purchased once a week and served two or three times weekly.

For the past decade prior to cancer diagnosis she was suffering from insomnia, frequent flu infection, body aches, and weight gain. Her body mass index (BMI) was 30.2, which put her in the obese category. Total fat mass was 37.3%, visceral fat was 21%, and total body water was at a low of 41.6%. Serum triglyceride levels tested over the past three years were in excess of 350mg/dl. She attributed her poor physical health to long working hours in a company competing fiercely in markets affected by economic recession. Having to work on most Saturdays meant little time for any outdoor or physical activity. Preliminary test results from the hospital indicated the presence of an estrogen-responsive MCF-7 breast cancer cell line.

2. DIETARY/NUTRITIONAL RECOMMENDATIONS

Recognizing that dietary modifications could prevent more than two-thirds of cancers [1], the recommendations to the patient included:

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2.1. Increase Intake of Dietary Fiber

Low fiber intake could lead to larger tumor size [2] and fiber can reduce incidence of breast cancer (BC) [3]. Consumption of total dietary fiber from fresh vegetables and citric fruits — but not from cereal — is found to be inversely associated with BC risk [4]. A very low fat, high fiber diet in premenopausal women could reduce their tumor/cancer promoting estradiol levels without affecting ovulation [5]. Flaxseed lignin could similarly reduce risk [6] and supplemented lignan might significantly improve glycemic control as evidenced by lower HbA1c and lower C-reactive protein (CRP) levels in type 2 diabetes patients [7, 8].

2.2. Fresh Organic Berries and Fruits

Nutritional intake provided by freshly harvested organic vegetables and fruits has a direct positive relationship with survival [9]. Fisetin (3,3',4',7-tetrahydroxyflavone), a flavonoid found in fruits such as cucumbers, kiwifruit, persimmons, and grapes, can induce higher cytotoxicity in BC cells with apparently no cytotoxicity in non-tumorigenic cells [10]. Apigenin inhibits tumor angiogenesis through reducing expression of the vascular endothelial growth factor (VEGF) in tumor cells [11, 12]. This flavonoid found in local guava and bell pepper is known to inhibit tumor metastasis [13].

2.3. Soy Food in Place of Animal Products

Soy intake seems to be associated with longer survival and low recurrence among BC patients [14, 15]. High intake is inversely associated with BC risk [16, 17]. Frequent intake of tofu reduces risk of this cancer in both pre- and postmenopausal women after adjustment for their age, study area, and ethnicity [18]. The protective effect of soy food, soy isolate, or soy protein does not seem to matter if the BC is estrogen receptor positive (ER+) or otherwise [19]. In raising serum concentrations, genistein in soy food seems to be as helpful as those found in supplements [20]. Genistein can offer substantial clinical benefit to patients with various types of cancer. Declining estrogen receptor-beta (ER-beta) expression can promote progression in breast malignancy. Genistein has a very much higher affinity to ER-beta than to ER-alpha, which is over-expressed in most breast cancer cases. Patient was advised to take only soy products from non-genetically modified or organic sources.

2.4. Fresh Organic Vegetables

Cruciferous such as cabbages and broccoli contain indole-3-carbinol (I3C) which not only prevents BC [21], but also possesses anti-cancer properties [22]. I3C strongly down-regulates ER-alpha proteins [23]. Following molecular transformation of I3C by stomach acid, DIM (3,3′-Diindolylmethane) is generated. DIM is known to induce apoptosis in breast [24] and various other cancer cell lines. Sulforaphane, an isothiocyanate also found in cruciferous vegetables and is especially high in broccoli sprouts [25], can inhibit tumor cell growth besides activating apoptosis and decreasing over-expression of survivin which is involved in BC cell proliferation [26]. Apigenin possesses anti-tumor properties and its content in Chinese cabbage is 187mg/kg. Luteolin in broccoli is about 74 mg/kg of its dry weight [27]. This phytonutrient could induce apoptosis through insulin growth factor-1 (IGF-1) receptor signaling while inhibiting cancer metastasis via the protein epithelial cadherin [28, 29], which may be used as a diagnostic biomarker in BC [30]. Green leafy vegetables are rich in folate, which higher plasma levels are linked to reduced risk of developing BC [31, 32].

