Cancer Surgery

The surgical removal of the primary tumor has been the cornerstone of treatment for the great majority of cancers. The rationale for this approach is straightforward: if you can get rid of the cancer by simply removing it from the body, then a cure can likely be achieved. Unfortunately, this approach does not take into account that after surgery the cancer will frequently metastasize (spread to different organs). Quite often the metastatic recurrence is far more serious than the original tumor. In fact, for many cancers it is the metastatic recurrence—and not the primary tumor—that ultimately proves to be fatal.¹

In a shocking irony, a growing body of scientific evidence has revealed that cancer surgery can increase the risk of metastasis.² This would fly in the face of conventional medical thinking, but the facts are undeniable.

To gain a better understanding of how surgery can increase the risk of metastasis, let’s first discuss the actual process of cancer metastasis. A complicated sequence of events must occur in order for cancer to spread to another part of the body.² Isolated cancer cells that break away from the primary tumor must first breach the connective tissue immediately surrounding the cancer. Once the cancer cell has broken free of the surrounding connective tissue, the next step is to enter a blood or lymphatic vessel. This is easier said than done, as entry into a blood vessel requires the cancer cell to secrete enzymes that degrade the basement membrane of the blood vessel.³ Entry into a blood vessel is vitally important for the aspiring metastatic cancer cell, since it uses the bloodstream as a highway for transportation to other vital organs of the body—such as the liver, brain, or lungs—where it can form a new deadly tumor.

Now that the lone cancer cell has finally entered the bloodstream, its problems have only just begun. Traveling within the bloodstream can be a hazardous journey for cancer cells. Turbulence from the fast moving blood can damage and destroy the cancer cell. Furthermore, cancer cells must avoid detection and destruction from white blood cells circulating in the blood stream. To complete its voyage, the rogue cancer cell must adhere to the lining of the blood vessel, where it degrades through and exits the basement membrane of the blood vessel. Its final task is to burrow through the surrounding connective tissue to arrive at the organ that is its final destination. Now the cancer cell can multiply and form a growing colony that serves as the foundation for a new metastatic cancer. Time is working against these solitary cancer cells. This entire sequence of events must happen quickly, since these cells have a limited life span.¹

We now see that cancer metastasis is a complicated and difficult process. Fraught with peril, very few free-standing cancer cells survive this arduous journey.² The probability of cancer cells surviving this journey and forming new metastases can be increased by anything that serves to make this process easier.

In a groundbreaking study published in the medical journal Annals of Surgery in 2009, researchers reported that cancer surgery itself can create an environment in the body that greatly lessens the obstacles to metastasis that cancers cells must normally face.² Just as concerning is the revelation that cancer surgery can produce an alternate route of metastasis that bypasses natural barriers. During cancer surgery, the removal of the tumor almost always disrupts the structural integrity of the tumor and/or the blood vessels feeding the tumor. This can lead to an unobstructed dispersal of cancer cells into the bloodstream, or seeding of these cancer cells directly into the chest or abdomen.⁴⁻⁷ This surgery-induced “alternate route” can greatly simplify the path to metastasis.

To illustrate, a study published in the British Journal of Cancer in 2001 compared the survival of women with breast cancer who had their tumors removed surgically, to the survival of women with breast cancer who did not have surgery. As expected, the findings established that surgery substantially improved survival in the early years. However, further analysis of the data determined that women who had surgery had a spike in their risk of death at eight years that was not evident in the group who did not have surgery.⁸ In their interpretation of the results, the authors of the study stated: “A reasonable hypothesis to explain the observed patterns of the hazard functions [risk of cancer death] is to assume that…primary tumor removal may result in sudden acceleration of metastatic process…”

Another group of researchers commenting on a study examining the surgical treatment of colon cancer were far bolder in their conclusions: “This finding strongly supports that surgery alters the natural course of the disease by elongating life expectancy in the greater part of the patient population, but also by simultaneously shortening survival in a smaller subset of patients. Thus, both
such as in a similar experiment, mice injected with melanoma cancer cells that were fed modified citrus pectin experienced a greater than 90% reduction in lung metastasis compared to the control group. Even more noteworthy was the finding that the modified citrus pectin group had an 89% reduction in the size of the metastatic colonies, compared to the control group, whereas only 50% of the modified citrus pectin group experienced lung metastasis. Modified citrus pectin can also inhibit circulating tumor cells from latching onto the lining of blood vessels. This was demonstrated by an experiment in which modified citrus pectin blocked the adhesion of galectin-3 to the lining of blood vessels by an astounding 95%. Modified citrus pectin also substantially decreased the adhesion of breast cancer cells to the blood vessel walls.

Impressive research has documented the power of modified citrus pectin to directly inhibit cancer metastasis. In a study published in the Journal of the National Cancer Institute, modified citrus pectin was administered to rats that were injected with prostate cancer cells, while rats not receiving modified citrus pectin served as the control group. Lung metastasis was noted in 93% of the control group, whereas only 50% of the modified citrus pectin group experienced lung metastasis. Even more noteworthy was the finding that the modified citrus pectin group had an 89% reduction in the size of the metastatic colonies, compared to the control group. In a similar experiment, mice injected with melanoma cancer cells that were fed modified citrus pectin experienced a greater than 90% reduction in lung metastasis compared to the control group.

