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Acupuncture And The Cancer Patient
Kenneth A. Conklin, MD

ABSTRACT
The use of acupuncture in oncology, for management of treatment-related adverse effects and for palliative care, is finding greater acceptance in Western medicine. Although the evidence is not extensive and for many applications, randomized controlled trials are lacking, acupuncture appears to be of benefit for managing chemotherapy-induced nausea and vomiting; cancer-related pain; generalized symptoms that result from treatment, including fatigue, insomnia, diarrhea, and anorexia; radiotherapy-induced xerostomia; brachial plexopathy resulting from axillary lymphadenectomy for breast cancer; treatment-related vasomotor symptoms; radiotherapy-induced rectitis; dysphagia due to carcinomatous obstruction; and end-of-life symptoms such as dyspnea. Studies further suggest that acupuncture enhances immune function and is effective for treatment of chemotherapy- or radiotherapy-induced myelosuppression.

KEY WORDS
Acupuncture, Xerostomia, Cancer, Radiotherapy, Nausea, Chemotherapy, Dyspnea

INTRODUCTION
Chemotherapy, biological therapy, and radiation therapy are based on an understanding of cancer cell characteristics such as how the cancer cell cycle differs from the cycle of normal cells and the processes involved in the development of cancer including initiation, promotion, and progression. Although Eastern medicine views cancer quite differently than does Western medicine, using acupuncture to treat cancer patients and manage adverse effects induced by conventional cancer therapies is based on sound Eastern principles. This review addresses cancer and the development of therapy-induced adverse effects from both an Eastern and Western perspective; it also reviews the literature regarding use of acupuncture for treatment of chemotherapy- and radiotherapy-induced adverse effects and cancer-related symptoms.

Cancer: Western and Eastern Perspectives
Western science views cancer as resulting from genetic-environmental interactions causing multiple genetic alterations that affect coding of oncogenes for growth factors, growth factor receptors, and tumor suppressor genes. When oncogenes are inactivated, they fail to control the normal process of cell growth and death. Thus, normal cells become cancer cells through a series of events that result in loss of regulation of cell proliferation and programmed cell death (apoptosis).

Despite events that result in derangements of regulatory mechanisms for cell growth and death, dysfunction of the host immune system plays an important role in the development of cancer. One of the vital functions of the immune system is immune surveillance, i.e., the recognition and elimination of cells that have undergone neoplastic transformation. Cancer cells express antigens that serve as targets for antitumor immunity and make them vulnerable to immune effector cells such as natural killer (NK) cells, lymphokine-activated killer cells, tumor-specific cytotoxic T lymphocytes, and macrophages. Development of cancer can thus be viewed as a failure of immune surveillance.
In Traditional Chinese Medicine (TCM), uncontrolled cell proliferation and dysfunction of the immune system can be attributed to a decline of deficiency of Essence (Jing). Essence, stored in the Kidneys, governs reproduction, growth, and development. Thus, it exerts primary control over the processes of cellular differentiation and proliferation. Improper control over these processes due to a deficiency of Essence may result in uncontrolled cellular growth, which manifests as cancer. Essence also determines basic constitutional strength and resistance to exterior pathogenic factors (although Wei Qi is primarily responsible for protection from exterior pathogenic factors, it draws its strength and has its root in Kidney Essence). Essence is the basis of Marrow, which produces the common matrix of bone marrow, brain, and spinal cord. Thus, Essence has an important role in maintaining proper immune function by producing Marrow, which, in turn, produces bone marrow that contains the pluripotent stem cells that give rise to immune effector cells. The differentiation of stem cells and subsequent proliferation of immune effector cells are also governed by Essence. Thus, a decline or deficiency of Essence could result in an individual’s immune system failing to recognize and eliminate cells that have undergone neoplastic transformation.

The physical manifestation of cancer (tumors) can also be viewed as resulting from a decline or deficiency of Essence. Essence, in its dynamic and rarefied form as Original Qi (Yuan Qi) with its origin in the Kidneys, can be viewed as the force that arouses and moves the functional activity of all the organs. Thus, the development of tumors results from a deficiency of Essence and Yuan Qi, which result in deranged functions of the internal organs. The results of the derangements can lead to stasis of Blood and formation of Phlegm, either of which may be manifest as tissue masses. Although all tissue tumors are not necessarily malignant (e.g., uterine fibroids, nerve ganglia, and lipomas), and some tumors or nodules may be transient (e.g., lymphadenopathy during infections), those resulting from Blood stasis or congealed Phlegm are manifestations of malignant processes.

Common causes of Blood stasis are Qi deficiency or Qi stagnation. If Qi becomes too weak to move Blood, or if Qi stagnates, Blood congeals. Masses resulting from Blood stasis most commonly manifest as fixed abdominal masses associated with pain of a boring or stabbing character.

The primary cause for formation of Phlegm is Spleen deficiency. The Spleen governs transformation and transportation. If the Spleen fails to transform and transport body fluids, they will accumulate and form Phlegm. Although Spleen deficiency is the primary factor in the formation of Phlegm, failures of the Lungs to disperse and lower fluids or failure of the Kidneys to transform and excrete fluids may also result in their accumulation into Phlegm. If Phlegm congeals, it may manifest as tissue masses, more commonly as subcutaneous nodule such as enlarged lymph nodes and thyroid tumors but also as tumors in the uterus.

**Adverse Effects of Western Therapies**
Chemotherapy and radiotherapy can result in numerous side effects (Table 1). Mucositis (inflammation of the gastrointestinal mucosa), myelosuppression, and hair loss are more or less associated with all chemotherapy regimens. Chemotherapy is cytotoxic to cells that proliferate rapidly. Although it is directed at rapidly growing cancer cells, the rapidly growing cells of the gastrointestinal tract, bone marrow, and hair follicles are also affected. Similarly, radiation therapy is also most toxic to cells with a high rate of proliferation.

Mutagenesis/carcinogenesis, which results in the development of secondary malignancies, is one of the most serious adverse effects of chemotherapy and radiation therapy. Secondary malignancies occur in up to 10% of individuals who receive either or both of these treatments. Secondary malignancies most commonly develop approximately 5 years following treatment of the primary malignancy and are generally more resistant to treatment than the original cancer.

TCM holds that the cause of mucositis is stagnation of noxious dampness in the Middle Heater resulting from dysfunction of the Spleen and Stomach.1 The Spleen’s function of transformation and transportation is crucial to the process of digestion. If this function is impaired, diarrhea (Spleen Qi descending instead of ascending), poor appetite, and impaired digestion may result. If Stomach Qi ascends instead of descends, nausea and vomiting will

<table>
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<tr>
<th>Table 1. Adverse Effects of Cancer Therapies</th>
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<tr>
<td>• Mucositis—inflammation of the gastrointestinal mucous membranes</td>
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<tr>
<td>o Nausea and vomiting</td>
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<td>o Anorexia</td>
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result (rebellious Stomach Qi). Therefore, mucositis may be viewed primarily as an impact of chemotherapy on the Spleen and Stomach.

Blood dyscrasias, anemia, and immune dysfunction in TCM are considered disorders of blood (the more physical aspect of Blood) resulting from dysfunction of the Spleen as it oversees the formation and distribution of blood and fluids in the body. The Spleen must extract Food Qi (Gu Qi) from food and send it upward to the Lungs, which begin the process of transformation into Blood, and send the Food Qi to the Heart where Original Qi and Essence facilitate the further transformation into Blood. Essence also contributes to the formation of Blood because it is the basis of Marrow which produces bone marrow. Myelosuppression and immunosuppression can thus be viewed as chemotherapy impacting primarily the Spleen and Kidneys but also, the Lungs and Heart.

