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REPORT TO PHYSICIANS

APRIL 2009 VOL. 54, NO. 4

Oncology

Rebuilding What Cancer Has Ravaged

Harnessing the body's ability to regenerate tissue, cancer surgeons are repairing wounds that were once thought irreparable.

**NON-CIRCULATING
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A scanning electron micrograph image shows a cell that has anchored to an engineered biologic scaffold by means of nanofibrils. This 4-mm histologic section was obtained 2 weeks after the scaffold was implanted in the mesentery of a rat.

By Sunita Patterson

In the past, during tumor resections, surgeons had few options for repairing large torso wounds that were at high risk of infection. A cosmetically undesirable outcome—or even a permanent open wound requiring ongoing dressing changes—would sometimes be the best that could be offered.

For cancer patients who need such extensive repair, reconstructive surgeons now have a solution—one that builds on the success of tissue engineering in patients with severe burns. Similar to the way skin substitutes can replace patients' damaged skin and then prompt regeneration of new tissue, torso wounds can now be repaired with materials that not only resist infection but also encourage the patients' own bodies to regenerate musculofascial tissue. The University of Texas M. D. Anderson Cancer Center has been a leader in developing and testing this technique for tissue engineering in the torso.

Three basic elements are needed in tissue engineering, said Charles E. Butler, M.D., a reconstructive surgeon and professor in the Department of Plastic Surgery at M. D. Anderson. Those elements are (1) a matrix or scaffold that can serve as a support for the new tissue, (2) seed cells, and (3) substances such as growth factors, genetic material, or hormones that encourage the growth of the cells on the scaffold and their differentiation into specific tissue types. Dr. Butler's work with regenerative tissues began in the 1990s, when he developed combinations of matrices and cells that organize to form a structure very close to that of normal skin, with a dermal and epidermal layer. For the past 10 years at M. D. Anderson, he has been developing ways to use similar dermal matrices internally, for structural reconstruction.

Those techniques, alone and in combination with complex flap reconstruction techniques, are now benefiting patients with vertebral hernias; challenging chest wall, abdomen, and pelvic defects caused by tumor resections; and other cancer-related torso defects. Such wounds are difficult to close, are prone to infection, and were once considered impossible to repair without significant patient morbidity. (Continued on page 2)

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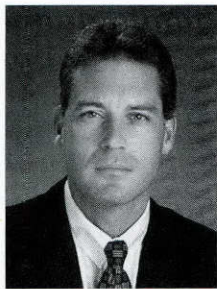
Rebuilding What Cancer Has Ravaged

(Continued from page 1)

A double-duty repair material

To repair structural defects in the torso, surgeons use a range of materials with high tensile strength. Synthetic surgical and prosthetic meshes, such as those made of knitted polypropylene or polytetrafluoroethylene, are common but have several limitations, the most important being an increased risk of infection.

Dr. Butler has had superior results with acellular dermal matrices, both human (HADM) and porcine (PADM). These commercially available materials are derived from



Dr. Charles E. Butler

porcine skin that has been decellularized and sterilized, leaving behind the extracellular matrix—a ubiquitous, nonspecific tissue matrix found in all mammals. Dr. Butler and others have found that in torso wound repair, such matrices can perform double duty as a repair material and as a scaffold. After HADM or PADM is placed in the body as part of a surgical repair, cells and blood vessels rapidly begin to grow onto it, and the matrix will recellularize and revascularize. Over time, it becomes integrated into the body's musculofascial tissue.

"This is true *in vivo* tissue engineering," Dr. Butler said. "The patient's body is the bioreactor. We place the matrix in, and the microenvironment that the matrix is in dictates what type of tissue it forms. The patient's own cells go in, blood vessels go in, and soon it all starts to function and look more like your own tissue. That's the fascinating thing about it. In fact, a year after surgical repair with HADM or PADM, it's hard to tell, even under a microscope, where the introduced regenerated matrix leaves off and the patient's own native tissues begin."

The benefits of a biologic scaffold

Through clinical follow-up, comparative studies in animal models, and histologic analysis of tissue biopsies, Dr. Butler and his colleagues have learned much about what works well in torso

repair, why it works, and how it might work better. In challenging cases, he has found several advantages to using biologic scaffolds—specifically, HADM and PADM—instead of synthetic mesh.