After these exciting findings in animal research, modified citrus pectin was then put to the test in men with prostate cancer. In this trial, 10 men with recurrent prostate cancer received modified citrus pectin (14.4 g per day). After one year, a considerable increase in cancer cell adhesion.9 Cancer cells that have broken away from the primary tumor utilize adhesion to boost their ability to form metastases in distant organs. These cancer cells must be able to clump together and form colonies that can expand and grow. It is unlikely that a single cancer cell will form a metastatic tumor, just as one person is unlikely to form a thriving community. Cancer cells use adhesion molecules—such as galectin-3—to facilitate their ability to clump together. Present on the surface of cancer cells, these molecules act like velcro by allowing free-standing cancer cells to adhere to each other.10 Cancer cells circulating in the bloodstream also make use of galectin-3 surface adhesion molecules to latch onto the lining of blood vessels.11 The adherence of circulating tumor cells (CTC) to the blood vessel walls is an essential step for the process of metastasis. Just like a person sliding down an icy hill has no hope of stopping if they cannot grab onto something, a cancer cell that cannot adhere to the blood vessel wall will just continue to wander through the bloodstream incapable of forming metastases. Unable to latch onto the wall of the blood vessel, these circulating tumor cells become like “ships without a port” and are unable to dock. Eventually, white blood cells circulating in the bloodstream will target and destroy the CTC. If the CTC successfully bind to the blood vessel wall and burrow their way through the basement membrane, they will then utilize galectin-3 adhesion molecules to adhere to the organ to form a new metastatic cancer.

One mechanism by which surgery increases the risk of metastasis is by enhancing cancer cell adhesion.9 Cancer cells that have broken away from the primary tumor utilize adhesion to boost their ability to form metastases in distant organs. These cancer cells must be able to clump together and form colonies that can expand and grow. It is unlikely that a single cancer cell will form a metastatic tumor, just as one person is unlikely to form a thriving community. Cancer cells use adhesion molecules—such as galectin-3—to facilitate their ability to clump together. Present on the surface of cancer cells, these molecules act like velcro by allowing free-standing cancer cells to adhere to each other.10 Cancer cells circulating in the bloodstream also make use of galectin-3 surface adhesion molecules to latch onto the lining of blood vessels.11 The adherence of circulating tumor cells (CTC) to the blood vessel walls is an essential step for the process of metastasis. Just like a person sliding down an icy hill has no hope of stopping if they cannot grab onto something, a cancer cell that cannot adhere to the blood vessel wall will just continue to wander through the bloodstream incapable of forming metastases. Unable to latch onto the wall of the blood vessel, these circulating tumor cells become like “ships without a port” and are unable to dock. Eventually, white blood cells circulating in the bloodstream will target and destroy the CTC. If the CTC successfully bind to the blood vessel wall and burrow their way through the basement membrane, they will then utilize galectin-3 adhesion molecules to adhere to the organ to form a new metastatic cancer.
improvement in cancer progression was noted, as determined by a reduction of the rate at which the prostate-specific antigen (PSA) level increased.16 This was followed by a study in which 49 men with prostate cancer of various types were given modified citrus pectin for a four-week cycle. After two cycles of treatment with modified citrus pectin, 22% of the men experienced a stabilization of their disease or improved quality of life; 12% had stable disease for more than 24 weeks. The authors of the study concluded that "MCP (modified citrus pectin) seems to have positive impacts especially regarding clinical benefit and life quality for patients with far advanced solid tumor."17

Please remember that these prostate cancer study subjects already suffered from advanced disease. It would appear more logical if these patients had initiated modified citrus pectin supplementation before surgical procedures to prevent metastatic colonies from being established, as was done in the successful laboratory studies.

In addition to modified citrus pectin, a well-known over-the-counter medication can also play a pivotal role in reducing cancer cell adhesion. Cimetidine—commonly known as Tagamet®—is a drug historically used to alleviate heartburn. A growing body of scientific evidence has revealed that cimetidine also possesses potent anti-cancer activity. Cimetidine inhibits cancer cell adhesion by blocking the expression of an adhesive molecule—called E-selectin—on the surface of cells lining blood vessels.15 Cancers cells latch onto E-selectin in order to adhere to the lining of blood vessels.18 By preventing the expression of E-selectin, cimetidine significantly limits the ability of cancer cell adherence to the blood vessel walls. This effect is analogous to removing the velcro from the blood vessels walls that would normally enable circulating tumor cells to bind.