The hair relies on the nourishment of Kidney Essence to grow, and Kidney vitality manifests in the moistness and strength of the head hair. The Lungs receive fluids from the Spleen and distribute them to the skin. This gives the skin and body hair nourishment and moisture without which the hair will be dry and wither. Thus, hair loss can be viewed as an impact of chemotherapy on Kidney Essence and the Lungs.

Mutagenesis/carcinogenesis comes full circle from cancer to cancer treatment to cancer. As described above, cancer can be attributed primarily to a decline or deficiency of Kidney Essence and Original Qi. Thus, chemotherapy and radiation therapy can be considered an assault of these therapies on Kidney Essence and Original Qi which lead to the development of secondary malignancies following treatment of the original cancer.

TREATMENT OF SYMPTOMS
The efficacy of acupuncture for relief of treatment-related adverse effects and palliative care of cancer patients has been investigated most extensively for management of chemotherapy-induced nausea and vomiting and cancer-related pain. The impact of acupuncture on immune function and treatment-induced myelosuppression has also received considerable attention. Although many studies have methodological flaws, fail to meet the rigors of randomized controlled trials (RCTs), or use “sham” acupuncture (which has been questioned as a true placebo),2 the studies reviewed herein provide considerable evidence about the benefits of acupuncture for individuals experiencing chemotherapy- or radiotherapy-induced adverse effects and end-of-life symptoms.

Nausea and Vomiting
Chemotherapy-induced nausea and vomiting occur in both an acute and a delayed form. Acute nausea and vomiting, occurring during or soon after intravenous administration of chemotherapeutic agents, result from stimulation of the chemoreceptor trigger zone. Delayed nausea and vomiting result from the toxicity of antineoplastic agents to the gastrointestinal tract, i.e., as a result of chemotherapy-induced mucositis. Peak symptoms of delayed nausea and vomiting usually occur between 2 and 4 days following chemotherapy. Acupuncture (Table 2) and acupuncture-related therapies (Table 3) have been used for prophylaxis and treatment of both acute- and delayed-onset nausea and vomiting resulting from chemotherapy.

Acupuncture. The pioneering work on the use of acupuncture for chemotherapy-induced nausea and vomiting, as well as for postoperative nausea and vomiting and morning sickness, was performed by the late John W. Dundee and his colleagues, who summarized their work in several reviews.3-7 Their initial studies of chemotherapy-induced nausea and vomiting involved 24 inpatients receiving various chemotherapy regimens.8,9 All patients had experienced severe sickness (nausea and/or vomiting) with a prior infusion of chemotherapy. Inpatients received 5 or 6 treatments over 3 days with electroacupuncture (10 Hz, 5 minutes) of PC 6 (right forearm only), the first treatment being given prior to administration of chemotherapy. Outpatients received 1 to 5 treatments. Eleven inpatients and 21 outpatients had complete alleviation of emetic symptoms lasting at least 8 hours following treatment with acupuncture while most of the remaining patients had some improvement.
Sham acupuncture (1 treatment of 15 inpatients) using a point near the right elbow was without benefit. In a study of 20 outpatients randomized to receive either intravenous metoclopramide (10 mg) or electroacupuncture of PC 6 (10 Hz, 5 minutes, right forearm) prior to their first course of chemotherapy, sickness occurred twice as often in those treated pharmaco logically although the difference between groups was not significant.11

<table>
<thead>
<tr>
<th>Technique</th>
<th>Electroacupuncture</th>
<th>Treatment Duration</th>
<th>Regimen</th>
<th>Reference(s)</th>
</tr>
</thead>
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<tr>
<td>Unilateral PC 6</td>
<td>10 Hz</td>
<td>10 min</td>
<td>1-6 in 3 days</td>
<td>8,9,11,12</td>
</tr>
<tr>
<td>Unilateral PC 6, PC 6 press needle</td>
<td>None</td>
<td>20 min</td>
<td>1</td>
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<tr>
<td>PC 6, ST 36</td>
<td>2-10 Hz</td>
<td>20 min</td>
<td>Daily for 5 days</td>
<td>13</td>
</tr>
<tr>
<td>TCM acupuncture: PC 6, ST 36, PC 6 press needle</td>
<td>None</td>
<td>20 min</td>
<td>1-3 daily for 2 weeks</td>
<td>14</td>
</tr>
<tr>
<td>TCM acupuncture: PC 6, ST 36, ST 34, PC 6, LI 11, LI 4, points based on symptoms</td>
<td>None</td>
<td>15-30 min</td>
<td>Alternate days for 30 days</td>
<td>15</td>
</tr>
<tr>
<td>TCM acupuncture: PC 6, ST 36, points based on symptoms</td>
<td>None</td>
<td>30 min</td>
<td>Before and after chemotherapy</td>
<td>16</td>
</tr>
</tbody>
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Table 2. Acupuncture for Chemotherapy-Induced Nausea and Vomiting

In a study by Dundee et al12 that included 130 patients with prior chemotherapy-induced sickness, electroacupuncture (10 Hz, 5 minutes, right forearm) of PC 6 given shortly before or soon after chemotherapy resulted in 97% of patients experiencing complete absence of sickness or reduced sickness for at least 8 hours. The study included 15 patients in an open pilot design, 10 patients from their previously reported crossover RCT,9 and 105 patients (34 inpatients and 71 outpatients) in a definitive study. Of those patients in the definitive study, 63% experienced complete absence of sickness whereas only 5% failed to have any benefit. In this study, acupuncture was used as an adjunct to standard antiemetic agents including metoclopramide plus prednisolone.

Aglietti et al13 evaluated the antiemetic effect of PC 6 acupuncture in 26 women receiving a cisplatin-containing chemotherapy regimen. All women received intravenous antiemetic medication including 3 mg/kg of metoclopramide prior to and after cisplatin, 20 mg of dexamethasone, and 50 mg of diphenhydramine in addition to acupuncture. A needle was placed in PC 6 (unilateral) for the duration of cisplatin infusion (20 minutes) and then replaced with a semipermanent press needle which was removed after 24 hours. Patients were instructed to press the needle gently if nausea occurred. Compared with a historical control of 51 patients who had received similar chemotherapy, the mean number of vomiting episodes, the mean maximal score of nausea (a measure of severity of symptoms), and the duration of nausea and vomiting were reduced, and the percentage of patients (88.5%) with complete protection from nausea was increased by the acupuncture treatment.

Shen et al14 compared the antiemetic effectiveness of electroacupuncture with that of minimal needling plus mock electrical stimulation (sham acupuncture) or antiemetic medication only in a 3-arm, parallel-group, RCT of 104 women with breast cancer who were receiving myeloablative chemotherapy with cyclophosphamide, cisplatin, and carmustine. All patients received intravenous pharmacological emesis management beginning 1 hour before chemotherapy and continuing until 48 hours following the final chemotherapy infusion. This treatment included prochlorperazine, 10 mg loading followed by an infusion of 1 mg/m2/hour; lorazepam, 1 mg/m2 every 4 hours; and diphenhydramine, 25 mg/m2 every 6 hours. Bilateral electroacupuncture (2-10 Hz, 0.5-0.7 milliseconds, DC, 20 minutes) was performed after achieving De Qi using PC 6 (negative pole) and ST 36 (positive pole). In the sham acupuncture group, superficial needling, without manipulation or stimulation, was performed at LU 7 and GB 34. These needles were connected to the clips of an electrical stimulator which emitted the same audiovisual stimulus for 20 minutes as in the electroacupuncture technique, but no current was passed through the needles. Electroacupuncture or superficial needling was performed daily for 5 days and patients were observed for an additional 9 days following these treatments. Patients in the electroacupuncture group had significantly fewer emesis episodes and a greater proportion of emesis-free days than patients in either the minimal needling group or the pharmacotherapy group. However, patients in the minimal needling group had significantly fewer emesis episodes than those in the pharmacotherapy group which illustrates the difficulty in designing a “mock” or “sham” acupuncture treatment.
During the follow-up period (days 6-14), the number of emesis episodes and the proportion of emesis-free days did not differ between the 3 groups.