When synthetic mesh is placed into a contaminated wound, or if a wound breaks down and the mesh becomes exposed, it often gets infected and eventually needs to be removed. In contrast, Dr. Butler has found, the biologic matrices have an inherent resistance to infection, and if infection does occur, it is much easier to treat, almost always without an operative procedure. Thus, biologic matrices can be used when there is some degree of bacterial contamination of the wound or a risk of contamination. In fact, the biologic matrices are so resistant to infection that under some circumstances they can even be left exposed to the air and treated as open wounds. Dr. Butler has treated patients in whom the skin could not be closed over the biologic matrix reconstruction, so the wound was covered with a dressing—and even though the matrix was exposed, the wound healed on its own.

Another benefit of the biologic materials is that they have a propensity to resist adhesions to the bowel, a finding that Dr. Butler has verified in laboratory studies and published. Synthetic mesh, on the other hand, is seen by the body as a foreign object, so its components become encapsulated over time by abundant abnormal scar tissue. When synthetic mesh is used to repair wounds directly over the intestines, the scarring can cause adhesions that can twist the bowel, causing an obstruction or tearing a hole in the bowel wall and resulting in an abscess or fistula. The scarring and bowel adhesions can make reoperation even more difficult than the original surgery.

A reduced likelihood of infection and adhesions is important for patients treated at M. D. Anderson, because many have had breaches of the bowel, have open wounds because of large tumor resections, or are at a high risk of wound-healing complications because of immunosuppression, previous surgeries, or postsurgical radiation treatment. With HADM and PADM, Dr. Butler

has been able to perform torso reconstructions in many patients with such challenges—patients in whom surgery with synthetic mesh would be contraindicated. He recalled, for example, a patient treated for ovarian cancer who had an enterocutaneous fistula.

"She was living her life with a massive hernia and an ostomy bag, and no one was interested in operating on her because it was a contaminated wound with a large incisional hernia," Dr. Butler said. Using HADM, he was able to repair the musculofascial defect and the skin deficiency during the same operation, without complications. Similarly, he has seen patients with large ventral hernias that surgeons had refused to electively repair because of patient comorbidities or the extremely challenging nature of the defects. With the help of the biologic matrices and minimally invasive component separation (a technique that Dr. Butler pioneered), he has been able to repair those patients' wounds. "So we've been able to make a huge, positive impact on their lives," he said.

Making a good thing better

In 2005, Dr. Butler published a report on one of the first series of patients who were at high risk of mesh-related complications and underwent complex torso reconstructions using HADM. Recently, an updated study of the same group of 13 patients, now with a longer follow-up (a mean of 43.7 months for those who did not die of cancer), confirmed that HADM can be successfully used in challenging reconstructions in which previous radiation treatment, contact with viscera, or wound contamination is an issue.

In addition to this and other clinical investigations, Dr. Butler also is conducting laboratory studies. He's particularly interested in understanding how cells grow into the matrices to generate new tissue. "Where do the cells come from—the fascial edge, the subcutaneous fat, or the abdominal cavity?" he said. "How fast do they come in? How complete is the recellularization and revascularization? We want to know what's really going on so we can harness

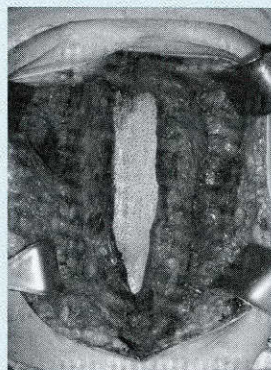
Using a Biologic Matrix to Repair a Large Torso Defect



1: A 53-year-old man with septic evisceration after colon surgery. His open abdominal wound had been treated with dressing changes for 6 months. A skin graft had then been placed over his abdominal viscera; the site subsequently had healed with a large ventral hernia.



2: The patient was referred to Dr. Butler for definitive reconstruction of his abdominal wall. The skin graft was meticulously dissected off the underlying bowel. As anticipated, a very large musculofascial defect and massive loss of domain were encountered.



3: After minimally invasive component separation, a surgical technique Dr. Butler developed, a tissue-derived biologic matrix (acellular dermal matrix) was carefully inset into the musculofascial defect using an inlay technique.