Cimetidine’s potent anti-cancer effects were clearly displayed in a report published in the British Journal of Cancer in 2002. In this study, 64 colon cancer patients received chemotherapy with or without cimetidine (800 mg per day) for one year. The 10-year survival for the cimetidine group was almost 90%. This is in stark contrast to the control group, which had a 10-year survival of only 49.8%. Remarkably, for those patients with a more aggressive form of colon cancer, the 10-year survival was 85% in those treated with cimetidine compared to a dismal 23% in the control group.19 The authors of the study concluded, "Taken together, these results suggested a mechanism underlying the beneficial effect of cimetidine on colorectal cancer patients, presumably by blocking the expression of E-selectin on vascular endothelial [lining of blood vessels] cells and inhibiting the adhesion of cancer cells." These findings were supported by another study with colorectal cancer patients wherein cimetidine given for just seven days at the time of surgery increased three-year survival from 59% to 93%.20

This data provides a compelling case for cancer patients, at least five days prior to surgery, to ingest at least 14 grams of modified citrus pectin and 800 mg of cimetidine daily. This combination regimen may be followed for a year or longer to reduce metastatic risk.
PREVENTING SURGERY-INDUCED IMMUNE SUPPRESSION

The essential role the immune system plays in combating cancer cannot be overstated. Although there are many aspects of the immune system that come into play when fighting cancer, the role of the natural killer cell predominates. Natural killer (NK) cells are a type of white blood cell tasked with seeking out and destroying cancer cells. Research has shown that NK cells can spontaneously recognize and kill a variety of cancer cells.\(^{21}\)

To illustrate the importance of NK cell activity in fighting cancer, a study published in the journal Breast Cancer Research and Treatment examined NK cell activity in women shortly after surgery for breast cancer. The researchers reported that low levels of NK cell activity were associated with an increased risk of death from breast cancer.\(^{22}\) In fact, reduced NK cell activity was a better predictor of survival than the actual stage of the cancer. In another alarming study, individuals with reduced NK cell activity before surgery for colon cancer had a 350% increased risk of metastasis during the following 31 months.\(^{23}\)

The likelihood of surgery-induced metastasis requires the immune system to be highly active and vigilant in seeking out and destroying renegade cancer cells during the perioperative period (the time immediately before and after surgery). Tragically, numerous studies have documented that cancer surgery results in a substantial reduction in NK cell activity.\(^{6,7,24,25}\) In an investigation having ominous implications, NK cell activity in women having surgery for breast cancer was reduced by over 50% on the first day after surgery.\(^{24}\) In light of this mounting evidence, a group of researchers stated: “We therefore believe that shortly after surgery, even transitory immune dysfunction might permit neoplasms [cancer] to enter the next stage of development and eventually form sizable metastases.”\(^{27}\)

The surgical procedure itself reduces NK activity. This NK cell-impairing effect that occurs immediately after surgery could not happen at a worse possible time. NK cell activity falters when it is most needed to fight metastasis. The surgery-induced increased risk of metastasis combined with a reduction in NK cell activity can have disastrous consequences for the person undergoing cancer surgery. With that said, the perioperative period presents a window of opportunity to actively strengthen immune function by enhancing NK cell activity. Fortunately, numerous nutraceutical, pharmaceutical, and medical interventions known to enhance NK cell activity are available to the person undergoing cancer surgery.

One prominent natural supplement that can increase NK cell activity is PSK, (protein-bound polysaccharide K) a specially prepared extract from the mushroom Coriolus versicolor. PSK has been shown to enhance NK cell activity in multiple studies.\(^{26-29}\) PSK’s ability to enhance NK cell activity helps to explain why it has been shown to dramatically improve survival in cancer patients. For example, 225 patients with lung cancer received radiation therapy with or without PSK (3 grams per day). For those with more advanced Stage 3 cancers, more than three times as many individuals taking PSK were alive after five years (26%), compared to those not taking PSK (8%). PSK more than doubled five-year survival in those individuals with less advanced Stage 1 or 2 disease (39% vs.17%).\(^{30}\)

A group of colon cancer patients were randomized to receive chemotherapy alone or chemotherapy plus PSK, which was taken for two years. The group receiving PSK had an exceptional 10-year survival of 82%. Sadly, the group receiving chemotherapy alone had a 10-year survival of only 51%.\(^{31}\) In a similar trial reported in the British Journal of Cancer in 2004, colon cancer patients received chemotherapy alone or combined with PSK (3 grams per day) for two years. In the group with a more dangerous Stage 3 colon cancer, the five-year survival was 75% in the PSK group. This compared to a five-year survival of only 46% in the group receiving chemotherapy alone.\(^{32}\) Research has confirmed that PSK also improves survival in cancers of the breast, stomach, esophagus, and uterus.\(^{33-36}\)

Other nutraceuticals that have been documented to increase NK cell activity are garlic, glutamine, IP6 (inositol hexaphosphate), AHCC (active hexose correlated compound), and lactoferrin.\(^{37-41}\) One experiment in mice with breast cancer found that glutamine supplementation resulted in a 40% decrease in tumor growth paired with a 2.5-fold increase in NK cell activity.\(^{40}\)