Acupuncture has also been shown to benefit patients with nausea and vomiting when acupuncture points are selected according to TCM. Dang and Yang15 randomized 48 patients having chemotherapy for stomach carcinoma and being treated with analgesics for cancer-related pain to receive either acupuncture (ST 36, SP 6, ST 34, PC 6, LI 11, LI 4, and points based on each patient’s symptoms), acupuncture plus injection of 4 points per treatment (Ah Shi points, PC 2, ST 19, SP 12, or SP 10) with human transfer factor, or no treatment other than analgesics (control group). Each patient who received acupuncture had 4 courses of treatment separated by 2-3 days, with each course of treatment being 1-3 treatments daily, 20 minutes each for 2 weeks. Although statistics were not presented, only 19% of patients in each acupuncture group experienced nausea and vomiting whereas these symptoms occurred in 50% of controls.

Xia et al16 randomized 76 patients being treated with chemotherapy (8 patients) or radiotherapy (68 patients) for lung, esophageal, or stomach cancer to receive either acupuncture (15-30 minutes, every other day for 30 days) or no additional treatment (control group). PC 6 and ST 36 were used for all patients in the acupuncture group, with additional points based on the TCM symptom complex. Only 5% of patients in the acupuncture group experienced nausea and vomiting vs 85% in the control group.

In a review of several clinical series, Zhou et al1 reported that more than 90% of 44 patients with gastrointestinal symptoms experienced complete relief of treatment-related nausea and vomiting with daily treatment (30 minutes each for 10 days) using LI 11, LI 4, ST 36, SP 6, PC 6, BL 17, BL 20, BL 21, CV 12, and LR 2. Electroacupuncture was applied to SP 6 and ST 36. In another series of 90 patients, nausea and vomiting were markedly reduced by 30-minute acupuncture treatments given 15 minutes before and 2 hours following chemotherapy. All patients were treated with ST 36, PC 6, and SP 4, with CV 12, CV 4, LR 3, CV 17, and BL 21 added, depending on each patient’s symptoms.

In a study of acupuncture for palliative care,17 4 patients (of 47 treated) who were experiencing nausea were treated with acupuncture using a Western approach (although the points used for the treatments were not stated). One patient experienced excellent relief for nausea, 1 patient had slight improvement, and 2 patients received no benefit from acupuncture.

**Acupressure.** Use of acupressure wristbands, which have a pressure button positioned over PC 6, have been investigated as a means of controlling nausea and vomiting. In a study of 18 patients, wristbands (bilateral) were worn during some courses of cytotoxic chemotherapy and were not worn during other courses so that

<table>
<thead>
<tr>
<th>Technique</th>
<th>Treatment</th>
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<tbody>
<tr>
<td>Acupressure wristbands, bilateral PC 6</td>
<td>During chemotherapy</td>
<td>18</td>
</tr>
<tr>
<td>Acupressure wristbands, bilateral PC 6</td>
<td>Continuous for 7 days</td>
<td>19</td>
</tr>
<tr>
<td>Finger acupuncture, PC 6 and ST 36</td>
<td>3 min, as needed for nausea, for 10 days</td>
<td>20</td>
</tr>
<tr>
<td>Transcutaneous electrical stimulation, PC 6 and LI 4</td>
<td>10-15 Hz, 5 minutes every 2 hours, for 5 days</td>
<td>22,23</td>
</tr>
<tr>
<td>Magnet, unilateral at PC 6</td>
<td>During and for 2 hours after chemotherapy</td>
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<th>Acupuncture-Related Therapies for Chemotherapy-Induced Nausea and Vomiting</th>
<th>Points</th>
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<td>TCM acupuncture</td>
<td>PC 6, ST 36, points based on symptoms</td>
<td>16</td>
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<tr>
<td>Microwave acupuncture</td>
<td>ST 36, SP 6</td>
<td>56</td>
</tr>
<tr>
<td>Microwave acupuncture</td>
<td>SP 10, BL 17</td>
<td>57</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>LI 11, LI 4, ST 36, SP 6</td>
<td>1</td>
</tr>
<tr>
<td>TCM acupuncture with electroacupuncture</td>
<td>ST 36, SP 6, points based on symptoms</td>
<td>1</td>
</tr>
<tr>
<td>Acupuncture with moxibustion</td>
<td>ST 36, SP 6</td>
<td>58</td>
</tr>
<tr>
<td>Acupuncture point injection</td>
<td>ST 36</td>
<td>60</td>
</tr>
<tr>
<td>Acupuncture point injection</td>
<td>ST 36</td>
<td>1</td>
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<th>Treatment of Therapy-Induced Myelosuppression</th>
<th>Points</th>
<th>Reference(s)</th>
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<tr>
<td>TCM acupuncture</td>
<td>PC 6, ST 36, points based on symptoms</td>
<td>16</td>
</tr>
<tr>
<td>Microwave acupuncture</td>
<td>ST 36, SP 6</td>
<td>56</td>
</tr>
<tr>
<td>Microwave acupuncture</td>
<td>SP 10, BL 17</td>
<td>57</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>LI 11, LI 4, ST 36, SP 6</td>
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</tr>
<tr>
<td>TCM acupuncture with electroacupuncture</td>
<td>ST 36, SP 6, points based on symptoms</td>
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<td>ST 36</td>
<td>60</td>
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<tr>
<td>Acupuncture point injection</td>
<td>ST 36</td>
<td>1</td>
</tr>
</tbody>
</table>

| Moxibustion | GV 14, LI 4, ST 36, SP 6, BL 17, BL 20, |

1
comparisons could be made. When the bands were used, the severity of nausea, as assessed by patients and staff, the incidence of vomiting, and the amount of antiemetic medication used were greatly reduced. Additionally, oral intake was better tolerated and patients reported less depression when bands were worn. In a single-blind, randomized, crossover study of wristbands (bilateral) placed at PC 6 vs placement at a sham point on the ankle, significantly better relief of chemotherapy-induced nausea and vomiting was reported when the bands were placed correctly.

In a single-cycle RCT, Dibble et al20 investigated the efficacy of finger acupressure bilaterally at PC 6 and ST 36 for relief of nausea in 17 women receiving adjuvant chemotherapy for breast cancer. Acupressure was self-administered by the patients for 3 minutes each morning and as needed whenever nausea arose for the first 10 days following chemotherapy. The nausea experience, as measured by the Rhodes Index of Nausea, Vomiting and Retching, was significantly less for 7 of the 10 days and nausea intensity was significantly less for 1 of the 10 days in the patients using finger acupressure.

In contrast to the above studies, Brown et al21 compared the use of a unilateral acupressure wristband to a placebo wristband (no pressure button) or no wristband, and found that use of the wristband was not effective in reducing nausea and vomiting in 6 terminally ill hospice patients (5 patients with cancer and 1 patient with renal failure).