2.5. Generous Serving of Spices

Fenugreek (Trigonella foenum-graecum) as a spice may hold promise in treating BC [33]. Its diosgenin, a steroid saponin considered safe even at very high doses [34], suppresses the proliferation of BC cell lines [35]. It can destroy tumor cells through induction of apoptosis [33]. Fisetin, a flavonoid found in onion and garlic, activates the cancer protective p53 gene and the fisetin-induced apoptosis seems unaffected by the p53 inhibitor pifithrin-alpha [10]. Garlic contains apigenin too. Capsaicin, a biologically active ingredient in the red chili [36], may retard proliferation of cancer cells by suppressing their inflammatory response, and may mediate apoptosis through the beta-catenin pathway, which is corrupted in many cancers [37, 38]. Black pepper’s resin contains piperine, which enhances absorption of green tea polyphenols and curcumin [39]. Ginger contains 6-gingerol [40], which has pronounced anti-inflammatory activity [41] and can inhibit invasion, motility, and adhesion in BC cell lines [42], besides treating nausea and vomiting [43].

2.6. Sweet Potato, Pumpkin, and Carrot

These alpha-carotene rich foods may be helpful to women with invasive BC with nodal metastasis [44] while their beta carotene content can significantly
improve patient’s survival [45]. Generally, carotenoids are known to be BC protective [46].

2.7. Fatty Fish

Women having high intake of eicosapentaenoic acid (EPA) enjoy significant reduction in BC risk [47–50]. A higher intake of omega-3 (n-3) fatty acids can decrease both inflammation and physical aspects of fatigue [51]. Docosahexaenoic acid (DHA) rather than EPA seems to be a stronger anti-neoplastic agent [52]. Adequate intake of n-3 fatty acid can reverse loss of critical adipose tissue [53] and can promote gain in lean body mass [54]. Fish rich in EPA/DHA fats include anchovy, mackerel, cod, and wild salmon.

2.8. Tryptophan-Rich Diet

Since many BC patients experience depression, anxiety, insomnia and cognitive dysfunction [55], a tryptophan-rich diet helps to reduce sleep disturbances [56]. Amino-acid L-tryptophan in soy isolate, organic lean poultry, leafy vegetables, legumes, and seeds is converted into brain neurotransmitter serotonin via L-5-hydroxytryptophan (5-HTP). The pineal gland then converts serotonin to the antioxidant hormone melatonin [57], which does not raise BC markers such as circulating estradiol and IGF-1 [58]. Quality sleep promoted by adequate melatonin secretion actually lowers risk of BC [59] and enhances the patient’s chances of survival [60].

2.9. Nuts, Seeds and Beans

These are rich in vitamin E, which can inhibit cancer cell proliferation [61]. Selenium deficiency increases the risk of cancer [62] and is associated with a higher risk of fatal cancer [63]. Brazil nuts, for instance, may contain as much as 544 micrograms of selenium per ounce [64]. Consequently, two Brazil nuts can provide some 200mcg selenium sufficient to lower this cancer risk [65] while offering possibly up to 50% reduced risk of cancer death [66].

Beverages

(i) **Green tea (Camellia sinensis):** two or more cups a day, but not in the evening. It contains catechins, which can kill BC estrogen-responsive MCF7 cells through induction of apoptosis effected by its ability to increase the expression of pro-apoptotic genes such as caspase-3, -8, and -9 and TP53 [69].

(ii) **Artemisia annua tea:** two to three cups a day of grounded leaf, which is widely available in Malaysia. Its active polyphenol, artemisinin, can arrest tumorogenic BC cell lines including late stage cancer phenotypes [70]. Treatment of MCF7 cells with artemisinin can block estrogen-stimulated cell cycle progression induced by 17-beta-estradiol, an agonist for both types of estrogen receptor [71].