4: The biologic matrix reduced the tension on and reinforced the midline fascial closure. Unlike synthetic mesh, such matrices become remodeled by and incorporated into the patient's body with rapid recellularization and revascularization.



5: The patient 6 months after abdominal wall reconstruction. The surgery allowed complete removal of the skin graft and restoration of the normal abdominal contour. There was no recurrence of abdominal bulging or hernia.

and optimize this response.”

Dr. Butler is also interested in whether the recellularization and revascularization process can be enhanced. In a novel syngeneic rat model, he is studying whether strategically introducing adipose-derived stem cells improves the outcome. “We want to see whether the wounds heal faster or stronger or better, or whether the tissue holds its shape better in the long term,” he said. “I think there’s potential for cellular therapy to help compromised patients with a difficult wound or infection.”

A custom-designed scaffold from the lab

In a parallel research effort, Dr. Butler has been collaborating with Anshu Bagga Mathur, Ph.D., director of research for the Tissue Regeneration and Molecular Cell Engineering Labs and an assistant pro-



Dr. Anshu Bagga Mathur

fessor in the Department of Plastic Surgery, to create an even better scaffold material—one that can be customized to the wound site or patient.

“With the HADM or PADM, we can’t alter many of the inherent properties of tissue-derived matrix,” Dr. Butler explained. “It is what it is. We’d like to have greater control over the characteristics of the scaffold based on what type of reconstruction we need to do.”

In previous work, Dr. Mathur studied cell-substrate interactions—how a cell behaves and can be engineered when anchored to a surface or material—and the reformulation of silk fibers into matrices. At M. D. Anderson, she has combined those areas of research to develop a library of scaffolds that incorporate fibroin, the fibrous protein portion of the silk fiber, and chitosan, a glycosaminoglycan that mimics the biologic matrices. “Depending on how you combine the two components, you get different mechanical properties and a different microstructure,” Dr. Mathur said. The intent is to be able to pour the solution

This is true *in vivo* tissue engineering. Soon it all starts to function and look more like your own tissue.”

– Dr. Charles E. Butler

into a mold or manipulate its structure “from nanoscale to macroscale” by applying electrical forces so that the resulting scaffold has the nanostructure that the cells recognize and a macrostructure that is adapted to a patient’s specific geometric form.

Not only are the scaffolds customizable, but they also eliminate the need for harvesting material from a human or animal source. Dr. Mathur coined the name “engineered biologics” for the scaffolds. “They are biologically derived, but we’re engineering the structure (nano to macro),” she explained.

Dr. Mathur has been testing these scaffolds since 2004 in animal studies.

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Organ-Confined Prostate Cancer

Choosing Between Observation and Definitive Treatment Options

By **Sunni Hosemann**

Introduction

The natural history of prostate cancer tends to differ from that of many other cancers. The tumor usually grows slowly, and a decade or more can pass from when it is detected to when it causes problems. So, an early-stage prostate cancer in a man who is 85 years old may never affect his health. In fact, for men such as him, treating the cancer may take a greater toll than the cancer itself. Likewise, men in their 50s and in good health may wish to forestall treatment—and the potential side effects, discussed below—until the cancer poses a threat. Conversely, men of any age or health status may prefer to treat the cancer immediately rather than adopt a watch-and-wait approach.

Thus, men diagnosed with organ-confined prostate cancer face complex decisions that hinge on many factors: an accurate assessment of the risk posed by the cancer, a consideration of life expectancy, evaluation of comorbid conditions and general health, and personal priorities. And the decisions can be confusing: Watch and wait, or opt for treatment? And if treatment is chosen, which one is best?

Organ-confined prostate cancer in context

Prostate cancers are currently classified according to:

- the tumor's clinical stage (using the tumor-node-metastasis, or TNM, system), based on digital rectal examination and, when indicated, computed tomography of the abdomen and pelvis and/or a whole-body bone scan,
- the patient's serum prostate-specific antigen (PSA) level,
- the histologic/pathologic grade (Gleason score) assigned to biopsy specimens, and
- the percentage of biopsies that are positive for cancer as well as the volume of cancer contained within the positive biopsy samples.

Although stage, PSA level, and grade have some predictive value on their own, most specialists use the three variables in combination when assessing a cancer. The significance of each variable can be weighted and assigned in individual cases through the use of statistical models or nomograms to aid decision-making.