Transcutaneous electrical stimulation (TCES). McMillan et al22 assessed the effect of TCES as an adjunct to ondansetron (8 mg intravenously followed by 8 mg orally 3 times daily for 5 days) for relief of nausea and vomiting in 16 patients receiving a chemotherapy regimen that included cisplatin and cyclophosphamide. Direct current TCES of 10-15 Hz for 5 minutes every 2 hours awake for 5 days, was applied to PC 6 (negative pole) and LI 4 (positive pole) on the patients’ dominant forearm. Patients were randomly assigned to receive TCES during either the 1st or the 2nd course of the highly emetic chemotherapy. The severity of nausea and the incidence of vomiting were reduced by TCES treatments in 12 of 13 patients who did not have complete relief of symptoms with antiemetic drugs alone. In a comparison of TCES to acupuncture as an adjunct to standard antiemetic medication for control of nausea and vomiting, Dundee et al23 found TCES (administered as described above22) to be beneficial in 88% of chemotherapy treatments as compared with a beneficial effect of PC 6 electroacupuncture (unilateral, 10 Hz, 5 min) in 96% of treatments.

Magnet therapy. Liu et al24 compared the effect of placing, unilaterally, the north pole of a 2-cm-diameter magnetic disk on PC 6 (161 patients) to placing a non-magnetic iron disk on PC 6 (23 patients), or point compression of PC 6 with a 0.5-cm steel ball (22 patients) for relief of cisplatin-induced nausea and vomiting. Treatment was initiated before and continued until 2 hours after infusion of cisplatin. Nausea and vomiting were significantly reduced in the magnetic disk group (61% markedly effective, 28% effective, 11% ineffective) compared with the effect observed in the iron disk group (none markedly effective, 22% effective, 78% ineffective). Unilateral point compression was ineffective for relief of nausea and vomiting in all patients, results that are consistent with those of others.21

Combined treatment. Dundee et al12 noted that a single acupuncture treatment of PC 6 was an effective adjuvant to standard antiemetic therapy in cancer chemotherapy, but the benefit lasted only 8 hours. Investigating a means of prolonging the antiemetic effect, Dundee and Yang25,26 placed an acupuncture wristband (unilateral) on PC 6 immediately following PC 6 acupuncture (unilateral, dominant forearm, 10 Hz, 5 minutes) and instructed patients to press the button for 5 minutes every 2 hours while awake until 24 hours following chemotherapy. In 20 inpatients (79 chemotherapy treatments) and 20 outpatients (43 chemotherapy treatments), use of acupressure prolonged the antiemetic effect of acupuncture for 24 hours following 95% of the treatments.

Dundee et al23 also investigated whether acupressure could prolong the antiemetic effect of TCES (administered as described above).22 Unilateral PC 6 acupressure applied following TCES prolonged the antiemetic effect for 24 hours in approximately 90% of patients. Additionally and consistent with the results of other studies,21,24 unilateral acupressure treatment alone was ineffective for relieving chemotherapy-
induced nausea and vomiting. Thus, although unilateral PC 6 acupressure alone does not appear to provide relief of chemotherapy-induced nausea and vomiting,21,23,24 it does appear to help prolong the antiemetic effect of PC 6 acupuncture25,26 and TCES.23

**Pain of Malignancy**

**Acupuncture.** Evidence that acupuncture benefits patients with pain due to malignant disease comes almost exclusively from case series. Although details of the treatments are lacking, early studies appearing soon after the dawn of acupuncture awareness in the United States in the early 1970s, reported acupuncture to be effective for relief of cancer pain in 8 patients for 3-72 hours27 and in 4 patients for 6-36 hours.28 Intensive electroacupuncture, administered daily, was also reported to be effective for pain relief in 29 patients with terminal malignant disease.29

Filshie and Redman30,31 investigated acupuncture using unspecified points for 5-15 minutes with minimal manual stimulation for management of pain in 183 patients. A total of 146 patients had pain related to malignant disease or resulting from treatment (chemotherapy, radiotherapy, or surgery) of the disease process, and 37 patients had pain unrelated to cancer. Thirty percent of patients obtained some benefit (pain relief for up to 3 days) from acupuncture treatments and 52% of patients were helped significantly. For the patients who experienced significant benefit from acupuncture, multiple treatments, up to 4 weekly, were nearly always necessary. It was further stated that acupuncture was particularly useful for myofascial pain. Although it is unclear from these reports to what degree patients with tumor-related pain were benefited, Filshie stated in a subsequent report of 156 patients (55 with tumor-related pain, 60 with treatment-related pain, and 41 with pain unrelated to cancer) that worthwhile results were least likely for patients with tumor-related pain.32

Leng17 reported that weekly treatments for 4-6 weeks with acupuncture practiced according to a "Westernized" approach resulted in excellent or good relief of pain for 62% of complaints of pain in 47 patients (45 with cancer and 2 with motor neuron disease). Eight of 10 patients with myofascial pain reported excellent or good relief. The acupuncture techniques used were described as including trigger-point acupuncture and traditional points for specific symptoms, but further details of the treatments were not given. Others have also reported excellent but short-lasting relief of malignant pain following acupuncture, but without providing a description of the treatment used.33

In contrast to reports that have not fully described the acupuncture technique used for pain management, Xu et al34 reported the benefit of acupuncture at ST 36 (bilateral, 15 min daily for 2 weeks) for relief of tumor-related abdominal pain due to stomach, liver, or colon cancer or abdominal lymphosarcoma. Fifteen patients with slight pain experienced complete relief. Of 41 patients with moderate pain, 37% had complete pain relief and 61% were improved. Twenty-six of 36 patients with severe pain experienced some improvement, but the remaining 10 patients had no benefit from acupuncture. The duration of pain relief by patients who experienced a benefit from the treatment was not stated.

In a study of acupuncture for pain management that used a control group, Dang and Yang15 randomized patients with pain due to stomach carcinoma to receive TCM acupuncture, TCM acupuncture plus point injection with human transfer factor, or treatment with Western analgesic medication only (described earlier). The total course of treatment was 2 months; the analgesic effect of treatment was assessed at 30 minutes (immediate effects) and 12 hours (long-term effects) following each of the 1st and last 10 days of treatment. During the first 10 days, the proportion of treatments resulting in an analgesic effect (complete or partial pain relief) with Western medicine was 100% for immediate effects and 85% for long-term effects. These results were significantly better than those with acupuncture or acupuncture with point injection (both groups approximately 80% immediate effects and 55% long-term effects). During the final 10 days of treatment, analgesia (complete or partial pain relief) was the same in all groups (approximately 95% immediate and 80% long-term effects) although the percentage of patients who experienced complete long-term pain relief was significantly higher in the 2 acupuncture groups (approximately 50%) than in the drug treatment group (34%). In another randomized study of patients being treated with chemotherapy or radiotherapy for esophageal carcinoma, Xia et al16 reported relief of chest pain in 41% of patients treated with TCM acupuncture (described earlier) compared with only 3% of patients in a control group (cancer therapy only).

Treatment of pain due to bony metastasis is one of the most difficult challenges in the palliative care of cancer patients. Guo et al35 investigated the efficacy of an analgesic decoction of herbs, administered twice daily, plus electroacupuncture for relief of pain due to bony metastasis. The electroacupuncture technique used acupoints on meridians related to the pain, local acupoints, and Ah Shi points (although
details of the electrical stimulation used were not given). A plate electrode was applied over the site of pain and the other electrode applied to
the acupuncture needles. Treatments were 10-20 minutes, twice daily, with 1 course of treatment lasting 10 days. Up to 10 courses of
treatment were given with a rest period of 3 days between courses. Pain was relieved in 83.6% of 104 patients with medium pain, described as
disturbing life and sleep and requiring analgesic drugs. Pain relief occurred in 68.6% of 182 patients with severe pain, described as
excruciating pain for which analgesic agents were indispensable and accompanied by functional disturbances in the autonomic nervous
system.