Scientists in Germany explored the effects of mistletoe extract on NK cell activity in 62 patients undergoing surgery for colon cancer. The participants were randomized to receive an intravenous infusion of mistletoe extract immediately before they were given general anesthesia, or were given general anesthesia alone. Measurements of NK cell activity were taken before and 24 hours after surgery. As expected, the group that did not receive mistletoe experienced a 44% reduction in NK cell activity 24 hours after surgery. Interestingly, the scientists reported that the group receiving mistletoe did not experience a significant decrease in NK cell activity after surgery. They went on to conclude that “perioperative infusion of mistletoe extracts can prevent a suppression of NK cell activity in cancer patients.”\(^{42}\)

Pharmaceuticals used to increase NK cell activity include interferon-alpha and granulocyte-macrophage colony-stimulating factor. These drugs were shown to prevent surgery-induced immune suppression when given perioperatively.\(^{43,44}\) Another immune boosting drug to consider in the perioperative setting may be interleukin-2.\(^{45}\)
Unlike chemotherapy, which can cause severe side effects and was administered to mice with stomach cancer. The results of the study concluded that tumor by 38%. Remarkably, EGCG decreased the expression of VEGF in cancer cells by an astounding 80%! The authors of the study concluded “EGCG inhibits the growth of gastric cancer by reducing VEGF production and angiogenesis, and is a promising agent for successful metastasis since tumors cannot grow beyond the size of a pinhead (i.e., 1-2mm) without expanding their blood supply.”

In a landmark study reported in 2003, 567 individuals with colon cancer were randomized to receive surgery alone, or surgery combined with vaccines derived from their own cancer cells. The median survival for the cancer vaccine group was over 7 years, compared to the median survival of 4.5 years for the group receiving surgery alone. The five-year survival was 66.5% in the cancer vaccine group, which dwarfed the 45.6% five-year survival for the group receiving surgery alone. This glaring difference in five-year survival clearly displays the power of individually-tailored cancer vaccines to greatly focus a person’s own immunity to target and attack residual metastatic cancer cells.

**CANCER SURGERY, ANGIOGENESIS, AND METASTASIS**

Cancers employ a clever strategy in their quest to grow and thrive within the body. Angiogenesis is the process by which new blood vessels are formed from pre-existing blood vessels. The formation of new blood vessels is a normal and necessary process for childhood growth and development, as well as for wound healing. Unfortunately, cancers hijack this otherwise normal process in order to increase blood supply to the tumor. The formation of new blood vessels supplying the tumor is an absolute requirement for successful metastasis since tumors cannot grow beyond the size of a pinhead (i.e., 1-2mm) without expanding their blood supply.49,50

It might be surprising to learn that the presence of the primary tumor serves to inhibit the growth of metastatic cancer elsewhere in the body. The primary tumor produces anti-angiogenic factors which restrict the growth of metastases.51-54 These anti-angiogenic factors inhibit the formation of new blood vessels to potential sites of metastasis. Regrettably, the surgical removal of the primary cancer also results in the removal of these anti-angiogenic factors, and the growth of metastasis is no longer inhibited. With these restrictions lifted, it is now easier for small sites of metastatic cancer to attract new blood vessels that promote their growth.55 Indeed, these concerns were voiced by researchers who declared that “…removal of the primary tumor might eliminate a safeguard against angiogenesis and thus awaken dormant metastatic cancer cells.77

As if the loss of angiogenic inhibition by the primary tumor were not enough of a problem, it turns out the surgery causes another angiogenic predicament. After surgery, levels of factors that increase angiogenesis—also known as vascular endothelial growth factor (VEGF)—are significantly elevated. This can result in an increased formation of new blood vessels supplying areas of metastatic cancer. A group of scientists summarized this research quite well when they asserted that “after surgery, the angiogenic balance of pro- and antiangiogenic factors is shifted in favor of angiogenesis to facilitate wound healing. Especially levels of vascular endothelial growth factor (VEGF) are persistently elevated. This may not only benefit tumor recurrence and the formation of metastatic disease, but also result in activation of dormant micrometastases.”

Given the metastatic cancer’s need for an expanding blood supply, inhibition of angiogenesis would certainly be an integral part of a comprehensive strategy to combat surgery-induced metastasis. To that end, various nutrients have been shown to inhibit VEGF. These include soy isoflavones (genistein), silybinin (a component of milk thistle), chrysin, epigallocatechin gallate (EGCG) from green tea, and curcumin.56-62

In one experiment, EGCG—the active constituent of green tea—was administered to mice with stomach cancer. The results demonstrated that EGCG reduced the tumor mass by 60%, while also reducing the concentration of blood vessels feeding the tumor by 38%. Remarkably, EGCG decreased the expression of VEGF in cancer cells by an astounding 80%! The authors of the study concluded “EGCG inhibits the growth of gastric cancer by reducing VEGF production and angiogenesis, and is a promising agent for successful metastasis since tumors cannot grow beyond the size of a pinhead (i.e., 1-2mm) without expanding their blood supply.”