(iii) **Malaysian Cocoa:** two to three cups a day, one tablespoon each. It is rich in trans-resveratrol that can affect multiple intracellular signaling transduction pathways such as p53 activation, protein translation inhibition, and apoptosis in a dose-dependent manner [72]. Resveratrol is known to induce growth inhibition and apoptosis even in highly invasive and metastatic BC cell line [73].

The patient was advised to avoid:

(i) **High Fat Dairy Products**

Cow milk may contain traces of hormones including IGF-1. However, in pre-menopausal women the consumption of dairy products, especially of low-fat dairy foods and skim/low-fat milk, may be inversely associated with risk of BC [74].

(ii) **Refined Sugars, Starches, High Fructose Drinks**

Cancer or tumor cells are primarily sugar metabolizers [75] in an anaerobic environment. Hyperglycemia raises the pro-inflammatory process and adversely affects the patient’s immune system [76].

(iii) **High Fat Diet**

Higher intake of omega-6 (n-6) relative to n-3 fatty acids is associated with greater C-reactive protein score and greater odds of fatigue [51]. Women with lower intake of marine-derived n-3 fats and higher intake of n-6 fats can suffer higher risk for BC [77].
(iv) Meat from Farmed Animal, Livestock or Fish

While meat from grass-fed cattle and from free-range livestock may be rich in n-3 fatty acids [78], that from farmed animal/livestock/fish tends to be higher in pro-inflammatory n-6 fats.

(v) Eel, Red and Organ Meat

While iron deficiency anemia can independently increase morbidity and mortality [79], elevated ferritin (stored iron) levels are associated with a higher risk of diabetes independent of inflammatory markers and metabolic syndrome [80]. There seem to be a higher mortality at high levels of consumption of egg yolks and red meats [45]. However, strong tea or coffee can block or reduce absorption of iron [81]. Tissue ferritin from mammary carcinomas have showed up to 1000% higher than benign breast tissues [82]. Iron overload can lead to oxidative stress mediated by highly reactive oxygen species including hydroxyl radicals known to promote mutagenesis, DNA strand breaks, activation of oncogenes, and tumor suppressor gene inhibition [83]. Consequently, iron chelators are being investigated as cancer therapeutics [84]. The patient lowered her serum ferritin by some 54% during the six-month therapy, while her lowered HbA1c scores suggested a return to normal blood glucose levels within the same period (Table 1).

3. Nutraceuticals

Nutritional supplements could improve overall micronutrient intakes of BC patients or survivors [83, 85]. The following nutraceuticals were prescribed to be taken with or after meals:

3.1. Co-enzymeQ10

200 mg twice a day (BID). Three months intake has been showed to significantly improve clinical conditions besides regressing tumor [84] and a six months' intake may cause breast tumor to disappear [85]. 100mg for three months is known to reduce markers such as Carcino-embryonic antigen (CEA) and CA-153 [86]. Statins which the patient took over the years reduced her serum coenzyme Q10 levels [87-89].

3.2. Vitamin D3

4,000IU thrice a day (TID). Serum 25(OH)D levels of about 75 to 110 nmol/l provide optimal benefits without increasing health risks and these levels can best be achieved by oral doses of at least 4,000 IU vitamin D3 per day [90]. A significantly higher risk of breast and other cancers may be linked to low serum 25(OH)D levels [91]. This nutrient has chemopreventive effects against BC [92]. The association of vitamin D receptor polymorphisms and cancer risk seems strongest for BC [93] and supplemented vitamin D3 is not associated with any risk of BC [94]. The patient's serum 25(OH)D levels rose from a very low of 21 to 124 nmol/l at end of six months (Table 1). Besides, her health would have benefited in other ways since plasma 25(OH)D level is inversely associated with increased risk of metabolic syndrome and insulin resistance [95].