According to the National Comprehensive Cancer Network, the most widely used nomogram for prostate cancer incorporates stage, PSA level, and grade and assigns cancers to one of the following four categories (in order of progression):

- organ confinement
- extracapsular extension (extension outside the prostate)
- seminal vesicle invasion
- lymph node metastasis

Treatment choices

Observation

A prostate cancer must be organ-confined to be considered for any approach that delays treatment. Such approaches have been called “watchful waiting” and “expectant management,” but “active surveillance” or “delayed intervention” might be more accurate terms, as they indicate that men who opt for such a course should undergo regular re-evaluation and may eventually require treatment. Many physicians are more comfortable with a decision to delay treatment when they believe the patient will participate in regular monitoring or when the patient has other medical problems that are expected to cause his death within 10 years.

Monitoring includes PSA testing, digital rectal examination, and repeated biopsy of the prostate. The frequency of such tests is usually based on life expectancy, with a more aggressive schedule recommended for younger, healthier men. The idea is that should disease progression occur, any needed intervention would still be timely, though this remains to be proven safe and effective.

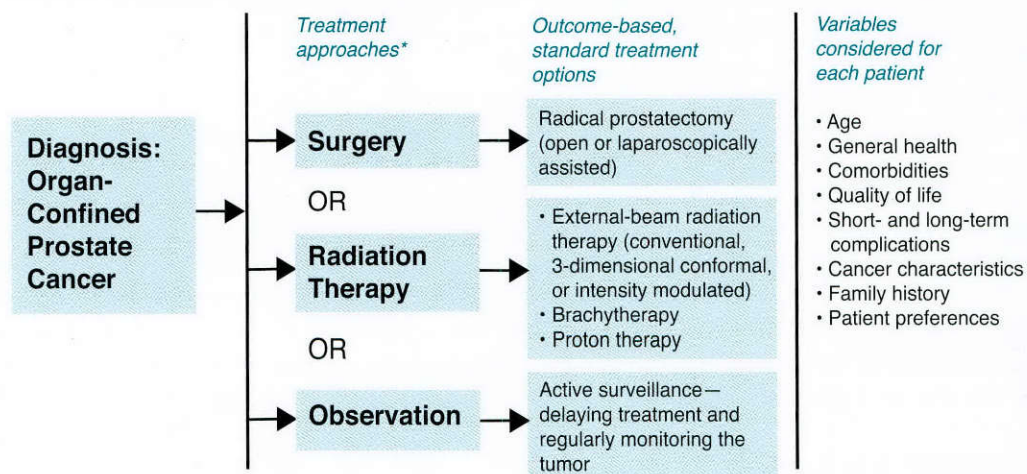
Changes may signal an increased risk of cancer progression and may indicate that treatment is needed. While firm criteria for disease progression have not been established, clinicians usually consider an increased grade on prostate biopsy, the appearance of a new nodule on digital rectal examination, a continued rise in PSA level over time, a PSA velocity greater than 0.75 (a doubling of PSA level in less than 3 years), or an increased volume of cancer on follow-up prostate biopsy to indicate progression and the need for treatment.

Surgery

Radical prostatectomy, whether done with open or laparoscopic (including robotic) surgery, is the gold standard for eradicating prostate cancer and therefore ranks high among the treatment options—especially for patients who are young and otherwise healthy, according to John F. Ward, M.D., an assistant professor in the Department of Urology.

However, radical prostatectomy is also associated with long-term erectile dysfunction and urinary incontinence. Approxi-

Organ-Confined Prostate Cancer: Primary Treatment Options



* Many emerging technologies for treating the entire prostate or just the prostate tumor are also available, frequently as part of a clinical trial. These include high-frequency ultrasonography, cryotherapy, and focal cryotherapy.

mately 30%–40% of men who undergo radical prostatectomy will experience erectile dysfunction, and 5%–10% will experience prolonged problems with urinary continence (although it is uncommon for any man to be left severely incontinent following surgery performed by experienced surgeons at a high-volume center). Whether nerves can be spared is an important factor. In approximately 75% of patients, one or both of the nerve bundles involved in erectile and urinary function can be spared. In others, sparing isn't possible because of either tumor involvement or anatomic reasons. Erectile function is preserved in up to 80% of men in whom both nerve bundles are spared, depending on age and pre-existing erectile function, and 30% of those with one nerve bundle spared are able to maintain erectile function.