**HEIGHTENING IMMUNE SURVEILLANCE WITH CANCER VACCINES**

An enlightened medical approach to cancer treatment involves the use of cancer vaccines. The concept is the same as using vaccines for infectious diseases, except that tumor vaccines target cancer cells instead of a virus. Another distinguishing feature of tumor vaccines is that while viral vaccines are created from a generic virus, tumor vaccines are autologous, that is, they are produced from a person’s own cancer cells removed during surgery. This is a critical distinction since there can be considerable genetic differences between cancers. This highly individualized cancer vaccine greatly amplifies the ability of the immune system to identify and target any residual cancer cells present in the body. Cancer vaccines provide the immune system with the specific identifying markers of the cancer that can then be used to mount a successful attack against metastatic cancer cells.

Autologous cancer vaccines have been studied extensively, with the most encouraging results noted in randomized, controlled clinical trials including more than 1,300 colorectal cancer patients in which tumor vaccines were given after surgery. These trials reported reduced recurrence rates and improved survival.46 Unlike chemotherapy, which can cause severe side effects and toxicity, cancer vaccines are a gentle therapy with proven long-term safety.47

In a landmark study reported in 2003, 567 individuals with colon cancer were randomized to receive surgery alone, or surgery combined with vaccines derived from their own cancer cells. The median survival for the cancer vaccine group was over 7 years, compared to the median survival of 4.5 years for the group receiving surgery alone. The five-year survival was 66.5% in the cancer vaccine group, which dwarfed the 45.6% five-year survival for the group receiving surgery alone.48 This glaring difference in five-year survival clearly displays the power of individually-tailored cancer vaccines to greatly focus a person’s own immunity to target and attack residual metastatic cancer cells.
In the evaluation of the research pertaining to curcumin’s anti-angiogenic effects, researchers at Emory University School of Medicine noted that “Curcumin is a direct inhibitor of angiogenesis and also downregulates various proangiogenic proteins like vascular endothelial growth factor... Additionally, the scientists remarked, “Cell adhesion molecules are upregulated in active angiogenesis and curcumin can block this effect, adding further dimensions to curcumin’s antiangiogenic effect.” In conclusion, they commented that “Curcumin’s effect on the overall process of angiogenesis compounds its enormous potential as an antiangiogenic drug.”

Five days prior to surgery, the patient may consider supplementing with standardized green tea extract, curcumin, soy genistein extract and other nutrients that suppress VEGF and thus may help protect against angiogenesis.

THE CHOICE OF SURGICAL ANESTHESIA CAN INFLUENCE METASTASIS

The conventional medical approach to surgical anesthesia has been the use of general anesthesia during surgery, followed by intravenous morphine after surgery for pain control. The conventional approach, however, may not be the optimal approach for preventing surgery-induced metastasis. The use of morphine directly after surgery poses significant problems. At a time when immune function is already suppressed, morphine further weakens the immune system by diminishing NK cell activity. Surgical anesthesia has also been shown to weaken NK cell activity. One study found that morphine increased angiogenesis and stimulated the growth of breast cancer in mice. The researchers concluded: “These results indicate that clinical use of morphine could potentially be harmful in patients with angiogenesis-dependent cancers.”

Given the inherent problems associated with the use of morphine and anesthesia, researchers have explored other approaches to surgical anesthesia and pain control. One novel approach is the use of conventional general anesthesia combined with regional anesthesia, which refers to anesthesia that only affects a specific part of the body. The benefits achieved with this approach are two-fold: the use of regional anesthesia reduces the amount of general anesthesia required during surgery, as well as decreasing the amount of morphine needed after surgery for pain control.

This elegant approach to surgical anesthesia and pain control has been validated in scientific studies. In one experiment, cancerous mice received surgery with general anesthesia alone or combined with regional anesthesia. The scientists reported that the addition of regional anesthesia to general anesthesia “markedly attenuates the promotion of metastasis by surgery.” Regional anesthesia reduced 70% of the metastasis-promoting effects of surgery caused by general anesthesia alone.

Doctors at Pennsylvania State University College of Medicine compared NK cell activity in patients receiving general or regional anesthesia for abdominal surgery. NK cell activity dropped substantially in the general anesthesia group, while NK cell activity was preserved at pre-operative levels in the group that received regional anesthesia. Building upon these encouraging findings, researchers then explored if regional anesthesia can affect metastasis in women undergoing surgery for breast cancer. In a pioneering study, 50 women having breast cancer surgery with general anesthesia combined with regional anesthesia were compared to 79 women who received general anesthesia during their breast cancer surgery followed by morphine for pain control. The type of regional anesthesia used is called a paravertebral block, which involves the injection of a local anesthetic around the spinal nerves between the vertebral bones of the spine. After a follow-up period of nearly three years, dramatic differences were noted between the two groups. Only 6% of patients who received regional anesthesia experienced a recurrence, compared to a 24% risk of metastatic recurrence in the group that did not receive regional anesthesia. Stated differently, women who received regional and general anesthesia had a 75% decreased risk for metastatic cancer. These findings led researchers to proclaim that regional anesthesia for breast cancer surgery “markedly reduces the risk of recurrence or metastasis during the initial years following surgery.”