3.3. Malaysian Wild bee Propolis, Wax Free

20 drops in a cup of warm water TID. Its biologically active caffeic acid phenethyl ester (CAPE) possesses

<table>
<thead>
<tr>
<th>Serum Markers</th>
<th>Aug</th>
<th>Sept</th>
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<th>Jan</th>
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<tr>
<td>CA15-3 (&lt;35 U/ml)</td>
<td>179</td>
<td>124</td>
<td>76</td>
<td>71</td>
<td>46</td>
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<td>CEA (&lt;5.0 ng/ml)</td>
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<tr>
<td>hs-CRP (&lt;1.0 mg/L)</td>
<td>51</td>
<td>29</td>
<td>18</td>
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<td>IL-6 (&lt;5.9 pg/ml)</td>
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<td>104</td>
<td>86</td>
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<td>19</td>
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<td>HbA1C (&lt;10%)</td>
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<td>IGF-1 (103-291 ng/mL)</td>
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<td>197</td>
<td>175</td>
<td>169</td>
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<td>Estradiol (20-100 pg/ml)</td>
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<td>152</td>
<td>125</td>
<td>87</td>
<td>89</td>
<td>68</td>
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<td>Cortisol (50-230 ng/ml)</td>
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<td>25-(OH)D (75-110 nmol/l)</td>
<td>21</td>
<td>36</td>
<td>53</td>
<td>76</td>
<td>87</td>
<td>105</td>
<td>124</td>
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<td>Ferritin (20-300 ug/L)</td>
<td>364</td>
<td>331</td>
<td>287</td>
<td>286</td>
<td>254</td>
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**Physical data:**

| BMI | 30.2 | 28.1 | 27.6 | 26.9 | 24.6 | 24.1 | 23.7 |
anti-mitogenic, anti-carcinogenic, anti-inflammatory and immunomodulatory properties [96]. It is a potent inhibitor of NFkB activation and it induces apoptosis via Fas signal activation in breast cancer MCF-7 cells [97] and through the caspase pathway [98] as well as interfering with tumor metabolic pathways [99]. Its antiproliferative effects in cancer cells are the result of suppressing complexes of cyclins and of cell cycle arrest [100].

3.4. Ginseng Extracts (Standardized to 80% Ginsenosides)

400mg TID. While its Rg3 component can inhibit breast and other tumor metastasis [101], its Rh2 component can induce apoptosis [102]. Furthermore, ginsenoside F2 induces apoptosis in BC cells by activating the intrinsic apoptotic pathway and mitochondrial dysfunction [103].

3.5. Quercetin (with 30% Bromelain)

1 g TID. Quercetin inhibits cells proliferation, induces cell cycle arrest and apoptosis in breast MCF-7 and other cancer cell types [104] via mitochondrial- and caspase-3-dependent pathways [105]. It increases the pro-apoptotic protein Bax and decreases the levels of anti-apoptotic protein Bcl-2.

3.6. Mixed Tocotrienols

300mg (450IU) BID. These members of the vitamin E family may inhibit proliferation of BC cells by as much as 50% [106].

3.7. Pomegranate Extract (Standardized to 40% Ellagic Acid)

500mg TID. Ellagic acid induces apoptosis by suppressing inhibitor of the apoptosis protein survivin [107]. Besides inhibiting growth of the BC cells, ellagic acid with its other phytoneutrants such as luteolin and punicic acid can decrease BC cell migration without adversely affecting normal cells [108].

3.8. Beta-Carotene

500mg TID. Higher intake of this nutrient can result in significantly fewer deaths from BC [45, 109, 110].

3.9. Selenium Yeast

230mg BID (equivalent to 200mcg elemental selenomethionine). Increasing serum selenium levels of up to 130 ng/mL may decrease cancer mortality [111]. Studies have showed that BC patients tend to have low serum selenium levels [112-114]. However its anti-carcinogenic effects may be neutralized by heavy metals such as lead, arsenic, and cadmium [115, 116].

3.10. Vitamin B12

250mcg TID. Women with the highest levels of this vitamin intake may reduce risk of BC by some 68% [117]. Generally, vitamin antioxidants offer protective effects against BC [118]. Women who consume them may reduce their mortality risk by 18% and reduce their recurrence cancer risk by 22% [119].