Radiation

Radiation can be delivered through external beam therapy or brachytherapy. External beam radiation techniques include 3-dimensional (3-D) conformal and intensity modulated (IMRT) radiation therapies. Both techniques deliver focused radiation to the tumor so that higher doses can be used with reduced risk to surrounding tissues. Proton therapy is also available; this external technique uses positively charged particles to deliver radiation with a well-focused beam. External beam therapy is given in daily doses, 5 days per week, for about 7 1/2 weeks.

Brachytherapy for prostate cancer uses “seeds” implanted in the prostate that emit radiation; the seeds gradually lose their radioactivity and become inert. The seeds are inserted via a needle using general or spinal anesthesia. The insertion is a one-time, outpatient procedure.

Whether to use external beam therapy or brachytherapy is often a decision made between the physician and the patient, said Deborah A. Kuban, M.D., professor and chief of the Genitourinary Section in the Department of Radiation Oncology. Tumor characteristics, prostate size, and patient preferences are typically the factors considered.

Side effects of radiation therapy during treatment can include bladder and bowel irritation. Long-term incontinence is uncommon. Typically, erectile function is initially preserved, but it can decrease over time.

Other treatment options

Although not considered standard equivalents to surgery or radiation therapy, newer ablative treatments such as high-frequency ultrasonography, cryotherapy, and focal cryotherapy are also available. While cryotherapy may be offered outside a clinical trial, high-frequency ultrasonography and focal cryotherapy are considered investigational and should be performed as part of a clinical trial.

“The tools for delivering ablative heat and cold continue to improve, allowing us to deliver more accurate therapy,” Dr. Ward said. “However, for prostate cancer, current imaging doesn't allow us to see which part of the prostate is affected by the cancer—which is the reason for multiple biopsy sites—and therefore patients must be selected carefully for ablative treatments.”

Because of the long natural history of prostate cancer, studies must have at least 10 years of follow-up information to provide definitive answers about whether newer therapies should become standard. “That is partly why we have so many treatments and so few definitive answers. Right now, we are exploring these ablative energies to determine which can be safely applied with fewer side effects than surgery and radiation,” Dr. Ward said.

The decision

Observation or treatment?

An elderly man or one who is in poor health might be an obvious candidate for active surveillance. “However, more and more, we are seeing otherwise healthy younger men opt for active surveillance,” Dr. Kuban said. Those men want to delay potential untoward effects of treatment, particularly erectile

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dysfunction, for as long as possible. But some men who are good candidates for active surveillance do not find the option desirable. "There are men of all ages, including some who are older, who have an aversion to harboring a cancer and want it removed," Dr. Kuban said. Also, some patients perceive surveillance as demanding, particularly if an aggressive surveillance schedule is recommended. Finally, in studies comparing treatment to surveillance, some men who were initially assigned to receive surveillance later asked to undergo treatment for reasons other than disease progression, including anxiety associated with continued uncertainty.

According to Dr. Ward, wives and significant others can be a big factor in surveillance protocols—they, too, must be comfortable with the plan.

If treatment, which one?

Choosing between radiation and surgery—the potentially curative options—is more than a medical decision. "Quality of life is all-important here, and that is something that is very individual," Dr. Kuban said. The long-term consequences of treatments—namely, potential loss of erectile function and urinary incontinence—must be considered in light of the patient's lifestyle and the things that are important to him.

The importance of erectile function varies among men and does not necessarily correlate with age. There are men in their 70s and 80s, for example, who are in new marriages or relationships and who might place a higher value on erectile function than younger men in different life situations. "These are long conversations," Dr. Ward said of the discussions needed to fully examine a patient's priorities. "But if you want to do what's right for the patient, you must spend the time."

Nerve-sparing surgery greatly reduces but does not eliminate the risk of erectile dysfunction, and thus surgeons can't promise preserved erectile function to any man preoperatively. A "possibility" of preserved erectile function may not be good enough for a man for whom erectile function is a high priority. For others, just the possibility of preserved erectile function makes surgical removal of the tumor more attractive.

Incontinence is also intimately related to a man's lifestyle and what is important to him. Men who participate in sports are often particularly concerned about the risk of incontinence, as are men who are in new social situations or pursuing new relationships.