Surgeons at Duke University Medical Center compared regional anesthesia alone to general anesthesia in women having surgery for breast cancer. The surgeons reported that while 39% of the general anesthesia group required medication for nausea and vomiting, only 20% of the regional anesthesia group needed this medication. Narcotic medication was needed for pain control after surgery in 98% of the general anesthesia group, compared to only 25% of the regional anesthesia group. And 96% of the women receiving regional anesthesia had returned home within a day after surgery, compared with 76% of the women who received general anesthesia. The surgeons concluded that regional anesthesia “can be used to perform major operations for breast cancer with minimal complications... Most importantly, by reducing nausea, vomiting, and surgical pain, paravertebral block [regional anesthesia] markedly improves the quality of operative recovery for patients who are treated for breast cancer and therefore provides the patient with the choice to return home as early as desired after surgery.”

The results of these studies have vast implications for those undergoing cancer surgery, as a group of researchers enthusiastically announced: “As regional techniques [anesthesia]... are easy to implement, inexpensive, and do not pose a threat greater than general anesthesia, it would be easy for anesthesiologists to implement them, thus reducing the risk of disease recurrence and metastasis.”
Finally, those requiring morphine for pain control after surgery can consider asking their doctor for a medication called tramadol instead. Unlike morphine, tramadol does not suppress immune function. On the contrary, tramadol has been shown to stimulate NK cell activity. In one experiment, tramadol blocked the formation of lung metastasis induced by surgery in rats. Tramadol also prevented the surgery-induced suppression of NK cell activity.
Cancer Surgery

LESS INVASIVE SURGERY REDUCES RISK OF METASTASIS

Surgery places an enormous physical stress upon the body. There is considerable scientific evidence supporting that surgeries that are less invasive—and therefore less traumatic—pose less risk of metastasis, compared to more invasive and traumatic surgery. Laparoscopic surgery is one type of minimally invasive surgery, in which operations in the abdomen, pelvis, and other regions are performed through small incisions, as compared to the much larger incisions needed in traditional “open” surgeries.

A study published in the prestigious medical journal *The Lancet* compared laparoscopic to open surgery to remove part of the colon (colectomy) in patients with colon cancer. In contrast to the group receiving traditional open surgery, the laparoscopic surgery group had a 61% decreased risk of cancer recurrence coupled with a 62% decreased risk of death from colon cancer. The surgeons concluded that laparoscopic colectomy is more effective than open colectomy for treatment of colon cancer as assessed by tumor recurrence and cancer-related survival. A long-term follow-up of these patients (median time 95 months) reported a 56% decreased risk of death from colon cancer for laparoscopic surgery as compared to traditional open surgery. Another comparison of laparoscopic surgery to open surgery for colon cancer reported a five-year survival rate of 64.1% for the laparoscopic group, and a five-year survival rate of 58.5% for the group receiving open surgery.

Minimally invasive surgery has produced substantial improvements in survival for those with lung cancer. Video-assisted thoracoscopic surgery (VATS), a minimally invasive surgery, was compared to traditional open surgery for removing lung tumors (lobectomy). The five-year survival rate from lung cancer was 97% in the VATS group. This greatly contrasts the 79% five-year survival in the open surgery group.

Commenting on the use of minimally invasive surgery for lung cancer, surgeons at Cedars-Sinai Medical Center stated that minimally invasive surgery for lung cancer “…can be performed safely with proven advantages over conventional thoracotomy [chest surgery] for lobectomy: smaller incisions, decreased postoperative pain, decreased blood loss, better preservation of pulmonary function, and earlier return to normal activities… the evidence in the literature is mounting that VATS may offer reduced rates of complications and better survival.

ADMINISTERING CHEMO AND RADIATION THERAPIES PRIOR TO SURGERY

Doctors at the University of North Carolina School of Medicine studied the use of combined radiation and chemotherapy prior to surgery for individuals with esophageal cancer. Twenty-six patients received surgery alone, while 30 patients received radiation and chemotherapy followed by surgery. The group receiving combined treatment had a five-year survival of 39%, while the group treated with surgery alone experienced a five-year survival of only 16%.

A study published in the *New England Journal of Medicine* in 2006 compared treatment with surgery alone to treatment with chemotherapy—given both directly before and after surgery—in patients with stomach or esophageal cancer. The five-year survival for the group receiving surgery and chemotherapy was 36%, compared to a five-year survival of 23% in the group receiving surgery alone.