Chronic inflammation is linked to increased risk of BC [120] and nutraceuticals inhibiting cyclooxygenase-2 (COX-2) (enzyme that makes prostaglandins that cause inflammation) to block metastasis include curcumin, resveratrol and epigallocatechin gallate (EGCG) [121-124]. Other nutraceuticals with broadly similar properties include capsaicin, eugenol, and gingerol [125]. Consequently, these anti-inflammatory nutraceuticals were also prescribed:

3.11. Curcumin (with 2% Piperine)

1 g TID after meal. Curcumin from Curcuma longa possesses strong anti-inflammatory and antioxidant properties [126] and exerts multiple suppressive effects in breast carcinoma cells [127]. Among the proteins it modulates include COX-2, VEGF (a chemical signal produced by cells that stimulates the growth of new blood vessels), the chemokines monocyte chemoattractant protein-1 (MCP-1) and MCP-4, the interleukins IL-1 and IL-6, and insulin growth factor (IGF) [123, 128-131]. Piperine enhances the uptake and bioavailability of not just curcumin, but also the Co-enzymeQ10 and tea polyphenols [39] for which the patient was prescribed. Curcumin with piperine have been showed to target destruction of BC stem cells (BSCs) [102]. They can inhibit mammosphere (large, floating spheres which is a hallmark feature of breast BSCs) formation [132] and chelate excess serum iron [133].

3.12. Trans-Resveratrol (RSVL;3,4',5-Trihydroxy-stilbene) (Standardized to 20%)

400 mg TID. This polyphenol can inhibit both COX-1 and COX-2 and its properties are comparable to non-steroidal anti-inflammatory drugs [134]. Patient’s inflammatory markers such as hs-CRP and IL-6 improved significantly by taking multiple anti-inflammatory supplements as evidenced by her
markers (Table 1) and wound appearance (Figure 1). Furthermore, resveratrol inhibits cancer metastasis by decreasing activity of matrix metalloproteinase 9 (MMP-9) [135]. It can act as an inhibitor of late-stage cancer due to its anti-angiogenic effects [136].

Furthermore, resveratrol inhibits cancer metastasis by decreasing activity of matrix metalloproteinase 9 (MMP-9) [135]. It can act as an inhibitor of late-stage cancer due to its anti-angiogenic effects [136].

Figure 1: Photograph taken approximately a month prior to cessation of phyto-nutritional therapy showing the last of several malignant lumps that disintegrated, with minimal inflammation around open wounds.

3.13. Green Tea Polyphenols (Standardized to 80% Epigallocatechin Gallate or EGCG)

500mg TID. EGCG is a well-researched [137, 138] constituent of green tea polyphenols which induces apoptosis and cell cycle arrest in breast and many other cancer cell lines without affecting normal cells [139]. It exerts inhibitory effects on diverse cellular events associated with multi-stage carcinogenesis [140]. It can inhibit neovascularization promoted by VEGF in breast and other cancer cell lines [137, 141, 142], as well as blocking pathways involving nuclear factor-kappaB (NFkB), MMPs, and COX-2, which are implicated in tumor cell growth and survival [121, 122]. EGCG is a potent pro-apoptotic agent in estrogen-dependent MCF-7 breast cancer cells that targets survivin expression via suppression of the Protein Kinase B (PKB)/AKT pathway [143], which alterations have been detected in a number of human malignancies [144]. It is chemopreventive in breast carcinoma especially with over-expression of fatty acid synthase enzyme [145].

4. CONTROVERSIES ON USE OF MULTIVITAMINS

More than 50% of cancer patients might have micronutrient intakes below the recommended daily allowance (RDA) levels from food alone [146]. Nutrients with strong antioxidant properties such as vitamins C and E, alpha lipoic acid, beta carotene, and selenium can reduce free radical loads widely implicated in numerous chronic health disorders including BC. Cellular deoxyribonucleic acid (DNA) mutation is a critical step in carcinogenesis and excessive oxidative DNA lesions have been observed in many tumour types, implicating such damage in the etiology of cancer [147]. In the US Women's Healthy Eating and Living Study, 58% of the BC survivors reported use of multivitamins with 46% and 42% reporting use of vitamins E and C, respectively [148, 149]. However, a diagnosis of cancer may not, by itself, lead to supplement use [150].