Therefore, when considering treatment options, patients must take into account a particular treatment's chances of eradicating the cancer as well as the associated long-term effects that can affect quality of life. This is why an objective multidisciplinary consultation involving a urologist and a radiation oncologist is invaluable—all issues can be discussed in detail and priorities can be weighed.

Some considerations are practical ones. For some men, the time available for treatment is a critical factor and a reason to opt for a one-time treatment—surgery or brachytherapy—rather than a course of external beam radiation therapy that may require 30–40 clinic visits over a period of weeks. Others simply like the idea of removing the cancerous organ.

Men who select radiation therapy give a variety of reasons for doing so. Some view radiation therapy as less invasive or feel that it has a gentler and more gradual impact on their health. Some select this therapy because they dislike the idea of surgery, anesthesia, or hospitalization.

One might think that having a choice of equivalent treatments for a cancer would be a good thing. But according to Dr. Kuban, there is a downside. "We used to think patients wanted us to give them all the options so they could make their own choices," she said. "But when we asked, they came across strongly saying, 'We want more direction.'"

Based on this feedback, M. D. Anderson opened its Multidisciplinary Prostate Cancer Clinic, where patients can meet with physicians from different specialties on the same day to discuss treatment options. Patient records and previous studies are evaluated by a team of physicians. The patient is examined by and meets with a urologist, a radiation oncologist, and if necessary, a medical oncologist. "This way the patient knows that if I recommend surgery, it's because we think that's the best choice for him, not because I'm a surgeon," Dr. Ward said. Patients also have access to an advanced practice nurse specialist who can provide guidance, discussion, and follow-up information. The clinic is available to patients who have a prostate cancer diagnosis and want a second opinion or want to be treated at M. D. Anderson.

In the future, imaging advances or refinements in tumor marker technology may predict how individual prostate tumors are likely to progress, which would make treatment decisions easier. "But for now, it's a matter of weighing side effects against cancer control," Dr. Ward said. Added Dr. Kuban, "It is important to individualize treatment recommendations." ●

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Integrative Medicine: Understanding Complementary and Alternative Therapies

Cancer patients often turn to sources besides their doctors to find treatments for the disease or ways to reduce side effects. In fact, studies indicate that anywhere from 50% to 80% of cancer patients try at least one type of complementary or alternative medicine in their quest to get well.

If you are considering complementary or alternative medicine, the following information can help you choose wisely from the seemingly countless options.

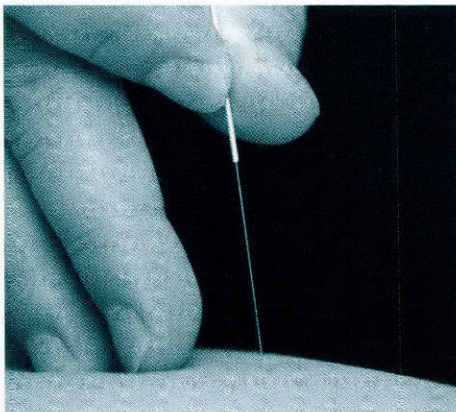
The term “complementary medicine” describes nonconventional approaches used *together with* conventional treatments. “Alternative medicine,” on the other hand, is used *in place of* conventional treatments. Taken together, complementary and alternative medicine includes a wide variety of options. Among them are:

- Mind-body interventions, such as guided imagery and hypnosis
- Herbal medicines and special diets
- Manipulative and body-based therapies, such as massage
- Energy therapies, such as Reiki and qigong
- Whole medical systems, such as traditional Chinese medicine or Ayurvedic medicine (traditional medicine from India)

You might also hear the term integrative medicine, which is an approach to treatment that makes use of all appropriate therapeutic approaches, providers, and disciplines to achieve optimal health and healing, according to the Consortium of Academic Health Centers for Integrative Medicine.

Consider the benefits and risks

Research has shown that some complementary treatments are useful in managing symptoms of cancer. For instance, acupuncture, which involves stimulating specific locations in the



Some complementary treatments are useful in managing symptoms of cancer.

body by puncturing the skin with fine needles, has been proven effective in managing chemotherapy-associated nausea and vomiting, in controlling pain associated with surgery, and in relieving dry mouth after radiation therapy. Yoga has been shown to improve cancer patients' quality of life, sleep, and sense of well-being.