Research also supports the use of chemotherapy and radiation therapy during the critical perioperative period. In one study, 544 patients with stomach cancer received combined chemotherapy and radiation therapy shortly after surgery. Survival comparisons were made with a similar group of 446 patients with stomach cancer treated with surgery alone. Postoperative chemotherapy and radiation led to a dramatic improvement in survival. The group treated with surgery alone had a median survival of only 62.6 months, compared to a median survival of 95.3 months in the group receiving postoperative radiation and chemotherapy. A similar study also demonstrated improved survival with the use of postoperative radiation and chemotherapy compared to surgery alone.

INFLAMMATION AND METASTASIS

Cancer surgery causes an increased production of inflammatory chemicals, such as interleukin-1 and interleukin-6. These chemicals are known to increase the activity of cyclooxygenase-2 (COX-2). A highly potent inflammatory enzyme, COX-2 plays a pivotal role in promoting cancer growth and metastasis.

This was evident in an article appearing in the journal *Cancer Research* that found levels of COX-2 in pancreatic cancer cells to be 60 times greater than in normal pancreatic cells. Levels of COX-2 were 150 times higher in cancer cells from individuals with head and neck cancers compared to normal tissue from healthy volunteers. COX-2 fuels cancer growth by stimulating the formation of new blood vessels feeding the tumor. COX-2 increases cancer cell adhesion to the blood vessel walls, and also enhances the ability of cancer cells to metastasize. Experiments in mice revealed that colon cancer cells expressing high levels
The adverse influence of COX-2 on the growth and progression of cancer was clearly revealed in a study published in the journal Clinical Cancer Research in 2004. Two hundred eighty-eight individuals undergoing surgery for colon cancer had their tumors examined for the presence of COX-2. The findings were alarming—when other factors were controlled for, the group whose cancers tested positive for the presence of COX-2 had a 311% greater risk of death compared to the group whose cancers did not express COX-2. A subsequent study in lung cancer patients found that those with high tumor levels of COX-2 had a median survival of only 15 months, whereas those with low tumor levels of COX-2 had a median survival of 40 months.

Given these findings, researchers began investigating the anti-cancer effects of COX-2 inhibitor drugs. Although initially used for inflammatory conditions, such as arthritis, COX-2 inhibitor drugs have been shown to possess powerful anti-cancer activity. For example, 134 patients with advanced lung cancer were treated with chemotherapy alone or combined with Celebrex® (a COX-2 inhibitor). For those individuals with cancers expressing higher amounts of COX-2, treatment with Celebrex® dramatically prolonged survival. Treatment with Celebrex® also slowed cancer progression in men with recurrent prostate cancer.

Perhaps the most impressive display of the anti-metastatic effects of COX-2 inhibitor drugs was presented at the annual conference of the American Society of Clinical Oncology in 2008. In this study, the incidence of bone metastases in breast cancer patients who had taken a COX-2 inhibitor for at least six months following the diagnosis of breast cancer was compared to the incidence of bone metastases in breast cancer patients who had not taken a COX-2 inhibitor. Remarkably, those who were treated with a COX-2 inhibitor were almost 80% less likely to develop bone metastases than those who were not treated with a COX-2 inhibitor drug.

Non-steroidal anti-inflammatory drugs (NSAIDs), such as aspirin and ibuprofen, are COX inhibitors. The widespread use of NSAIDs for pain and arthritis has created an ideal environment in which to examine if these drugs can prevent cancer. Large-scale studies have documented a substantial reduction in cancer risk with the use of NSAIDs. A comprehensive review of the scientific literature reported that the long-term use of NSAIDs (primarily aspirin) produced risk reductions of 63% for colon cancer, 39% for breast cancer, 36% for lung cancer, 73% for esophageal cancer, 62% for stomach cancer, and 47% for ovarian cancer. “This review provides compelling… evidence that regular intake of NSAIDs that... block COX-2 protects against the development of many types of cancer,” the authors concluded.

A number of nutritional and herbal supplements are known to inhibit COX-2. These include curcumin, resveratrol, vitamin E, soy isoflavones (genistein), green tea (EGCG), quercetin, fish oil, garlic, feverfew, and silymarin (milk thistle).

Scientists at Memorial Sloan-Kettering Cancer Center in New York created an experimentally-induced increase in COX-2 activity in human breast cells, which was completely prevented by resveratrol. Resveratol blocked the production of COX-2 within the cell, as well as blocking COX-2 enzyme activity.

CONCLUSION

A group of noted experts in the field of surgery-induced metastasis stated that cancer treatment “necessitates the surgical excision of the primary tumor in order to relieve the patient of the major tumor burden, which is the main source of mutating and metastasizing cells. However, along with its obvious benefits, the surgical procedure has been suggested to involve serious hazards as it releases tumor cells into the circulation or lymphatics, promotes the secretion of angiogenic and growth factors, and induces suppression of CMI [immune function]. These consequences synergistically facilitate the establishment of new metastases and the development of preexisting micrometastases. As cancer-related death is most commonly the result of metastatic disease, it is crucial to minimize this facilitation.”