A Swedish study found that for women consuming less than 5 grams alcohol/day the use of multivitamin was associated with a 19% increased risk of BC compared with women not taking these vitamins [151]. On the other hand, the US Nurses' Health Study found that the use of multivitamins was associated with a lower risk of BC among women with high-alcohol consumption [152]. Frequent intake of excessive carotenoids may be linked to higher risk of BC death [153] although supplemented vitamins C, D, E, or B-6 is not associated with BC risk. However, most studies have showed a decreased risk of death for those with higher intakes of beta-carotene and vitamin C [45, 109, 110]; others reported a similar effect but the findings were insignificant [154, 155]. While some reported no association between individual micronutrients and all-cause mortality risk [156, 157] or between multivitamin use and BC risk [158, 159], multivitamin use was found to reduce risk for women who regularly consume alcohol or to decrease risk of ER- and progesterone receptor negative BC [160].

Vitamin supplementation in the first six months after BC diagnosis might be associated with reduced risk of mortality and recurrence [119]. Although low folate levels seem to be associated with a higher risk of cancer development [161, 162], it is being argued that synthetic folic acid in multivitamin supplements may promote malignancy [163] since its increasing serum concentrations can lead to a dose-dependent down-regulation of tumor suppressor genes promoting increased DNA methylation in non-invasive MCF-7 breast cells [164]. Controversies may apply equally to
high intake of vegetables, fruits and fiber and low fat diet where it was observed that survivors of early stage BC who adopted such a diet did not reduce subsequent BC events or mortality [165].

5. MALNUTRITION

Malnutrition can be a decisive factor in the overall treatment outcome for cancer patients [166]. It is a major cause of cancer morbidity and mortality [167] and its adverse consequences include impairment of immune functions, muscular function, and quality of life (QoL). There is strong association between diet and prognostic factors [2, 168, 169]. Nutrition-related diseases have emerged as the major health threat [170]. More aggressive cancers seem to be more prevalent in nutritional deficiency status in 85% of undernourished patients [166].

The incidence of malnutrition in cancer patients may be up to 80% [171, 172] depending on stage of disease, treatment received and the types of nutritional assessment method used [173]. Cancer cachexia (characterized by weight loss and muscle wasting) contributes to malnutrition [172] and low quality protein intake can lead to a lower physical functioning [174]. QoL depends on patient’s health status, which is substantially influenced by nutritional factors [175]. While nutritional therapy for cancer is of acknowledged importance [176-178] and a key determinant of patient’s QoL [179], higher body mass index (BMI) may be negatively correlated with QoL [180].

6. CANCER APOPTOSIS

Apoptosis is caspase-induced programmed cell death [181] which is an essential physiological process [182] that plays a critical role in the maintenance of healthy tissues and organ systems by providing a controlled cell deletion and avoiding uncontrolled cell proliferation [183]. The mechanism of action of many anticancer drugs is also based on their ability to induce apoptosis [184]. Several natural chemopreventive agents are known to possess strong cancer-preventive properties that could interrupt different stages of cancer [139, 183, 185]. Anti-apoptotic protein survivin is over-expressed in many human cancers including breast [186]. Phytonutrients that decrease the expression of this protein are crucial to surviving late stage BC.