Also, natural products have given rise to many cancer drugs. For example, vincristine (used to treat several types of cancer, including lymphoma and leukemia) comes from the periwinkle plant; Taxol (used to treat breast and ovarian cancer) is derived from a fungus isolated from the inner bark of the Pacific yew tree; and camptothecin (used to treat colon cancer) comes from a Chinese tree.

However, other forms of complementary or alternative treatments have not been shown to offer any benefit. For instance, laetrile (also known as amygdaline, a chemical found in the pits of many fruits and in numerous plants) is sometimes taken as a cancer treatment but has been shown ineffective against the disease. Worse, some seemingly harmless herbs and vitamins may cause anti-cancer drugs to work less effectively. High doses of vitamins, for example, may affect how radiation and chemotherapy work, and the herb St. John's

wort, often used for treating depression, may make some cancer medications less powerful.

Consult a doctor

Complementary and alternative therapies should not be used alone to *treat* cancer outside of a clinical trial, according to experts at M. D. Anderson Cancer Center. While conventional medicine is studied scientifically in laboratory and clinical trials, many complementary and alternative therapies have not been appropriately researched.

It is important that you tell your doctor about any therapies you are using or considering. That way, your doctor can ensure the therapy is safe and won't conflict with other treatments. Your doctor can also advise you about the benefits, risks, and possible side effects of the therapy.

Beware online information

Just because something is online doesn't mean it's true. The Internet is full of conflicting and erroneous health information, but there are also many reputable Web sites that you can trust. One good online source for complementary and alternative medicine is Complementary/Integrative Medicine Educational Resources (www.mdanderson.org/departments/CIMER), part of the Integrative Medicine Program at M. D. Anderson. The Web site offers reviews of published research studies of complementary and alternative medicine, a list of potential interactions between some drugs and herbal and other supplements, and links to other trustworthy Web sites. ●

For more information, talk to your physician, or:

- visit www.mdanderson.org
- call askMDAnderson at 1-877-632-6789

OncoLog, April 2009
K. Stuyck

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Rebuilding What Cancer Has Ravaged

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In 2006, with Andrea S. Gobin, Ph.D., Drs. Mathur and Butler published results on engineered biologics for ventral hernia repair in a guinea pig model; an innovation grant from the U.S. National Institute on Aging is supporting further development of the application. Dr. Mathur has also collaborated with other plastic surgeons at M. D. Anderson to develop engineered biologics for bone regeneration in sheep, nanotherapeutic delivery via tissue flap in mice, and directional microvasculature growth in the mesentery of rats.

“We found in those models that the silk fibroin–chitosan scaffold supports the growth of fascia and bone and directs endothelial cell migration for vascular growth, alluding to the overall regenerative capacity of the material,” Dr. Mathur said. “The microenvironment in which we implant the scaffold drives what kind of tissue will be formed.”

She and Dr. Butler are currently testing the engineered biologic scaffolds in an abdominal-wall musculofascial model in

guinea pigs. Dr. Mathur is also using the same material to make biodegradable nanoparticles containing therapeutic agents against cancer; results thus far indicate that the efficacy of drugs encapsulated in the material is increased using this delivery method in association with higher intracellular retention and increased bioavailability. A patent for the formulation is pending. “It’s a multifunctional material because of its biomimetic properties,” Dr. Mathur noted.

The development of new scaffolds, as well as improved understanding of how best to use commercially available meshes and matrices, has benefited from the collaboration between Drs. Butler and Mathur. Dr. Mathur noted, “We’re very lucky to be at M. D. Anderson working with the reconstructive plastic surgeons. Surgeons have to have novel ways of overcoming issues that arise as they’re doing repairs. When we do any studies in the laboratory, we keep that in mind.”

Outside the lab and back in the operating room, many patients have benefited already. “I used this technique today,” Dr. Butler said. “I used it yesterday, and I’ll be using it tomorrow. And with the breakthroughs we’re achieving in our clinical, basic science, and translational research, the rewards for our patients will increase even more in the future.” ●

For more information, call Dr. Butler at 713-794-1247.

“The microenvironment in which we implant the scaffold drives what kind of tissue will be formed.”

— Dr. Anshu Bagga Mathur

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