Remarking further, they commented that “Taken together, it is evident that the perioperative period harbors many risks; however, it is also the ideal time for battling MRD [small numbers of cancer cells remaining after surgery] to reduce recurrence and future metastases.” Thus, these scientists believe “it is essential to employ preventative interventions during this critical time.” Additionally, they urge that, “Ideally, each problematic aspect of surgery should be treated when oncological patients undergo resection [surgery] in order to minimize recurrence and metastatic spread.”

Armed with the knowledge discussed in this article, the person with cancer can reap all the benefits that cancer surgery offers, while simultaneously avoiding the metastatic perils imposed by this procedure.

If you have any question on the scientific content of this article, please call a Life Extension® Health Advisor at 1-866-864-3027.

LIFE EXTENSION FOUNDATION RECOMMENDATIONS
Note: these products are to be used for cancer recovery and preparation and not to prevent, cure or treat cancer.

Begin taking the following supplements at least 5 days prior to surgery, discontinue taking the supplements the day of the surgery, and resume taking the supplements one day after surgery (unless directed otherwise by your physician).

It is suggested to take these supplements for approximately one month after surgery.

- **Glutamine**: 3000 mg per day away from food
- **IP6** (inositol hexaphosphate): 1-3 grams per day
- **AHCC** (active hexose correlated compound): 3000 mg per day
- **Lactoferrin**: 300-900 mg per day
- **PSK** *(protein bound polysaccharide K (Coriolus))**: 3000 mg per day
- **Cimetidine**: 800 mg before bedtime
- **Modified Citrus Pectin**: 14-30 grams per day away from food
- **Soy isoflavones** *(genistein)*: 100-200 mg per day with food
- **Silibinin** *(component of milk thistle)*: 500-600 mg per day
- **Chrysin**: 1000 mg per day
- **Green Tea**: 650-1000 mg of EGCG per day
- **Curcumin**: BCM-95® extract: 400 mg per day with food OR 2500 mg per day of a regular curcumin supplement

Please Note: Different curcumin formulations will differ in their absorption and bioavailability. These differences in absorption can affect the suggested doses. For example, one type of curcumin — called BCM-95 — has studies documenting that 400 mg of BCM-95 curcumin compound can provide curcumin blood levels equal to ingesting 2,500–2,800 mg of regular curcumin supplements.

- **Resveratrol**: 20-25 mg before surgery; increase to 100-250 mg 2 weeks after surgery
- **Quercetin**: 500-1000 mg per day

**DUE TO BLOOD-THINNING EFFECTS, AVOID THE FOLLOWING SUPPLEMENTS FOR 2 WEEKS PRIOR TO SURGERY AND BEGIN TAKING 2 WEEKS AFTER SURGERY:**

- **Garlic**: 1200-2400 mg per day with food
- **Fish oil**: 4000 mg per day with food
- **Vitamin E**: 400-800 IU per day with food
- **Feverfew**: 250 mg per day

**PRESCRIPTION DRUGS:**

Pharmaceuticals prescribed prior to surgery depend on the status of the individual cancer patient. Patients with low white blood count are typically treated with granulocyte colony-stimulating growth (GCF) factors such as Neupogen® (300-480 micrograms per day) or Neulasta® (6 mg) which lasts 3 weeks. Other pharmaceutical compounds which have shown benefits for cancer patients undergoing surgery are interferon alpha and Interleukin 2.

- **Neupogen®**: 300-480 micrograms per day OR Neulasta®: 6 mg, which lasts 3 weeks
- **Interferon alpha**: 0.5 to 3 million IU
- **Interleukin 2**: 1 to 6 million IU

**CANCER SURGERY SAFETY CAVEATS**

Curcumin

- Do not take curcumin if you have a bile duct obstruction.
- Use during chemotherapy should only be performed under the direct supervision of a qualified medical professional.
- Curcuminoids may enhance the action of anti-platelet drugs and the effect of warfarin. If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product.
- High doses of curcumin may cause gastrointestinal irritation (e.g. upset stomach/diarrhea) in some individuals.
Glutamine

If you have significant kidney or liver disease, please consult your healthcare practitioner before using this product.

Coriolus mushroom

Do not use if allergic or hypersensitive to mushrooms.

Cimetidine

If you have significant kidney or liver disease, please consult your healthcare practitioner before using this product. If you are taking any other medications, consult your healthcare practitioner before using this product, as Cimetidine can interact with other medications.

Soy Isoflavones

Persons with estrogen dependent cancers should consult a healthcare professional before beginning taking soy isoflavones.

Chrysin

Men with existing prostate cancer may not be able to use this product. Do not take chrysin if you are taking an aromatase inhibitor drug, such as arimidex® (anastrozole), femara® (letrozole), or aromasin® (exemestane).

Resveratrol

If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product.

Garlic

If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product.

Fish oil

If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product.

Vitamin E

If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product.

Feverfew

If you are taking anti-coagulant or anti-platelet medications, or have a bleeding disorder, consult your healthcare provider before taking this product.

*These statements have not been evaluated by the Food and Drug Administration. These products are not intended to diagnose, treat, cure or prevent any disease.