Ahmed et al36 reported the use of percutaneous electrical nerve stimulation (PENS) for treatment of 3 patients with pain due to bony
metastasis. Acupuncture needles were inserted into the periosteum (negative electrode) of vertebrae at levels corresponding to the
dermatomal distribution of the patient’s pain, and into the soft tissue (positive electrode) peripherally along the dermatome. A direct current of
4-100 Hz was then applied for 30 minutes. Two patients experienced marked pain relief lasting from 1-4 days following each of 2 (initial
treatment with 15 and 30 Hz, second treatment with 100 Hz) or 3 treatments (6 Hz, 15/30 Hz, then 100 Hz). However, 1 patient receiving
treatments of 4 Hz, 15/30 Hz, and 100 Hz experienced no pain relief.

Rico and Trudnowski37 also reported the use of anatomical acupuncture for treatment of back pain due to malignant disease in 22 patients
who failed to obtain relief with conventional treatments. For 10 patients, needles were inserted 5 cm from the midline, to a depth of 1.25 cm, at
the levels of the vertebrae above and below the dermatome of the pain area. Electrical stimulation of 6-8 Hz for 15-30 minutes was applied
daily for 6-7 days. The remaining patients received the same electrical stimulation, for 1-2 days every 5-10 days, of needles inserted into both
gluteal folds and popliteal areas, the median aspect of the heels, and the most painful Ah Shi point on the back. Pain relief was greater than
75% in 13 patients, 50%-75% in 2 patients, and less than 50% in 3 patients. Only 4 patients experienced an unsatisfactory effect. The authors
stated that the analgesic effects observed were far greater than that of placebo although the placebo treatment was not described.

Aural acupuncture. Auricular acupuncture also has been reported to effectively relieve the pain of malignant disease. As part of a large
study that included 377 patients with pain due to various causes, Fischer et al38 reported complete or substantial relief in 19 of 27 patients with
pain due to carcinoma. Treatment involved placement of semipermanent auricular needles that were replaced once or twice weekly for an
unspecified period. The auricular points used were not indicated. Dillon and Lucas39 applied a semipermanent press needle in a single auricular point identified by an electrodermal response for treatment of
28 patients (22 with metastatic cancer) with neuropathic, benign soft tissue, benign bone, or malignant bone pain that was not controlled by
conventional means. Needles were repositioned if they became displaced and were routinely replaced in the opposite ear at week 2 of a 4-
week observation period. Patients experienced significant pain relief 2 days after needle insertion and 26 patients reported moderate to
complete pain relief at 2 and 4 weeks. There was no difference in pain scores or pain relief between patients with benign or malignant disease.

Dyspnea
Cancer-related dyspnea is a distressing symptom for many individuals at end-of-life. Filshie et al40 reported the benefits of acupuncture in 20
patients for treatment of breathlessness that was directly related to malignancy and was refractory to conventional medications. A needle was
inserted into each LI 4, and 2 needles were placed 1-2 cm apart in the upper sternum and advanced to the periosteum. Needles were left in
place for 10 minutes without stimulation. Seventy percent of patients reported marked subjective benefit from the treatment, with significant
improvements in visual analog scale (VAS) scores of breathlessness, relaxation, and anxiety lasting at least 6 hours following acupuncture. There was also a reduction of respiratory rate following the treatment, an
effect that was sustained for the 90-minute period during which it was measured. Pulse rate and oxygen saturation were unchanged by the
treatment. In an attempt to prolong symptom relief, in-dwelling needles were placed in the sternal points of 8 patients who had reported benefit
from the treatment. Patients were instructed to massage the studs in the event of a breathless attack. All 8 patients reported some benefit
lasting up to 2 weeks. Leng17 also reported that acupuncture given according to a “Westernized” approach provided good relief from
breathlessness in 4 of 8 patients with cancer-related dyspnea.

General Symptoms
Dang and Yang15 and Xia et al16 reported the benefits of acupuncture for treating generalized symptoms resulting from chemotherapy or
radiotherapy. In both studies, acupuncture treatments were administered according to TCM theories (described earlier) and comparisons were
made between patients treated with acupuncture and those of a control group who were treated with Western therapies only. Dang and Yang15 found that the incidence of chemotherapy-related adverse effects was less in the acupuncture group as compared with the incidence in the control group (anorexia: 22% vs 75%; diarrhea: 0% vs 13%; dizziness: 16% vs 69%; insomnia: 6% vs 44%; and weakness: 22% vs 100%). Xia et al16 found the incidence of chemotherapy- or radiotherapy-induced adverse effects was less in the acupuncture group as compared with the incidence in the control group (anorexia: 5% vs 90%; diarrhea: 3% vs 20%; dizziness: 13% vs 85%; insomnia: 8% vs 45%; and fatigue: 5% vs 100%).

In their review of several clinical series, Zhou et al1 reported greater than 90% relief of treatment-related diarrhea and constipation in a series of 44 patients treated (30 minutes daily for 10 days) using LI 11, LI 4, ST 25, ST 36, ST 37, SP 6, PC 6, BL 20, BL 21, and CV 12. Electroacupuncture was applied to ST 36 and SP 6 although details of the electrical stimulation used were not given. In another series of 70 patients, daily acupuncture treatments of 30-40 minutes each for 4 days, using ST 36 and SP 4, were used to treat chemotherapy-induced diarrhea. Moxa was also applied to CV 12, CV 8, and ST 25. Seventy-three percent of patients experienced complete relief of diarrhea and 21% had some relief. In a third series, patients were treated with 30 minutes of electroacupuncture at ST 36 immediately before chemotherapy and the following 2 days. Auricular press pellets on Stomach, Diaphragm, Shen Men, and Adrenal Gland were used in addition to ST 36 acupuncture in patients with severe symptoms. Symptom relief was reported in 87% of patients. Although these results are encouraging for the use of acupuncture for treatment of gastrointestinal symptoms, the results are difficult to interpret because control groups were not used and the natural course of treatment-related symptoms is improvement following completion of each cycle of chemotherapy.

**Xerostomia**

Blom and colleagues41-43 investigated the effects of acupuncture for treatment of xerostomia in patients who received radiotherapy for head and neck malignancies. Following encouraging results from a pilot study of 2 patients,41 they treated 20 patients with acupuncture and 18 patients with placebo-acupuncture.42 All patients received 2 treatments of 20 minutes each weekly for a total of 24 treatments with a 2-week interval between the first 12 treatments and the final 12 treatments. Acupuncture treatments were administered according to TCM with De Qi elicited for each point, and included local points in the head and neck selected from ST 3, ST 5, ST 6, ST 7, SI 17, LI 18, TE 17, and GV 20 and distal points selected from PC 6, HT 7, LI 4, LI 10, LI 11, SI 3, KI 3, KI 5, KI 7, SP 3, SP 6, SP 8, LR 3, and ST 36. A total of 5-8 points were selected, most bilaterally. Two to 4 ear points selected from Mouth, Kidney, Sympathetic, Shen Men, Stomach, GI Parotis, and Subcortex were also used. Placebo acupuncture was performed by inserting needles superficially (intradermally), without manipulation, about 1 cm away from the classic acupuncture points. Improvement of unstimulated and paraffin-chewing stimulated salivary flow rates was observed in both groups.

Although the difference in flow rates between the groups was not significant, the changes in the placebo group were somewhat less and appeared after a longer latency period than in the acupuncture group. The improved flow rates persisted for the 1 year-long observation period of the study, but for some patients the flow rates were decreased at 6 or 12 months following treatment. Some patients also reported improved taste, diminished pain in the tongue, and lessened hoarseness following the treatments.