7. DIAGNOSTIC ISSUES

Globally, more than one million women are diagnosed with BC every year [187]. Lactation seems to protect against BC at all ages [188]. Mammography screening can have several drawbacks, and a major one being its tendency towards false positive and false negative results with all their potential psychosocial consequences to women [189]. In addition, screening mammography in women aged 40 to 49 years at average risk for BC may be ineffective in reducing their mortality [190]. The radiographic appearance of the breast on mammography can vary among women and it reflects the variations in their breast tissue composition [191]. Since the days of pioneering work [192] describing the differences in risk of BC associated with variations in the mammographic appearance, other qualitative and quantitative methods of measuring percent mammographic density (PMD) [193] have been applied to the assessment of PMD in relation to BC risk. PMD is calculated by dividing the dense area by the total area and multiplying by 100 [194]. The BC risk associated with PMD does not differ by age, menopausal status, or ethnicity [195]. The PMD, at a given age, may also be highly heritable [196].

Weight of the patient was determined using a SECA floor scale with an incorporated stadiometer to measure height. Weight and height were then used to calculate patient’s BMI (weight [kg]/height [m^2]) and her obesity was determined by BMI higher than 30 kg/m^2 [197]. Percentage weight loss is a sensitive and specific tool that can screen and identify signs of malnutrition [178]. The patient’s BMI scores improved dramatically from 30.2 to 23.7, which was closer to the widely regarded ideal score of 22.5 (Table 1).

Patient-Generated Subjective Global Assessment (PG-SGA) is a validated and specific nutritional assessment tool in integrative oncology [171]. It classifies patient’s nutritional status in three degrees: adequate, moderate undernutrition, or severe malnutrition [198]. A variation of PG-SGA was used and the patient was assessed to be suffering from “moderate undernutrition”. Hand grip strength measured by dynamometry as a marker of nutritional status [199] was not carried out. However, anthropometric measurements [174] such as changes in weight, lean body mass, total bone density as well as biochemical parameters such as serum albumin were performed.

A monthly blood sample was taken and the patient’s BC biomarkers tested include estradiol and insulin-like growth factor-I (IGF-1). The most common serum marker for breast tumor/cancer is carbohydrate antigen
(CA) 15-3, which is expressed by breast carcinoma cells. However, during normal pregnancy this tumor marker could be elevated too [200]. CA15-3 changes may correlate closely with the clinical course of the disease in up to 90% of the antigen positive cases. Consequently, this marker is useful in the surveillance of BC patients although about one-third of the patients with metastatic BC may not show any significant increase in CA15-3 [201]. Patients with stage IV breast cancer not responding to conventional treatment might have antigen levels greater than 40 U/ml and these levels could correspond with the stage of BC [202]. Indeed, most patients with metastatic BC might have CA15-3 levels greater than 50 u/ml [203]. In this particular patient, her initial score was rather high at 179 U/ml (Table 1). This antigen may be a more sensitive marker than the equally popular marker Carcino-embryonic Antigen (CEA) for evaluating and monitoring BC patients [204] and for those with metastatic BC [205]. Whereas any score higher than 5ng/ml could suggest presence of malignancy, the patient’s score was 52. The combination of CA15-3 with Tumor Polypeptide Antigen (TPA) might show improved sensitivity of both markers [206]. However, TPA testing was not ordered due to its expense. Although CA 27-29 marker appears to be at least as sensitive and specific as CA15-3 in BC patients [207], this test was unavailable.

The scalp hair trace heavy metal contents could be linked to cancer development [208, 209]. In view of the urgency in initiating a therapy as requested by the patient, this test was not performed.

The patient had never received any prior training in breast self-examination (BSE). A woman’s desire to receive such BSE training might be influenced by her personal and social factors [210].

8. CONCLUSION

Gene-diet interactions in cancer have yet to be fully understood. However, diet and food are clearly modifiable environmental factors. Besides improving QoL, dietary factors seemed to be crucial in determining breast cancer reversal for this premenopausal woman. Her conditions at the end of the sixth month of therapy were rechecked at a local hospital as being free from malignancy. It was unclear in what ways “spontaneous regression”, if any, could be partly responsible for reversing the malignancy. Although based on a single case, the results achieved in reversing this advanced stage metabolic disorder warrants further investigation involving larger number of women with similar level of breast malignancy.

REFERENCES


Reversing Breast Cancer in a Premenopausal Woman
International Journal of Biotechnology for Wellness Industries, 2015, Vol. 4, No. 1