Blom and Lundeberg43 subsequently reported their results of a long-term follow-up of 70 patients with xerostomia which included 38 patients (apparently from their prior study42) with post-radiotherapy xerostomia. The points selected for treatment were similar to those of their prior study with the addition of TE 17 to the head and neck points, and TE 5 and GB 41 instead of SI 3. In the extremity point group, LI 10, SP 3, SP 8, and KI 7 were used. Each treatment was described as including 4 points from the local group and 6 points from the distal group, some bilaterally, for a total of 12-15 needles. Auricular points were also used in 47 patients. For the 38 patients with post-radiotherapy xerostomia, objective (stimulated and unstimulated flow rates) and subjective changes in salivary flow rates were reported at 6 months, following a series of 24 acupuncture treatments over 4 months. Twenty patients had both subjective and objective improvement, 6 patients had objective improvement only, and 5 patients experienced subjective improvement without any objective changes. If this assessment was made following the treatment of the 38 patients as reported in their prior publication,42 (in this report) the authors made no apparent distinction between patients in the acupuncture group and those in the placebo group. Following the initial 6 months of the study, patients were offered a series of 5-12 additional acupuncture treatments as needed for 3 years. Of the 8 patients in the post-radiotherapy group who chose to receive additional treatments, stimulated and unstimulated salivary flow rates were consistently higher than those of patients who chose not to continue acupuncture.
Johnstone et al\textsuperscript{44} reported the effects of acupuncture for treatment of pilocarpine-resistant xerostomia in 18 patients who had received radiotherapy bilaterally for head and neck malignancies. Treatment, as described in their preliminary report,\textsuperscript{45} was a 2-phase approach. Needles were initially (phase 1) inserted bilaterally into LI 2 or LI 3 and into auricular points Point Zero, Shen Men, and Salivary Gland II. Needles were removed and phase 2 was performed. The 2nd phase incorporated bilateral electrostimulation of Salivary Gland II and Salivary Gland (F) I (10 Hz, 40 mA, 30 seconds), followed by replacement of Salivary Gland II needles and bilateral piezoelectric stimulation for 10 seconds of LI 4. Two treatments were given the first week, followed by 3-4 weekly treatments. All but 2 patients experienced better salivation subjectively. Objective results obtained with the Xerostomia Index, an 11-item survey administered before and after treatment, noted a significant quality of life improvement for half of the patients.

Rydholm and Strang\textsuperscript{46} investigated the use of acupuncture for treatment of xerostomia due to underlying malignancy, previous chemotherapy, or ongoing treatment with opioids, diuretics, antihistamines, or anticholinergic drugs in 20 patients (17 with cancer) receiving late-stage palliative care. Manual acupuncture stimulation of ST 4, ST 5, ST 6, and ST 7 for 20 minutes was performed twice weekly for 5 weeks. Dryness of mouth and difficulty with swallowing or speaking due to xerostomia were assessed by means of a VAS at baseline and before each treatment. For symptoms of dryness, speech problems (10 patients), and dysphagia (10 patients), significant improvements were observed following 5 treatments with further improvements being noted after completion of 10 treatments.

\textbf{Postsurgical Brachial Plexopathy}

He et al\textsuperscript{47} investigated the benefits of acupuncture for treatment of pain and limited upper extremity movement following axillary lymphadenectomy in patients with breast cancer. Forty-eight patients received acupuncture on the 3rd, 5th, and 7th postoperative day and on the day of discharge (postoperative day 14, approximately). Their symptoms were compared with those of a control group of 32 patients who had the same surgical procedure but did not receive acupuncture. The main acupuncture points selected based on TCM theory were GB 24, TE 6, PC 3, LR 14, and GV 14; LU 2 was needled if pain radiated to the chest, LU 3 and GV 10 if pain radiated to the inside and backside of the arm, GV 15 and GV 16 if the patient “complained of a convulsive feeling in the shoulder area,” and HT 7, CV 6, or CV 17 depending on the patient’s basic health. Pain at rest was significantly less in patients receiving acupuncture on the 3rd and 5th postoperative day although pain at rest was similar in the 2 groups for the remainder of the hospital stay. However, the maximum abduction angle without pain was significantly greater in the treated group than in the control group following the initial acupuncture treatment and for the duration of hospitalization. Others have reported that acupuncture is an effective treatment for relief of chronic pain and diminished upper extremity strength and range of motion following surgery for breast cancer although details of the treatment were not provided.\textsuperscript{30-32}

Alimi et al\textsuperscript{48} treated 20 patients with malignant disease, most of whom had postoperative pain and 11 had post-mastectomy brachial plexopathy, with semipermanent press needles applied to auricular points identified by an electrodermal response. Needles were retained for 5-35 days after their initial placement and were not replaced when they fell out. Average pain intensity was 74 mm on a 100-mm VAS before treatment and fell to an average of 41 mm, a significant decrease, 60 days following needle placement. Although the response of the patients with post-mastectomy pain was not stated separately, these results suggest that auricular acupuncture may effectively relieve this postoperative complication. Niemtzow\textsuperscript{49} also reported that electroauriculotherapy (details not provided) was effective for relieving chronic pain and diminished upper extremity range of motion following mastectomy.

\textbf{Vasomotor Symptoms}

Vasomotor symptoms (hot flushes and sweating), frequent symptoms of menopause, also result from certain therapies of malignant disease including orchietomy or medical castration with gonadotropin-releasing hormone analogs for prostate cancer, and antiestrogen therapy with tamoxifen or therapy with aromatase inhibitors for breast cancer. Hammar et al\textsuperscript{50} treated 7 men with vasomotor symptoms following castration with twice-weekly acupuncture treatments of 30 minutes each for 2 weeks, followed by weekly treatments for 10 weeks. Electroacupuncture at 2 Hz was applied bilaterally at BL 23 and BL 32. Also needled were BL 15 bilaterally, GV 20, and HT 7, PC 6, LR 3, SP 6, and SP 9 unilaterally. Six of 7 patients experienced a significant decrease of the number of hot flushes after 6, 10, and 24 weeks following the start of treatment. The 7th patient discontinued therapy after 3 weeks (5 treatments) because severe back pain prevented him from undergoing further treatments.
Climacteric vasomotor symptoms which result from diminished blood levels of estrogens have been shown to respond favorably to acupuncture.51,52 In a study of women with breast cancer, Towler et al53 also demonstrated that acupuncture weekly sessions using SP 6 and LR 3 reduced hot flushes due to tamoxifen therapy. The authors additionally used semipermanent acupuncture needles applied to SP 6 bilaterally for 4-36 months for 12 patients who continued to experience hot flushes despite conventional therapy and intermittent acupuncture at SP 6 and LR 3. Eight of the 12 patients reported that use of the studs abolished or attenuated the severity or duration of their hot flushes. Niemtzow49 also reported that acupuncture relieved therapy-related vasomotor symptoms in several patients with breast cancer.

Radiation Rectitis
Zhang54 used acupuncture to treat 44 women who developed rectitis following intracavitary irradiation for carcinoma of the cervix. Twenty-minute treatments were performed daily for 3-8 days using LI 4, ST 25, ST 37, and ST 36 bilaterally, with CV 6 added for serious tenesmus, SP 6 and GB 34 for mucous stools, and ST 39 for hematochezia. Seventy-two percent of patients reported complete resolution of symptoms, 9% noted a marked improvement of symptoms, and 18% experienced some improvement of symptoms.

Dysphagia
Feng55 treated 2 patients with advanced esophageal carcinoma who experienced dysphagia due to cancer-related obstruction that was confirmed by barium swallow. The 1st patient received 6 treatments, each consisting of 2 consecutive days of acupuncture (20-30 minutes) followed by a 3-day interval before the next treatment. ST 25, ST 40, and BL 25 were used on both days of treatment, with CV 12, CV 22, ST 36, and SP 4 added on the 1st day, and BL 17, BL 21, BL 46, and PC 6 added on the 2nd day. The 2nd patient was treated with CV 12, CV 22, ST 35, SP 4, and PC 7 on the 1st and 2nd day of each treatment. Both patients experienced relief of dysphagia without recurrence of the symptom for the remaining few months of their lives. Xia et al16 reported that relief of dysphagia occurred in 41% of patients who received acupuncture (described earlier) during treatment with chemotherapy or radiotherapy for esophageal carcinoma whereas 3% of patients who did not receive acupuncture experienced relief of this symptom.

TREATMENT OF MYELOSUPPRESSION/IMMUNOSUPPRESSION
Chemotherapy/Radiotherapy-Induced Myelosuppression
Acupuncture. In a randomized study of 76 patients with lung, esophageal, or stomach cancer, Xia et al16 assessed the impact of acupuncture on leukocytopenia and thrombocytopenia resulting from chemotherapy (7 consecutive days of 5-fluorouracil every 13 days, 8 patients) or radiotherapy (5 times weekly, 68 patients). Patients receiving acupuncture (15-30 minutes every other day for 30 days) were treated using PC 6 and ST 36 plus additional points based on each individual’s TCM symptom complex, whereas those in the control group received no additional treatment (Table 4). Following 30 days of cancer treatment, there was a significant 35% decline in leukocyte count and an 18% (non-significant) decline in platelet count in the control group and no change in the leukocyte count, and a significant 17% increase in the platelet count in the acupuncture group.

He et al56 treated 20 patients with chemotherapy-induced leukocytopenia with microwave acupuncture which has a heating effect similar to moxibustion. Bilateral treatment of ST 36 and SP 6 for 20 minutes was performed daily for 10 days. A significant rise in the leukocyte count from 2.65 x 10^9/L to 3.80 x 10^9/L was observed in the acupuncture group, whereas a non-significant rise from 3.31 x 10^9/L to 3.83 x 10^9/L was observed in a control group (no acupuncture) of 29 patients. Wu et al57 reported that daily microwave acupuncture to SP 10 and BL 17 was effective for raising the leukocyte count of patients receiving chemotherapy although they did not have a control group in their study.

In their summary of several clinical series, Zhou et al1 reported that during chemotherapy, patients receiving daily treatments of 15-30 minutes for 7 days using LI 11, LI 4, ST 36, and SP 6 had significantly higher leukocyte counts than patients in a control group. In a 2nd clinical series, electroacupuncture of ST 36 and SP 6 plus needling of points selected from LI 11, LI 4, PC 6, BL 18, BL 20, SP 10, GB 39, and GV 14 (daily treatment for 10-30 days) was also reported to elevate the decreased hemoglobin levels and leukocyte and platelet counts caused by chemotherapy although a control group was not included in this study. In another study that lacked a control, Chen and Huang58 reported that acupuncture with moxibustion of ST 36 and SP 6 effectively elevated the leukocyte count in 88% of 121 cases of chemotherapy-induced leukocytopenia.
In addition to the above studies of leukocytopenia due to cancer treatments, Wei59 demonstrated that acupuncture was an effective treatment for 90% of 48 patients with leukocytopenia described as idiopathic (32 patients) or resulting from hypersplenism (6 patients), drug adverse effects (3 patients), rheumatoid arthritis (2 patients), or aplastic anemia (1 patient). Only 4 patients in this series had leukocytopenia that was cancer-related or due to chemotherapy or radiotherapy. ST 36 was needled bilaterally once daily for 14 consecutive days. After De Qi was elicited, needles were retained for 20 minutes with manipulation every 5 minutes. Before treatment, the leukocyte count was less than 2.0 x 10^9/L in all patients. Following the 14-day therapeutic course, the leukocyte count was above 5.0 x 10^9/L in 18 patients, above 4.0 x 10^9/L in 15 patients, "improved" in 10 cases, and unchanged in 5 cases.

**Acupuncture point injection.** Yin et al60 treated 104 patients with chemotherapy-induced leukocytopenia (leukocyte count <4.0 x 10^9/L) with daily injections of a solution containing 5 mg of dexamethasone, 20 mg of adenosine triphosphate, and 0.1 g of inosine into ST 36 bilaterally. Twenty-three patients in a control group received twice-daily subcutaneous injections of filgrastim (granulocyte colony-stimulating factor). Treatment was considered effective if the leukocyte count rose above 4.0 x 10^9/L. After 3 days, treatment was effective in 39% of patients in the acupuncture group and 61% of patients in the control group. After 7 days, treatment was 91%-92% effective in both groups. Zhou et al1 reported a study in which injection of ST 36 with 5-10 mg of dexamethasone initially, followed by daily injections of either dexamethasone or inosine, elevated severely depressed leukocyte counts in 97% of 60 patients being treated with chemotherapy. Although these studies suggest that injection of ST 36 is an effective treatment for leukocytopenia, the results can also be attributed to the parenteral administration of dexamethasone. This treatment results in elevation of the granulocyte count by causing their release from bone marrow, reducing the rate of their removal from the circulation, and increasing their demargination from blood vessel walls.

**Moxibustion.** Zhou et al1 reviewed 3 clinical studies in which moxibustion was used for treatment of chemotherapy-induced leukocytopenia. Daily treatment with moxibustion applied to GV 14, LI 4, ST 36, SP 6, BL 17, BL 20, BL 21, and BL 23 for 10-15 minutes, followed by mild massage of each point for 3-5 minutes, was reported to effectively treat leukocytopenia in 82% of 49 patients. In a series of 114 leukocytopenic patients, daily moxibustion of BL 17, BL 20, BL 21, BL 23, and GV 14 increased the leukocyte count above 4.0 x 10^9/L in 46% of patients following 1-3 treatments. An additional 30% of patients and 17% of patients responded favorably following 4-6 treatments and 7-9 treatments, respectively. In a 3rd study, a significant elevation of the leukocyte count was observed in 31 of 37 leukocytopenic patients following 6-18 moxibustion treatments of 3 points selected from CV 8, GV 14, SP 6, BL 17, BL 20, BL 21, and BL 23. Chen and Huang58 also reported that moxibustion of ST 36 and SP 6 effectively elevated the leukocyte count in 91% of 221 cases of chemotherapy-induced myelosuppression. Although these results suggest that moxibustion may be effective for treating leukocytopenia, these studies lack control groups.

**Immunosuppression**

Several investigators have shown that acupuncture enhances various parameters of cell-mediated immunity in patients with cancer who exhibit immunosuppression (Table 5). In a double-blind RCT of 40 patients with malignancies, Wu and colleagues61,62 reported significant increases in CD3+ and CD4+ T-lymphocyte subgroups and an elevated CD4+/CD8+ ratio following 10 daily treatments of 30 minutes each using PC 6, LI 4, ST 36, and CV 4. In a study of similar design, Yuan and Zhou63 observed similar results following acupuncture treatments using PC 6, LI 4, ST 36, and CV 4. In another double-blind RCT, Wu et al64 reported that 10 daily treatments of 30 minutes each using ST 36, LI 11, and CV 6 elevated the level of interleukin 2, which induces the proliferation of thymocytes and increased NK cell activity. Guo et al35 treated 50 patients with an analgesic decoction of herbs twice daily plus acupuncture (points not specified) and reported a statistically significant increase in the lymphoblast transformation rate.

Zhou et al65 randomized 40 patients to acupuncture or control following surgery for stomach, colon, or breast cancer. Epidural anesthesia was used in all cases to avoid the immunosuppressive effects of intravenous or inhalational anesthetics (although surgery itself is immunosuppressive). Patients in the acupuncture group were given 30-minute treatments daily beginning the day following surgery, using ST 36 and either PC 6 if the operation was above the diaphragm or SP 6 if it was below. Following 3 treatments, in acupuncture patients, leukocyte phagocytosis of bacteria was significantly increased whereas this parameter did not change in the control group.
Dang and Yang15 randomized 48 patients with stomach cancer to receive TCM acupuncture, acupuncture point injection, or no treatment other than analgesic medication which all patients received (described earlier). Treatments were initiated at the start of chemotherapy. E-rosette forming rate (E-RFR) was measured before and at the end of 2 months of treatment. Before treatment, E-RFR in all 3 groups was significantly below that of healthy controls which reflects the immunosuppression observed in most patients with cancer. Following 2 months of treatment, E-RFR rose to normal levels in the acupuncture and point injection group whereas it decreased significantly in controls.

Xia et al16 also investigated the impact of acupuncture on E-RFR in patients undergoing treatment for various malignancies. E-RFR was significantly decreased in controls following completion of chemotherapy or radiotherapy. In patients randomized to receive TCM acupuncture (described earlier) during cancer therapy, E-RFR was significantly elevated to nearly that of healthy controls at the end of their therapy.

Acupuncture has also been reported to enhance immune function when immunosuppression is due to causes other than cancer or cancer treatment. Guo and colleagues66,67 investigated the impact of acupuncture in patients with immunosuppression associated with mammary gland hyperplasia. For both studies, the acupuncture points chosen were ST 15, CV 17, LI 4, GB 21, SI 11, and BL 18; LR 3 replaced LI 4 for cases of Fire in the Liver, KI 3 replaced BL 18 for cases of Liver and Kidney Yin deficiency, and ST 36 replaced LI 4 for cases of Qi and Blood deficiency. SP 6 was added for all patients with menstrual disorders. In these authors’ earlier study,66 BL 20 replaced BL 18 for cases of Qi and Blood deficiency and TE 5 was added for cases of an “oppressive feeling in the chest.” Front and back points were treated for 20-30 minutes on alternate days, with patients receiving either 3-4 courses of 30 daily treatments66 or 1-7 courses of 10 daily treatments.67 The E-RFR and lymphoblast transformation rate of patients with mammary hyperplasia were significantly below that of healthy controls before treatment. Following treatment with acupuncture, both parameters were significantly elevated and not different from that of healthy controls.

Using “classical acupuncture,” Bianchi et al68 treated 10 patients for low back pain with 7 weekly treatments of 30 minutes each. Mitogen-induced T-lymphocyte proliferation was unchanged immediately following the 1st treatment, but it was significantly elevated following the 7th treatment. The b-endorphin concentration of blood mononuclear cells, which correlates with enhanced lymphocyte responses to mitogens, was also significantly elevated following the 7th treatment, but not after the 1st treatment. Wu61 observed a significant

**Table 5. Treatment of Cancer-Related Immunosuppression**

<table>
<thead>
<tr>
<th>Technique</th>
<th>Points</th>
<th>Immune Parameters Studied</th>
<th>Reference(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acupuncture</td>
<td>PC 6, LI 4, ST 36, CV 4</td>
<td>CD3+, CD4+/CD8+ ratio</td>
<td>61,62</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>PC 6, LI 4, ST 36, SP 6</td>
<td>CD3+, CD4+/CD8+ ratio</td>
<td>63</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>ST 36, LI 11, CV 6</td>
<td>Interleukin 2 levels, natural killer cell activity</td>
<td>64</td>
</tr>
<tr>
<td>Acupuncture plus herbal therapy</td>
<td>Not specified transformation</td>
<td>Lymphoblast</td>
<td>35</td>
</tr>
<tr>
<td>Acupuncture</td>
<td>ST 36 plus SP 6 or PC 6</td>
<td>Leukocyte phagocytosis</td>
<td>65</td>
</tr>
<tr>
<td>TCM acupuncture</td>
<td>ST 36, SP 6, PC 6, ST 34, LI 4, LI 11, points based on symptoms</td>
<td>E-rosette forming rate</td>
<td>15</td>
</tr>
<tr>
<td>TCM acupuncture</td>
<td>PC 6, ST 36, points based on symptoms</td>
<td>E-rosette forming rate</td>
<td>16</td>
</tr>
</tbody>
</table>

**Table 6. Signs and Symptoms That Respond Favorably to Acupuncture**

- Chemotherapy-induced nausea and vomiting
- Cancer-related pain
- Cancer-related dyspnea
- General symptoms resulting from cancer therapies
  - Fatigue
  - Insomnia
  - Diarrhea
  - Anorexia
- Radiotherapy-induced xerostomia
- Postsurgical brachial plexopathy
- Treatment-related vasomotor symptoms
elevation of the b-endorphin concentration in plasma, which correlates with that in mononuclear cells, following acupuncture treatments in patients with cancer.

Zhang et al investigated the impact of acupuncture on suppression of NK cell activity that follows epidural injection of morphine. Eighteen patients undergoing cholecystectomy with epidural anesthesia were randomized to a control group to receive 1 mg of epidural morphine for postoperative relief, or to receive 1 mg of epidural morphine plus a 1-hour acupuncture treatment using ST 36, SP 6, LI 4, and PC 6. An electric current (6 Hz and 25 Hz) was applied to the points on the right side. NK cell activities were determined immediately preoperatively and on the 1st, 3rd, and 7th postoperative day. Compared with normal values, patients in all 3 groups showed decreased NK cell activities before operation. On the 1st and 3rd postoperative days, NK cell activities were below preoperative levels in all 3 groups, with the least depression observed in the acupuncture group and the greatest observed in the epidural morphine group. On the 7th postoperative day, NK cell activity in the control and acupuncture groups were near their preoperative values whereas that of the epidural morphine group was still markedly depressed.

CONCLUSION

Interest in the use of acupuncture and evidence documenting its efficacy for treating cancer-related symptoms and therapy-induced adverse effects have increased steadily during the past few decades. In 1997, the National Institutes of Health Consensus Development Panel on Acupuncture, which reviewed literature produced from January 1970-October 1997, concluded that there is evidence that acupuncture is effective for the treatment of chemotherapy-induced nausea and vomiting. The panel further concluded that promising results have emerged for the efficacy of acupuncture in postoperative dental pain and that it may be useful for treatment of certain other painful conditions although cancer-related pain was not mentioned. The results of studies presented herein suggest that acupuncture may be less effective for management of cancer-related pain than it is for other painful conditions. Other investigations reviewed above suggest that acupuncture is useful for treating a variety of cancer-related conditions (Table 6).

As part of an effort to encourage further research that has the potential to improve the quality of life for individuals with cancer and/or HIV/AIDS, the National Center for Complementary and Alternative Medicine released a request for applications (RFA-AT-01-002, January 16, 2001) entitled “Complementary/Alternative Medicine (CAM) at the End of Life for Cancer and/or HIV/AIDS.” The grant, to fund research over 4 years for a total of approximately $9 million, resulted in the submission of several applications to investigate acupuncture as the sole CAM modality and other applications that incorporated acupuncture into a more broad-based holistic approach. Certainly, efforts such as these will further our knowledge of the benefits of acupuncture for individuals with cancer.

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